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The Impact of Guided Imagery on Sleep Quality in Mothers of Preterm Infants

Linda M. Schaffer PhD, MN, RN
University of San Diego

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Hahn School of Nursing and Health Science

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THE IMPACT OF GUIDED IMAGERY ON SLEEP QUALITY IN MOTHERS OF PRETERM INFANTS

Linda M. Schaffer, MN, RN

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Dissertation Committee

Lois C. Howland, DrPH, MSN, RN, Chairperson

Nancy Jallo, PhD, FNP-BC, WHNP-BC

Kathy James, DNSC, MSN, RN

Abstract

Background:

Mothers who have given birth to preterm infants are at an increased risk for impaired sleep. Evidence based interventions are needed to assist mothers in improving their sleep quality as few are available.

Purpose:

Guided by the transactional framework of Lazarus and Folkman (1984), the purpose of this study was to: describe maternal and infant factors which influence sleep quality, examine the relationships between depression, anxiety, stress, social support, to sleep quality, and describe the influence of a R-GI intervention on sleep quality among a sample of mothers whose preterm babies were admitted to NICU.

Methods:

This prospective, descriptive, secondary data analysis study which used repeated-measures ($N = 20$) (mother-infant dyads) was conducted over 8-weeks. The intervention consisted of the use of a CD which contained three tracks structured to influence outcomes. Maternal study measures collected at baseline (pre-enrollment), week four (time 2), and week eight (time 3) included: *The Perceived Stress Scale (PSS), The State-Trait Anxiety Inventory (STAI) State Scale only, The Duke UNC – Functional Social Support Scale (FSSQ), The Center for Epidemiologic Studies Depression Scale (CES-D), and The Pittsburg Sleep Quality Index (PSQI).* Infant measures included *The Neonatal Medical Index (NMI)* collected at time 3.

Findings:

The findings suggested that anxiety, depression, stress, and lower income are related to poor sleep quality, and that social support and increased age are related to better sleep quality. The participants reported that the intervention of R-GI assisted them in falling asleep and reduced stress. With cumulative R-GI use, sleep quality improved. The findings from this study may be used to inform future intervention studies designed to benefit the health outcomes of mothers of hospitalized preterm infants.

Conclusion:

This study was important in providing an investigation into factors which influence sleep quality in a sample of mothers whose preterm babies were admitted to NICU. Continued research is needed with a larger population to better understand interventions and factors which influence sleep quality in this population.

Dedication

This dissertation is dedicated to the memory of Helga Herman Schaffer, my mother, and Claudia Sue Jaunzemis, friend and maternal grandmother to my grandson. In honor of Stacy, Jonathan, Candice, Christoph, and Trevor (my family), friends, and the mothers who participated in this study.

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It has truly been an honor and a privilege to have attended the University of San Diego, Hahn School of Nursing and Health Science for a PhD in Nursing Science. For this, once in a life-time experience, and all who have contributed, I am so grateful.

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Chapter 1

Problem and Background

Postpartum depression is a worldwide public health problem (Almond, 2009). In the United States, the rate of postpartum depression is approximately 13% (Gibson, McKenzie-McHarg, Shakespeare, Price, & Gray, 2009). The disruption of sleep, which occurs during the last trimester of pregnancy and the postpartum period, has been significantly associated with the onset of depressive symptoms in postpartum women (Dennis & Ross, 2005). Mothers who have given birth to preterm infants are at an increased risk for impaired sleep (Davis, Edwards, Mohay, & Wollin, 2003); however, as Lee and Kimble (2009) pointed out, there are few tested interventions available to suggest to these mothers to assist in improving their sleep quality. Legislative mandates contained in the Patient Protection and Affordable Care Act include actions that should be taken regarding further research into the causes of postpartum depression and the development and evaluation of new treatments for this health problem (Patient Protection and Affordable Care Act, H.R. 3590, 2010). The purpose of this investigation was to identify factors that influence sleep quality in mothers with hospitalized, preterm infants.

Background and Significance

The preterm birth experience is a non-normative role transition to motherhood associated with significant stress. Challenges faced by these mothers include coping with concerns about their infant's survival, a lack of physical contact with their newborn, medical complications, invasive medical interventions, and their own recovery. Mothers of preterm infants are at an increased risk for encountering poor sleep quality due to the uncertainty they experience regarding the health of their infants (Davis et al., 2003), stressful events related to their infant's medical conditions, postpartum hormonal issues, and poor sleep hygiene (Lee & Kimble, 2009). These mothers experience ambivalence, shame, guilt, frustration, hopelessness (Obeidat, Bond, & Callister, 2009), grief, loss (Shaw, Clements, & Poehlmann, 2011), anxiety, depression (Voegtline & Stifter, 2010), and acute and posttraumatic stress disorder (Shaw et al., 2009).

Davis et al. (2003) identified that 40% of the mothers who have given birth to very premature infants experienced significant depressive symptoms 1-month after the infant's admission to the Neonatal Intensive Care Unit (NICU). Dorheim, Bondevik, Eberhard-Gran, and Bjorvatn (2009) discovered that for postpartum women, poor sleep quality was associated with depressive symptoms independent of other risk factors, for example, poor partner relationship, previous depression, depression during pregnancy, and stressful life events in the past year.

Lee and Kimble (2009) found that common symptoms of mothers of low-birth-weight (LBW), hospitalized infants included poor sleep quality, insufficient hours of nocturnal

sleep, fatigue, and depressive symptoms. Lee, Lee, Aycock, and Decker (2010) noted that mothers with an infant in the NICU had nocturnal sleep problems, disturbed circadian activity rhythms (CAR), and depressive symptoms. They identified that poor sleep quality and poor CAR contributed to diminished cognitive ability and decision making, which may have implications related to parenting. Poor sleep quality was both a cause and a symptom of postpartum depression (Dorheim et al., 2009), which has been linked with deficits in a mother's ability to care for her infant (Field, 2010).

Deficits in maternal caretaking activities associated with postpartum depression included difficulties with: (1) follow through with well-child exams, (2) having their child immunized, (3) safety practices, (4) breastfeeding (Field, 2010), and (5) greater use of emergency department services (Flynn, Davis, Marcus, Cunningham, & Blow, 2004). Postpartum depression adversely impacts a mother's ability to attend to infant cues, which negatively affects maternal-infant attachment (Shaw et al., 2011). An increased incidence of depression in the partners of depressed, new mothers has also been found. Depression in either or both parents may alter family dynamics and lead to an environment which may not support the normal growth and development of the child (Paulson, Dauber, & Leiferman, 2006). Since maternal depression is linked to negative maternal and child outcomes (Campbell, Matestic, von Stauffenberg, Mohan, & Kirchner, 2007), strategies are needed to assist mothers with coping to facilitate more positive trajectories for the mother and the child. Interventions aimed at improving sleep quality in mothers may prove beneficial to achieving better maternal and infant outcomes (Hunter, Rychnovsky, & Yount, 2009).

Relaxation-guided imagery (R-GI) has been found to be a strategy that reduced stress (Rossman, 2000), was convenient for use, and has shown promise as an intervention that was acceptable to pregnant women (Jallo, Bourguignon, Taylor, & Utz, 2008). R-GI utilizes visualization to promote relaxation. The mind is used to create images, which helps with relaxation as the brain cannot differentiate between a mental image and an actual physical experience (Rossman, 2000). R-GI involves breathing, muscle relaxation, and visualization techniques. With R-GI, the person imagines and experiences an internal reality which can be initiated by the participant or by a guided imagery therapist (Frisch & Frisch, 2011). It can be practiced individually, or in a group using a video, audiotape, or compact disc (CD) (Battino, 2000). An example of a guided imagery technique is to think back to an enjoyable event or a safe place and imagine sights, sounds, and smells. Using imagination, the participant remembers the place and experiences being there. Positive memories can be substituted for negative thoughts encountered in unpleasant situations (Frisch & Frisch, 2011). The R-GI intervention produces positive physiological and psychological responses (Rossman, 2000) and has been used in a variety of patient care situations (Frisch & Frisch, 2011).

Previous empirical studies have been conducted to explore how R-GI influences: (1) stress in overweight Latino adolescents (Weigensberg et al., 2009), (2) stress in patients with Parkinson's disease (Schlesinger, Benyakov, Erikh, Suraiya, & Schiller, 2009), (3) stress and anxiety in African-American women in their second trimester of pregnancy (Jallo, Bourguignon, Taylor, Ruiz, & Goehler, 2009; Jallo et al., 2008), and (4) stress, anxiety, and depression in hospitalized psychiatric patients (Alves-Apostolo &

Kolcaba, 2009). R-GI has been found to improve breathing, promote relaxation, diminish anger, facilitate sleep (Jallo et al., 2008), lessen stress (Alves-Apostolo & Kolcaba, 2009; Jallo et al., 2009; Jallo et al., 2008; Schlesinger et al., 2009), lower anxiety (Alves-Apostolo & Kolcaba, 2009; Jallo et al., 2009; Jallo et al., 2008), and decrease depressive symptoms (Alves-Apostolo & Kolcaba, 2009).

Specifically it has been helpful in reducing stress and anxiety in outpatient women in their second trimester of pregnancy (Jallo et al., 2009), and in assisting pregnant women to get to sleep and stay asleep (Jallo et al., 2008). Although studies have linked R-GI to decreasing stress, improving sleep, and lessening depression, there is a paucity of studies which have examined these relationships in mothers who have hospitalized, preterm infant. Research was needed to examine whether R-GI was helpful in improving sleep quality in this population.

Purpose of the Study

The purpose of this study was to identify factors that influence sleep quality in mothers who have given birth to hospitalized, preterm infants. The specific aims to be addressed by this study were to:

Aim 1: Maternal and Infant Variables and Sleep Quality

Describe maternal and infant factors which influence sleep quality among a sample of mothers whose preterm babies were admitted to NICU.

Aim 2: Depression, Anxiety, Stress, Social Support, and Sleep Quality

Examine the relationships between depression, anxiety, stress, and social support with sleep quality among a sample of mothers whose preterm babies were admitted to NICU.

Hypothesis 2.1: Depression and Sleep Quality

Women with higher levels of depressive symptoms will report poorer sleep quality than women with fewer depressive symptoms.

Hypothesis 2.2: Anxiety and Sleep Quality

Women with higher levels of anxiety will report poorer sleep quality than women with lower levels of anxiety.

Hypothesis 2.3: Stress and Sleep Quality

Women with higher levels of stress will report poorer sleep quality than women with lower levels of stress.

Hypothesis 2.4: Social Support and Sleep Quality

Women with less social support will report poorer sleep quality than women with more social support.

Aim 3: R-GI Use and Sleep Quality

Describe the influence of a R-GI intervention on sleep quality among a sample of mothers whose preterm babies were admitted to NICU.

Hypothesis 3.1: R-GI Use and Sleep Quality at Time 2 and Time 3

Women with more frequent use (dosage of R-GI) will have improved sleep quality at week 4 (time 2) and week 8 (time 3).

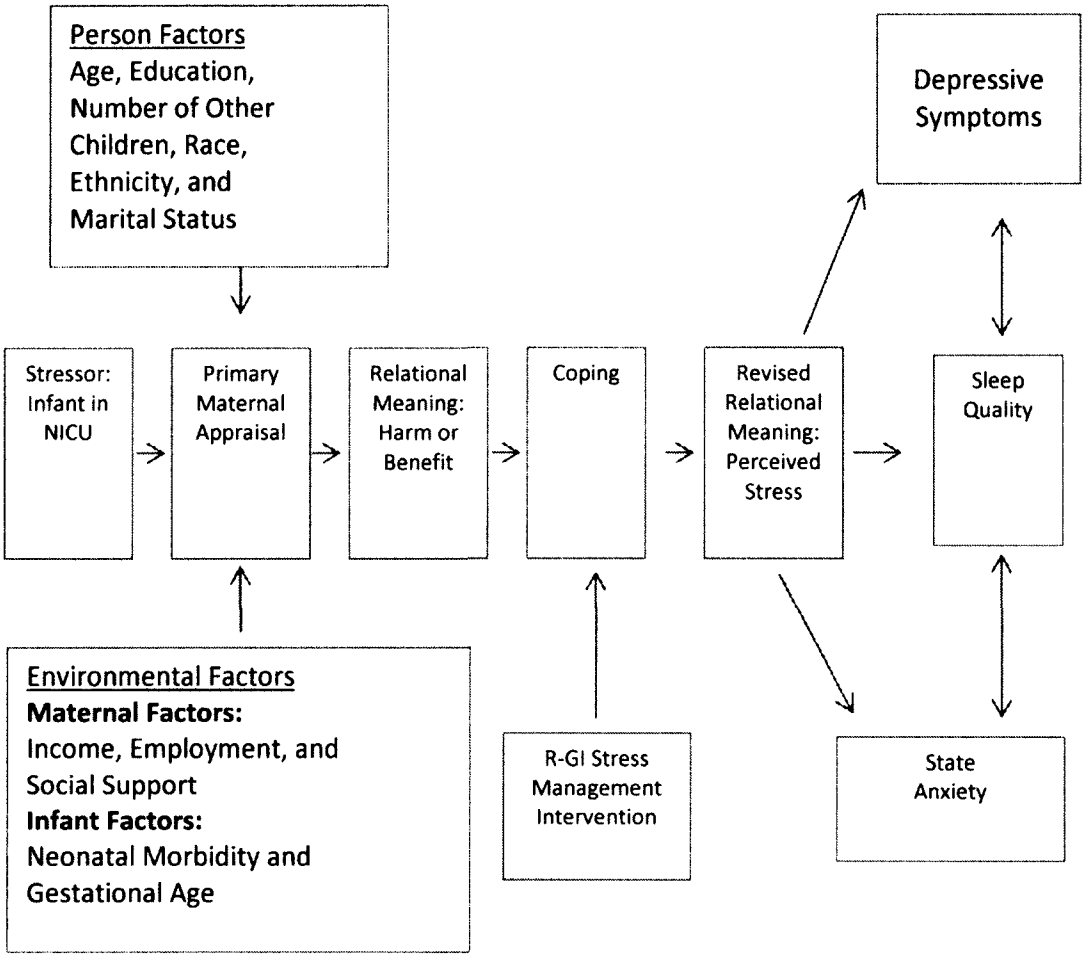
Hypothesis 3.2: Cumulative R-GI Use and Sleep Quality

Women with more cumulative dosage of R-GI will have improved sleep quality at time 3.

Theoretical Framework

Lazarus and Folkman (1984) identified the processes of cognitive appraisals and coping as mediators between stressful person-environmental transactions and outcomes. Appraisal is a process in which the person evaluates what is happening in an encounter with the environment. During cognitive appraisal, the person evaluates the stressor to determine the relevance to his/her well-being. In primary cognitive appraisal, the person evaluates harm and benefit, as well as, what is at stake. If an appraisal is made that determines that there is harm or threat, the emotions will be negative. If an appraisal is made that identifies benefit, the emotions will be positive. Environmental and personal factors influence relational meaning of the person-environmental transaction. These factors influence one's ability to cope. In secondary cognitive appraisal, the person evaluates the options for coping. Coping is a person's efforts, which are both cognitive and behavioral, to manage stress and can be emotion-focused or problem-focused. Emotion-focused coping relates to regulating stressful emotions and is accomplished by changing the meaning of the interaction with the environment or by diverting one's attention. Problem-focused coping relates to altering the person-environment relations that cause the distress by planning actions to change the interaction, for example acting on the environment or oneself (Lazarus & Folkman, 1984). Coping impacts mood states including anger, depression, and anxiety (Pereira & Penedo, 2007). R-GI positively influences coping as individuals learn skills to reduce anxiety, tension, stress, and to feel a sense of mastery over the circumstances causing stress (Antoni, 2007). The application of this theoretical framework to this study is represented in Figure 1.1.

Figure 1.1 Theoretical Framework



(Adapted from Lazarus & Folkman, 1984)

Significance of the Study

This chapter has described that there were few studies that identify factors which influence sleep quality in mothers of hospitalized, preterm infants. The results of this inquiry have contributed to the knowledge regarding sleep quality and sleep quality

interventions. Evidence-based interventions were needed to improve sleep quality in mothers with preterm infants. Since intervention studies were very limited and have not been widely attempted, this inquiry identified approaches to studying this group, which are useful in guiding further research. This study contributed to the knowledge base that is needed to impact policy related to focusing research on sleep quality and sleep quality interventions to reduce postpartum depression. This investigation was informed by previous research and literature related to R-GI, sleep quality, stress, anxiety, postpartum depression, and social support. Each of these topics has been explored to provide the framework for this research in the following chapters.

Chapter 2

Literature Review

This chapter contains a review of the literature related to R-GI intervention studies, sleep quality, stress, anxiety, postpartum depression, and social support. The current state of the science has been analyzed with recommendations for future research.

Background

In 2005, the cost for preterm birth in the United States was estimated at $26.2 billion (Behrman & Butler, 2007). More than 500,000 infants are born prematurely each year in the United States (Hamilton, Martin, & Ventura, 2006). Several identical risk factors and hormonal processes for preterm delivery, LBW, and postpartum depression have been identified (Halbreich, 2005). Further, the disruption of sleep, which occurs during the last trimester of pregnancy and the postpartum period, has been significantly associated with the onset of depressive symptoms in postpartum women (Dennis & Ross, 2005). Birth to the first year postpartum is a critical period for developing affective disorders (Giakoumaki, Vasilaki, Skouroliakou, & Liosi, 2009) including anxiety, depression, and stress disorders (Wenzel, Haugen, Jackson,

& Brendle, 2005). Postpartum depression has received considerable attention both in practice and in research (Miller, Pallant, & Negri, 2006). However, anxiety and stress have not been studied as widely as depression in the postpartum population (Miller et al., 2006). Failure to treat anxiety and stress may lead to worsening of symptoms and the development of depression. In the general population, individuals with both anxiety and depression have more severity of symptoms, are more difficult to treat, experience poorer outcomes, and are at an increased risk of suicide (Rivas-Vasquez, Saffa-Biller, Ruiz, Blais, & Rivas-Vasquez, 2004).

Mothers of preterm infants experience psychological distress during their infant's hospitalization (Holditch-Davis et al., 2009) as high levels of depression, anxiety, stress, and post-traumatic stress symptoms are common (Davis et al., 2003). Increased levels of maternal anxiety were related to the duration of the infant's hospital stay in the NICU with lengthier stays resulting in higher anxiety (Erdem, 2010). Mothers with infants in the NICU have been found to express worry over the health, future, and survival of their infant. These concerns put them at risk for encountering poor sleep quality due to the uncertainty they experience regarding the health of their infants (Davis et al., 2003), stressful events related to their infant's medical conditions, postpartum hormonal issues, and poor sleep hygiene. Poor sleep quality is a risk factor for developing postpartum depression (Lee & Kimble, 2009). Postpartum depression has been linked with deficits in a mother's ability to care for her infant (Field, 2010). It adversely impacts a mother's ability to attend to infant cues, which negatively affects maternal-infant attachment (Shaw et al., 2009). Previous studies

have not examined the effect of a R-GI on sleep quality or considered the relationship of anxiety, depression, stress, and social support to sleep quality with mothers of infants hospitalized in the NICU. This study examined these relationships.

Theoretical Model

The theory of stress and coping developed by Lazarus and Folkman (1984) was utilized as a framework to guide this research study and literature review. The transactional framework of Lazarus and Folkman (1984) was used in studies with pregnant African-American women in their second trimester of pregnancy to examine the effects of a R-GI intervention on stress (Jallo et al., 2008), and anxiety and stress (Jallo et al., 2009).

Primary Maternal Appraisal: Antecedent/Environmental Factors

In this study, the maternal variables that were examined were age, education, number of children, income, employment, marital status, race, and ethnicity. Infant variables that were studied included gestational age and neonatal morbidity. A number of environmental and personal factors are associated with poor maternal stress outcomes and have been discussed in previous studies.

Factors found to contribute to preterm delivery, LBW, and postpartum depression, include low socioeconomic status (SES), a lack of social support, race (African-American), marital status (single), socio-economic level (poverty), residence (inner city or disadvantaged community), stress and/or anxiety during pregnancy, early psycho-social stress and/ or repeated stressful events, physical or psychological trauma, age (adolescent mothers or mother older than 35), and maternal nutritional

deficits. Stress-related hormonal processes that are identical for LBW, preterm delivery, and postpartum depression included elevated cortisol, corticotrophin releasing hormone (CRH), interleukin-1 (IL-1), interleukin-6 (IL-6), norepinephrine, and vasopressin (Halbreich, 2005).

Lanes, Kuk, and Tamim (2011) found that the strongest association with postpartum depressive symptomatology was the mother's stress level during pregnancy. Other predictors of postpartum depressive symptomatology included: (1) support after pregnancy (those with more support had less depressive symptoms), (2) a prior diagnosis of depression, (3) household income (those in higher income categories had less depressive symptoms), (4) maternal age (teenage mothers between the ages of 16-through 19-years are most at risk), (5) immigrant status, (6) prior antidepressant usage, and (7) smoking during the third trimester of pregnancy. R-GI interventions have been attempted with a variety of populations in an effort to improve stress, anxiety, and/or depression and are presented in the section which follows.

Coping: Use of R-GI Stress Management Intervention

Previous empirical studies have been conducted to explore how R-GI influences: (1) stress in overweight Latino adolescents (Weigensberg et al., 2009), (2) stress in patients with Parkinson's disease (Schlesinger et al., 2009), (3) stress and anxiety in African-American women in their second trimester of pregnancy (Jallo et al., 2009; Jallo et al., 2008), and (4) stress, anxiety, and depression in hospitalized psychiatric patients (Alves-Apostolo & Kolcaba, 2009). R-GI has been found to improve breathing, promote relaxation, diminish anger, facilitate sleep (Jallo et al., 2008),

lessen stress (Alves-Apostolo & Kolcaba, 2009; Jallo et al., 2009; Jallo et al., 2008; Schlesinger et al., 2009), lower anxiety (Alves-Apostolo & Kolcaba, 2009; Jallo et al., 2009; Jallo et al., 2008), and decrease depressive symptoms (Alves-Apostolo & Kolcaba, 2009). A description of these studies can be found in Table 2.1.

Table 2.1

R-GI Studies

Author	Study Design/Length	Population (*N*) Location	Intervention	Measures/ Data	Findings for R-GI Intervention
Jallo et al. (2008)	Longitudinal 12-Weeks	Pregnant (Second Trimester) African-American Women (30) U.S.	Three R-GI CDs	Demographic Data Practice Logs	Improved Breathing, Relaxation, Sleep, Stress, Anxiety, and Anger
Jallo et al. (2009)	Controlled Randomized Experimental 12-Weeks	Pregnant (Second Trimester) African-American Women (59) U.S.	Three R-GI CDs	*PSS* *STAI Form Y* *CES-D* *NRSS* CRH Practice Logs	Decreased State Anxiety and Stress
Alves-Apostolo and Kolcaba (2009)	Quasi-Experimental 10-Days	Hospitalized, Depressed Patients (60) Portugal	R-GI CD Daily	*PICS* *DASS-21*	Decreased Anxiety, Depression, and Stress
Weigensberg et al. (2009)	Pilot Intervention 4-Weeks	Overweight Latino-Adolescents (12) U.S.	Weekly R-GI with Practioner Home Practice in Between	*PSS* Practice Logs	Reduced Salivary Cortisol (Stress)
Schlesinger et al. (2009)	Intervention	Patients with Parkinson's Disease (20) Israel	R-GI with Nurse	Accelerometer	Reduced Tremor (Stress)

Note: Measures that were abbreviated: The Perceived Stress Scale (PSS) (Cohen, Kamarck, & Mermelstein, 1983). State-Trait Anxiety Inventory (STAI Form Y-1) (Spielberger, 1983). Center for Epidemiologic Studies Depression Scale (CES-D) (Radloff, 1977). Numeric Rating Scale of Stress (NRSS) (Cupal & Brewer, 2001; Glynn, Wadhwa, Dunkel-Schetter, Chicz-Demet, & Sandman, 2001). Psychiatric Inpatient Comfort Scale (PICS) (Alves-Apostolo, Kolcaba, Cruz-Mendes, & Calario-Antunes, 2007). and DASS-21 (Lovibond & Lovibond, 1995).

Analysis of the Literature: R-GI Studies

In comparing the articles, several types of study designs, and a variety of self-report measures were used to measure anxiety, depression, and stress. The duration of the R-GI intervention varied from 10-days (Alves-Apostolo & Kolcaba, 2009) to 12-weeks (Jallo et al., 2009; Jallo et al., 2008). The intervention was delivered by CD in three studies (Alves-Apostolo & Kolcaba, 2009; Jallo et al., 2009; Jallo et al., 2008). One study utilized a certified interaction guided imagery practioner to provide the intervention on an individual basis (Weigensberg et al., 2009). A nurse was utilized to provide the intervention in another study (Schlesinger et al., 2009).

Common limitations to the investigations were samples that were small (Jallo et al., 2008; Schlesinger et al., 2009; Weigensberg et al., 2009), or lacked diversity (Jallo et al., 2009; Jallo et al., 2008). This limited the ability to generalize the findings to other populations. The results for *The PSS* were omitted from one study (Weigensberg et al., 2009). Some of the study designs did not control for the introduction of other treatments including journals/logs (Jallo et al., 2009; Jallo et al., 2008; Weigensberg et al., 2009), medications, or group therapy (Alves-Apostolo & Kolcaba, 2009), which posed a threat to validity. The studies had a variety of measures, methods, and populations, which made comparisons difficult.

Revised Relational Meaning: Stress, Anxiety, and Depression

Studies have been conducted which have examined comorbidities of stress, anxiety, and depression in the postpartum population. Wenzel et al. (2005) identified that postpartum anxiety was common and occurred at a higher rate than postpartum

depression. Miller et al. (2006) found either anxiety or depression or combinations of disorders (anxiety and stress; anxiety and depressive symptoms) in postpartum mothers.

Giakoumaki et al. (2009) discovered that anxiety symptomatology was higher than depressive symptomatology in postpartum mothers; state anxiety correlated with primiparity, infant admission to the NICU, and negative labor experiences; increased anxiety symptoms were associated with giving birth prematurely or delivering a LBW infant; and depressive symptoms were correlated with mothers that were young and had negative labor experiences.

Holditch-Davis et al. (2009) found that mothers of preterm infants who experienced extreme distress had the sickest infants, the lowest educational levels, and infants with longer mechanical ventilation. At 24-months, these mothers had symptoms of posttraumatic stress (65%) and depressive symptoms (56%). Poehlmann, Schwichtenberg, Bolt, and Dilworth-Bart (2009) identified that depressive symptoms were present in mothers (32%) of preterm infants prior to NICU discharge. A description of these studies can be found in Table 2.2.

Table 2.2

Stress, Anxiety, and Depression Studies

Authors	Type of Study Design	Population (Postpartum Period) (*N*) Location	Measures	Significant Findings for Stress, Anxiety, and Depression
Wenzel et al. (2005)	Cross-Sectional	Postpartum Women (8-Weeks) (147) U.S.	*DSM-IV Axis I* (Anxiety and Depression Disorders) *BAI* *BDI* *PSWQ* *SIAS* *DAS*	Postpartum anxiety occurred at a higher rate than postpartum depression
Miller et al. (2006)	Cross-Sectional	Postpartum Women (6-24 Weeks) (325) Australia	*DASS-21* *EPDS*	Participants had anxiety or depression or various combinations of anxiety, stress, and depression
Poehlmann et al. (2009)	Longitudinal	Mothers of Preterm and LBW Infants (Birth to 24-Months) (181) U.S.	*CES-D*	Depressive symptoms were present in mothers (32%) prior to the infant's NICU discharge
Giakoumaki et al. (2009)	Correlational Descriptive	Postpartum Mothers (2-Days) (235) Greece	*EPDS* *STAI (Greek Version)*	Anxiety symptomatology was higher than depressive symptomatology
Holditch-Davis et al. (2009)	Longitudinal	African-American Mothers of Preterm, LBW Infants (Birth to 24-Months) (177) U.S.	*PSS:NICU* *CES-D* *STAI* *PPQ* *The Hassles and Uplift Scale* *NBRS* *Worry Index*	At 24-months, mothers with high NICU distress had posttraumatic stress and depressive symptoms

Note: Measures that were abbreviated: DSM-IV Axis I Disorders-Non Patient Version (anxiety and depression disorders) (First, Spitzer, Gibbon, & Williams, 1977), The Beck Anxiety Inventory (BAI) (Beck, Epstein, Brown, & Steer, 1988), Beck Depression Inventory (BDI) (Beck & Steer, 1987), Penn-State Worry Questionnaire (PSWQ) (Meyer, Miller, Metzger, & Borkovec, 1990), Social Interaction Anxiety Scale (SIAS) (Mattic & Clark, 1998), and The Dyadic Adjustment Scale (DAS) (Spanier, 1976), DASS-21 (Lovibond & Lovibond, 1995), Edinburgh Postnatal Depression Scale (EPDS) (Cox, Holden, & Sagovsky, 1987), Center for Epidemiologic Studies Depression Scale (CES-D) (Radloff, 1977), Greek Version of The State Trait Anxiety Inventory (STAI) (Liakos & Giannitsi, 1984), Parental Stressor Scale: NICU (PSS:NICU) (Miles, Funk, & Carlson, 1993), State Anxiety Sub-Scale of State-Trait Anxiety Inventory (STAI), (Spielberger, Gorsuch, & Lushene, 1970), Perinatal PTSD Questionnaire (PPQ) (Quinnell & Hynan, 1999), Daily Hassles Sub-Scale of The Hassles and Uplift Scale (Kanner, Coyne, Schaefer, & Lazarus, 1981), Neurobiologic Risk Scale (NBRS) (Brazy, Goldstein, Oehler, Gustafson, & Thompson, 1993), Worry Index (Miles & Holditch-Davis, 1995).

Analysis of the Literature: Stress, Anxiety, and Depression

A variety of study designs and measures were utilized to examine anxiety, depression, and stress. The timing as to the specific postpartum period studied varied from 2-days (Giakoumaki et al., 2009) to 24-months postpartum (Holditch-Davis et al., 2009; Poehlmann et al., 2009). The samples utilized in the various studies lacked diversity (Holditch-Davis et al., 2009; Miller et al., 2006) and were limited to a geographic region (Giakoumaki et al., 2009; Holditch-Davis et al., 2009; Miller et al., 2006; Poehlmann et al., 2009), which made it difficult to generalize findings to other populations. The variety of measures, methods, and postpartum time period studied made comparisons difficult.

Revised Relational Meaning: Sleep

Sleep is a state of rest for the body and the mind in which the eyes are usually closed and there are decreased bodily movements and responsiveness to external stimuli. Adults sleep approximately 6- to 7- hours every 24-hour period. Sleep and wake patterns are controlled by neurotransmitter systems in the brain. Sleep is associated with hormonal changes involving thyroid-stimulating hormone (suppressed by sleep), growth hormone (expressed during slow-wave sleep), cortisol (increased toward the end of the night), prolactin (peaks during sleep) and melatonin (rises during nocturnal sleep) (Ross, Murray, & Steiner, 2005). Brain wave activity during sleep has characteristic cycles. Rapid eye movement (REM) sleep is a phase of sleep in which dreams take place. Non-rapid eye movement (NREM) sleep is divided into three stages. With Stage 1 of sleep, there is a transition from wakefulness to sleep.

Stage 1 represents less that 5% of sleep. Stage 2 represents about 50% of sleep and is the first true sleep stage. Stage 3 and Stage 4 are referred to as delta or slow wave sleep which is the deepest form of restorative sleep. Individuals cycle one complete REM and NREM stage every 90-minutes completing approximately five cycles in an 8-hour period. Physiologically with slow wave sleep, there is a reduction of norepinephrine, serotonin, and acetylcholine. People feel the most rested with ample slow wave sleep (Chiong, 2008).

Sleep is essential in promoting health. Insufficient sleep can negatively affect energy, performance, memory, learning, thinking, alertness, productivity, creativity, longevity, and the quality of life. Failure to get enough sleep increases cortisol (Howard, 2006). High cortisol levels have a negative effect on the body as they interfere with the sleep cycle by stimulating the body when it should be asleep and by diminishing inflammatory and immune responses. High cortisol levels can adversely impact the cardiovascular, gastro-intestinal, metabolic, endocrine, and immunologic systems of the body (Plant & Stephenson, 2009). Insufficient sleep increases IL-6, a cytokine (protein) that regulates immune function. Excessive levels of this protein can damage bone and tissue, and contribute to poor immune function, growth of fat rather than muscle, acceleration of the aging process, memory impairment, depression, anxiety, insulin resistance, increased risk of heart disease, and accidents (Howard, 2006).

From birth to 6-months, there are alterations in the sleep patterns of postpartum women commonly associated with feeding a newborn during the night (Doan,

Gardiner, Gay, & Lee, 2007). New mothers experience a lack of sleep, sleep deprivation, and fatigue (Dennis & Ross, 2005). Studies of sleep patterns during the postpartum period have described significant changes, especially during the first week after delivery. There is a decrease in sleep efficiency and a decrease in total sleep time. Hormonal changes (decline in progesterone) during the postpartum period have been thought to contribute to altered sleep patterns (Ross et al., 2005). Kang, Matsumoto, Skioda, Mishima, and Seo (2002) identified that total sleep time and sleep efficiency (recorded by actigraphy and sleep logs) became significantly shortened or decreased each week following delivery up to week 12, when it went from interrupted to uninterrupted. Dorheim et al. (2009) found that postpartum mothers sleep 6.5-hours on average per night.

Many of the neurotransmitter systems in the brain responsible for the regulation of sleep also are responsible for multiple functions in the brain, which include those related to psychiatric disorders. This accounts for the significant interactions that occur between sleep and psychiatric disorders. Characteristics of sleep observed in patients with depression include difficulty falling asleep and staying asleep, decreased slow-wave sleep, and increased REM sleep (Ross et al., 2005). During the postpartum period, new mothers are especially susceptible to poor sleep quality and mood disorders (Posmontier, 2008).

Sleep Quality and Mood Disorders

Factors associated with postpartum depression in mothers of term infants were having a male infant and experiencing more infant awakenings at night. Mothers with

personal and family psychiatric history, previous psychotherapy and antidepressant use, anxiety, life stress, and suicidal thoughts were more at risk. In postpartum mothers, those with postpartum depression experienced poorer sleep quality; poor sleep quality predicted the severity of postpartum depressive symptoms; and as depression increased, sleep quality worsened (Posmontier, 2008).

Poor sleep quality in the postpartum population was associated with depression, being a first-time mother, not breastfeeding exclusively, having a male infant, and previous sleep problems. Poor sleep was associated with depression independent of other risk factors (poor partner relationship, previous depression, depression during pregnancy, and stressful life events in the past year) (Dorheim et al., 2009). In studies of hospitalized LBW infants, postpartum mothers experienced poor sleep quality, poor daytime functioning, and fatigue. Those who had more sleep debt reported more fatigue severity, depression, and poorer mental and physical health. Daytime sleep negatively impacted sleep at night, and greater daytime light exposure resulted in less sleep disturbances, earlier morning rising, sleep debt, and better physical and mental health. Higher activity levels and a better CAR were related to longer nighttime sleep (Lee and Kimble, 2009), less self-reported sleep disturbance, and fatigue severity (Lee et al., 2010). A description of these studies can be found in Table 2.3.

Sleep and Coping: Intervention Studies

Intervention studies with postpartum mothers were very limited. Stremler et al. (2006) identified that mothers in a behavioral-education sleep intervention program averaged 57-minutes more nighttime sleep, and rated sleep as less of a problem than a

control group. Doan et al. (2007) examined sleep patterns in parents who breastfed their infants as compared to infants that were bottle fed at night. Mothers and fathers of infants who were breastfed slept an average of 40-to 45-minutes more than the parents of infants given formula. The parents who bottle fed reported more sleep disturbance than those who breastfed. A description of these studies can be found in Table 2.3.

Coping: Sleep and Social Support

Studies could not be located which described the effects of social support on sleep quality in the postpartum population or in the subset postpartum population of mothers with infants in the NICU. However, a study conducted in Brazil examined the relationships between the quality of perceived social support and sleep difficulties with (N = 498) elderly participants. Elderly participants who reported difficultly falling asleep and sleeping poorly at night had less social support than participants who did not report sleep disturbances (Costa, Ceolim, & Neri, 2011).

Table 2.3

Sleep and Depression Studies/Sleep and Intervention Studies

Authors	Type of Study Design	Population (Weeks Postpartum) (*N*) Location	Intervention	Measures	Significant Findings
Posmontier (2008)	Case-Controlled Repeated-Measures Matched-Pairs	Postpartum Women Depressed Versus Not Depressed (6- to -26) (46) U.S.		Actigraphy and Activity Logs (7-Days)	Postpartum depression related to poor sleep quality Sleep quality predicted the severity of postpartum depression
Dorheim et al. (2009)	Descriptive Cross-Sectional Population-Based	Postpartum Women (7) (4191) Norway		*PSQI* *EPDS*	Poor sleep was associated with depression independent of other risk factors
Lee and Kimble (2009)	Cross-Sectional Descriptive Exploratory Feasibility	Postpartum Women with LBW Infants in NICU (2) (20) U.S.		Sleep Diaries and Wrist Actigraphy (2-Days) *EPDS* *NRS-F* *GSDS*	Participants had sleep disturbances and depression
Lee et al. (2010)	Descriptive Secondary Data Analysis	Postpartum Women with LBW Infants in NICU (2) (72) U.S.		Sleep Diaries and Wrist Actigraphy (2-Days) *GSDS* *LFS*	Participants with significant fatigue upon awakening, had disrupted sleep
Stremler et al. (2006)	Randomized, Controlled Trial	Postpartum Women (birth-to- 6) (60) Mother/Infant Pairs Canada	Behavioral Education Sleep Program	Actigraphy and Sleep Diary (6-Weeks)	Intervention group had an average of 57-minutes more nighttime sleep and rated sleep as less of a problem
Doan et al. (2007)	Randomized Controlled Trial	Parents of Newborn (12) (133) U.S.	Compared Parental Sleep Patterns of Breastfed Versus Bottle Fed Infants	Wrist Actigraphy and Sleep Diary (2-Days) *GSDS*	Parents of breastfed infants slept an average of 40-45 minutes more and had less sleep disturbance than those who bottle fed

Note: Measures that were abbreviated: The EPDS (Cox et al., 1987), *Pittsburg Sleep Quality Index (PSQI)* (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989), 7-item *Numerical Rating Scale-Fatigue (NRS-F)* (Lee, Hicks, & Nino-Murcia, 1991), *General Sleep Disturbance Scale (GSDS)* (Lee, 1992), *GSDS* (Lee, 1992), and *Lee Fatigue Scale (LFS)* (Lee et al., 1991).

Analysis of the Literature: Sleep Quality

In comparing the articles, a variety of study methods and measures were used to study sleep quality. When wrist actigraphy was used, this measure was paired with either a sleep diary or a sleep log (Doan et al., 2007; Lee & Kimble, 2009; Lee et al., 2010; Posmontier, 2008; Stremler et al., 2006). Data was obtained for 2-days in several studies (Doan et al., 2007; Lee & Kimble, 2009; Lee et al., 2010), for 1-week in one inquiry (Posmontier, 2008), and for 6-weeks in another investigation (Stremler et al., 2006). The timing as to when the studies were conducted varied from 2-weeks (Lee & Kimble, 2009; Lee et al., 2010) to 26-weeks postpartum (Posmontier, 2008). The intervention studies were conducted with postpartum mothers of term infants and utilized randomized controlled trials (Doan et al., 2007; Stremler et al., 2006). Relationships between poor sleep quality and depression in the postpartum population were identified (Dorheim et al., 2009; Lee & Kimble, 2009; Posmontier, 2008). Common limitations were small sample sizes which lacked diversity (Doan et al., 2007; Lee & Kimble, 2009; Lee et al., 2010; Posmontier, 2008; Stremler et al., 2006), or samples from one geographic region (Dorheim et al., 2009) which made it difficult to generalize findings to other populations. Studies of mothers with infants in the NICU examined depression and sleep disturbance (Lee & Kimble, 2009), and sleep disturbance and fatigue (Lee et al., 2010). A variety of self-report measure, actigraphy, and sleep diaries/logs were utilized at different periods of time to examine several different variables in conjunction with sleep in the postpartum population. It was difficult to make comparisons given the diversity of approaches to studying the problem.

Recommendations for Future Research

The relationship between anxiety, depression, stress, and social support to sleep quality and interventions to promote sleep for the postpartum population (term and preterm) needs to continue to be explored as studies were limited. A study could not be located which examined the relationship of social support to sleep quality with term or preterm mothers. Intervention studies were not available which examined sleep quality in mothers of preterm infants. Notably, numerous researchers have identified that interventions to improve sleep quality in the postpartum population are needed (Dorheim et al., 2009; Lee & Kimble, 2009; Lee et al., 2010; Posmontier, 2008; Stremler et al., 2006).

Previous empirical studies have linked R-GI to decreasing stress, reducing anxiety, improving sleep, and lessening depression. However, there were no studies that have examined these relationships in mothers who have preterm infants, particularly those admitted to NICU. Further research was needed to examine whether R-GI was helpful to this population. This literature review identified the need for a study to examine relationships between anxiety, depression, stress, social support and sleep quality, and the influence of an R-GI intervention on sleep quality for mothers of preterm infants hospitalized in the NICU.

Chapter 3

Research Methodology and Design

A prospective, descriptive, secondary data analysis study which used repeated-measures was the design for this inquiry. Repeated-measures of secondary data collected between April 2010 and November 2010 were examined. This design was appropriate because it was useful for identifying quantitative measures of outcomes related to an intervention (Creswell, 2009). This secondary data analysis study used data that was collected by another researcher and was analyzed again to answer new research questions (Vogt, 2005). There were advantages to this approach for the participants as they were not contacted again for purposes of collecting information. This method also saved time and money for the researcher as the data had already been collected (Rudestam & Newton, 2007).

The Maternal Relaxation Study (MRS)

The Maternal Relaxation Study (*MRS*), a prospective non-randomized feasibility study conducted by Howland, Jallo, Pickler, Glaser, and Connelly (2011), was designed to test the use of a (R-GI) intervention on biological and behavioral outcomes in mothers of hospitalized, preterm infants.

Sample and Setting

The original study sample consisted of (N = 20) mothers who had given birth to preterm infants (N = 20) hospitalized in the NICU between April 2010 and September 2010 at a large metropolitan hospital for women and newborns located in San Diego County. Nineteen participants completed the study with attrition due to a missed final interview. This participant did not complete time 3 study measures; another participant did not complete a page of the *CES-D,* so it could not be used. The participants were initially screened for eligibility by study personnel who were NICU nurses. Once deemed eligible, mothers were offered information on *The MRS.* If interested in the study, they contacted *The MRS* primary investigator (PI) or the research coordinator for further study information. The PI or the research coordinator met with each participant to review the study protocols.

The inclusion criteria for the sample consisted of participants who were: (1) mothers of infants 26- to 32-weeks gestation at the time of birth, (2) ≥18-years of age, (3) had one or more children currently in the NICU at the time of enrollment, (4) willing to complete three study visits over an 8-week period and (5) able to collect two early morning saliva samples at specified times. The exclusion criteria for the participants were: (1) unable to read, write, and understand English, (2) currently using corticosteroids, (3) receiving treatment for immune disorders, thyroid, adrenal, cardiac, or chronic renal disease, (4) receiving treatment for psychiatric disorders (except depression or anxiety disorders), and (5) currently using guided imagery techniques (Howland et al., 2011).

Data Collection Procedures

Once enrolled in the study, participants completed a demographic questionnaire and baseline self-report measures for several constructs. The self-report measures were completed by the participants again at time 2 and time 3 of the study. The intervention consisted of the daily use of a 20-minute R-GI CD by the participants for 8-weeks. The CD was utilized to teach R-GI techniques and consisted of a set of three 20-minute tracks of recordings. Each track of the CD focused on a theme which included relaxation, working with difficult feelings, and caring for self. The participants received: (1) a detailed packet of instructions, (2) a CD which contained the intervention, (3) a CD player, (4) extra batteries, and (5) individualized instructions regarding all study materials by the PI. They received weekly phone calls from study personnel who: (1) monitored their amount of weekly R-GI practice, (2) advised them at scheduled times to advance to a different track of the CD, and (3) inquired if they had any problems utilizing the CD daily for R-GI practice. A summary of data collection procedures can be found in Table 3.1. The data collected from the weekly conversations was recorded by research personnel on a questionnaire. After 8-weeks, a semi-structured face-to-face interview was conducted by the PI. Data from this interview was recorded by the PI on a questionnaire (Howland et al., 2011).

Table 3.1

Data Collection Procedures (MRS Study)

	Pre-Enrollment	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
Screening Informed Consent	X								
Demographic Questionnaire	X								
Weekly Phone Call		X	X	X	X	X	X	X	X
Study Visit		X			X				X
R-GI Track		1		2		3			
R-GI Practice		X	X	X	X	X	X	X	X
PSQI	X				X				X
CES-D	X				X				X
STAI	X				X				X
PSS	X				X				X
FSSQ	X				X				X
NMI									X

Schaffer Study

For the present investigation, variables were chosen as a result of: (1) a literature review, and (2) the availability of relevant data from the existing data set. Variables for this inquiry included the amount of R-GI intervention use, sleep quality, depressive symptoms, stress, anxiety, and social support. The maternal demographic variables included age, education, number of children, income, employment, marital status, breastfeeding, race, and ethnicity. The infant variables included gestational age and neonatal morbidity. The standardized measures employed in this study had considerable application with adults. Every measure selected was utilized in the original investigation and was congruent with the purposes of the research.

Measures

Sleep quality was measured by *The PSQI* (Buysse et al., 1989), a 19-item (4-level response) self-report measure of subjective sleep quality over the past month. It was used to differentiate between good and poor sleepers. The components measured included sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbance, use of sleep medications, and daytime functions. The component scores were weighted equally on a 0-to-3 scale and were summed together to provide a global *PSQI* score that ranged from 0-21. A global *PSQI* score of ≥ 5 indicated poor sleep quality. The higher the global score on *The PSQI*, the worse the sleep quality. This measure has concurrent validity (Buysse et al., 1989) and a Cronbach alpha of 0.734 (Howland et al., 2011).

Depressive symptoms were measured by *The CES-D* (Radloff, 1977), a 20-item (4-level response) self-report depression scale. The major symptom areas assessed by this measure included depressed mood, guilt/worthlessness, helplessness/hopelessness, psychomotor retardation, loss of appetite, and sleep disturbance. The scale for the range of answers was from 0-to-3, with a total score range of 0-to-60. The single total score was used to estimate the degree of depressive symptoms. Scores of ≥ 16 indicated depressive symptomology. *The CES-D* has construct validity (McDowell, 2006), and a Cronbach alpha of 0.930 (Howland et al., 2011).

Anxiety was measured by *The STAI*, a self-report measure (Spielberger et al., 1970) of state anxiety (a reaction to a specific situation) and trait anxiety (a quality an individual possesses to be predisposed to perceive situations as threats). The inventory contains 40-items total (4-level response) (20-items each measure state and trait anxiety). The measure has construct validity (Rojas-Carrasco, 2010), and a Cronbach alpha of

0.950 (Howland et al., 2011). For the present inquiry, data from the state anxiety scale was utilized, as the trait anxiety scale was not administered in the original inquiry.

The perception of stress during the last month was measured by *The PSS* (Cohen et al., 1983), a 10-item (5-level response) self-report measure of the degree to which situations in one's life were appraised as stressful. It also indicated how unpredictable, uncontrollable, and overloaded respondents found their lives. The experience of stress was assessed in a global manner. Higher scores were reflective of greater perceived stress. *The PSS* (10-item version) has construct (Cohen et al., 1983; Cohen & Williamson, 1988), convergent, and concurrent validity (Mitchell, Crane, and Kim, 2008), and a Cronbach alpha of 0.873 (Howland et al. (2011).

Social support was measured by *The Duke – UNC Functional Social Support Questionnaire (FSSQ)* (Broadhead, Gehlbach, DeGruy, & Kaplan, 1988), a self-report measure containing 8-items with 5-levels of responses. Higher scores were reflective of more social support. This measure has construct validity (Broadhead et al., 1988), and a Cronbach alpha of 0.960 (Howland et al., 2011).

The severity of infant illness while hospitalized was measured by *The Neonatal Medical Index (NMI)*. A 5-point scale was utilized to determine a single score. Scores range from 1 (least ill) to 5 (most ill) utilizing data collected from a brief chart review. This measure has concurrent validity (Korner et al., 1993).

Data from the self-report measures (*The PSQI, CES-D, STAI, FSSQ,* and *PSS)* obtained from *The MRS Study* (Howland et al., 2011) (collected at baseline, time 2, and time 3), and information from the infant's chart (used to determine *The NMI* and the infant's gestational age) was studied. In addition, a demographic data questionnaire

included age, education, number of other children, income, employment, marital status, breastfeeding, race, and ethnicity that was collected at baseline, was examined. Weekly phone interviews that captured the amount of R-GI practiced by the participants were utilized. Telephone interviews (126) used to ensure intervention fidelity, and face-to-face interviews (19) conducted at time 3 were studied.

Data Analysis Plan

Descriptive and inferential statistics were used to analyze the data. These methods were chosen based on the research aims, study questions, independent and dependent variables, and level of measurement of each of the variables that were selected for study. Descriptive statistics were utilized to enumerate characteristics of the sample and to examine numerical distribution of study variables. Pearson's *r* was used to evaluate relationships between continuous variables, and independent samples *t* tests were used to evaluate mean differences in dichotomous variables.

The following describes the aims, hypotheses and the data analysis plan:

Aim 1: Maternal and Infant Variables

Describe maternal and infant factors which influence sleep quality among a sample of mothers whose preterm babies were admitted to NICU.

Descriptive statistics were computed to describe the maternal population relative to maternal age, education, number of children, income, employment, marital status, breastfeeding, race, ethnicity, amount of R-GI practiced by the participants, depressive symptoms, anxiety, stress, social support, and sleep quality. Descriptive statistics were computed to describe the gestational age of the infant and neonatal morbidity. Pearson's *r* was used to analyze the continuous predictor variables of maternal age, gestational age,

and neonatal mortality to quality of sleep at baseline, time 2, and time 3. Independent samples *t* tests were used to analyze if there were significant mean differences between quality of sleep (a continuous variable) and the categorical variables of marital status, ethnicity, race, employment, income, and other children at baseline, time 2, and time 3.

Aim 2: Depression, Anxiety, Stress, Social Support, and Sleep Quality

Examine the relationships between depression, anxiety, stress, and social support with sleep quality among a sample of mothers whose preterm babies were admitted to the NICU.

Hypothesis 2.1: Depression and Sleep Quality

Women with higher levels of depressive symptoms will report poorer sleep quality than women with fewer depressive symptoms.

Pearson's *r* was used to test whether there was a significant relationship between depressive symptoms to sleep quality at baseline, time 2, and time 3.

Hypothesis 2.2: Anxiety and Sleep Quality

Women with higher levels of anxiety will report poorer sleep quality than women with lower levels of anxiety.

Pearson's *r* was used to test whether there was a significant relationship between anxiety to sleep quality at baseline, time 2, and time 3.

Hypothesis 2.3: Stress and Sleep Quality

Women with higher levels of stress will report poorer sleep quality than women with lower levels of stress.

Pearson's *r* was used to test whether there was a significant relationship between stress to sleep quality at baseline, time 2, and time 3.

Hypothesis 2.4: Social Support and Sleep Quality

Women with less social support will report poorer sleep quality than women with more social support.

Pearson's *r* was used to test whether there was a significant relationship between social support to sleep quality at baseline, time 2, and time 3.

Aim 3: R-GI Use and Sleep Quality

Describe the influence of a R-GI intervention on sleep quality among a sample of mothers whose preterm babies were admitted to NICU.

Hypothesis 3.1: R-GI Use and Sleep Quality at Time 2 and Time 3

Women with more frequent use (dosage of R-GI) will have improved sleep quality at time 2 and time 3.

The average listening scores for weeks 1- 4 and for weeks 5-7 were computed and were the independent variables that were correlated separately with the dependent variable sleep quality (average listening scores from weeks 1-4 were correlated with time 2 *PSQI* scores, and average listening scores from weeks 5-7 were correlated with time 3 *PSQI* scores) by statistical testing utilizing Pearson's *r*.

Hypothesis 3.2: Cumulative R-GI Usage and Sleep Quality

Women with more cumulative dosage of R-GI will have improved sleep quality at time 3.

Pearson's r was used to determine if the amount of cumulative R-GI CD use influenced sleep quality at time 3.

Protection of Human Subjects

The original study was reviewed by the institutional review boards (IRB) from the sponsoring hospital and the University of San Diego. The PI provided participants with written and verbal informed consent prior to the start of the original study and identification numbers which were associated with all data. The PI stored all questionnaires in a locked and secured file cabinet in a private office. The data was entered into *Statistical Package for Social Sciences (SPSS)* statistical software, version 19, using identification numbers. This investigation complied with the ethical standards of the institution and federal regulations to protect human subjects, as IRB approval was obtained from the sponsoring institution (the University of San Diego) prior to initiation of research.

Summary

In this chapter, a prospective, descriptive, secondary data analysis study which used repeated-measures was described. This approach was used to identify factors that influenced sleep quality, and examined specific effects of R-GI on sleep quality in mothers who had given birth to hospitalized, preterm infants. The sample characteristics, setting, sample recruitment, data collection procedures, measures, data analytic strategies, and protection of human subjects were presented. The following chapter describes the results.

Chapter 4

Results

The aims of this study were to: (1) describe maternal and infant factors which influence sleep quality, (2) examine the relationships between depression, anxiety, stress, social support, to sleep quality, and (3) describe the influence of a R-GI intervention on sleep quality among a sample of mothers whose preterm babies were admitted to NICU.

Maternal variables that were examined included sleep quality, anxiety, depressive symptoms, stress, social support, the R-GI intervention, maternal age, race, ethnicity, income, employment, number of other children, and marital status. Infant factors that were explored included gestational age, and neonatal morbidity. This chapter presents maternal and infant profiles, measurement reliabilities, and the findings of the study organized under study aims.

Participant Profiles

Maternal Profile

Of the 20 women who completed baseline measures, one participant dropped out of the study after week 7 due to time constraints, resulting in a 5% attrition rate. Another participant completed the study and all measures with the exception of *The CES-D* at

time 3. Participants' ages ranged from 18-to 37-years with a mean of 27.30 (*SD* = 6.38). Race levels were dichotomized as White and non-White due to an insufficient number of individual discrete categories. There were a limited number of participants in all other categories. Employment status was dichotomized as employed versus not employed. The number of other children was dichotomized as no other child versus other children. All of the participants reported breast feeding. This variable was not analyzed further. Total family income was dichotomized into < $30,000 per year or ≥ $30,000 per year, as this was the midpoint of the range of categories. Due to the high educational level of the sample (17 out of 20 had an education of > than high school), this variable was not analyzed further. A description of the study sample is in Table 4.1.

Percentages of clinically important levels of depressive symptoms (*CES-D* ≥ 16) varied across the three study time points. At baseline 13/20 participants had CES-D scores ≥ 16, at 4-weeks, 7/20, and at 8-weeks 7/18. Poor sleep quality (global *PSQI* scores of ≥ 5) was present in 18/20, 15/20, and 16/19 participants for baseline, time 2, and time 3 measures respectively. Maternal behavioral variables are described in Table 4.2.

Infant Profile

Infants ranged in gestational age from 24-to 32-weeks with a mean gestational age of 28-weeks (*SD* = 2.32). A description of the study sample is in Table 4.1 and Table 4.2.

Measurement Reliabilities

Measurement reliabilities for *The PSS* (perceived stress), *CES-D* (depressive symptoms), *STAI* (state anxiety), *FSSQ* (social support), and *PSQI* (sleep quality) are

described in Table 4.2. The range for a Cronbach's alpha is from .00 to +1.00. The closer the alpha is to 1.00, the better the internal consistency of the measure. Coefficients of .70 to .75 are considered adequate. However, coefficients of .80 or greater are considered highly reliable (Polit, 2010).

Table 4.1

Description of Maternal/Infant Variables for Study Sample (N = 20)

Variable	Level	n (%)
Marital Status	Married	10 (50)
	Not Married	10 (50)
Ethnicity	Hispanic	10 (50)
	Not Hispanic	10 (50)
Race	White	12 (60)
	Non-White	8 (40)
Employment Status	Employed	6 (30)
	Not Employed	14 (70)
Number of Children	Other Children	13 (65)
	No Other Children	7 (35)
Total Family Income	≥ $30,000	10 (50)
	< $30,000	10 (50)
Maternal Education Level	Completed High School	3 (15)
	> High School	17 (85)
Variable	***M (SD)***	**Range**
Maternal Age (Years)	27.30 (6.38)	18-37
Gestational Age (Weeks)	28.0 (2.32)	24-32

Table 4.2

Description of Maternal Behavioral Variables and Measurement Reliabilities

Variable	Baseline μ (*SD*) Range (*n*)	α	*Time 2* *μ (SD)* *Range* *(n)*	α	Time 3 μ (*SD*) Range (*n*)	α
Sleep Quality	9.79 (3.94) 4-17 (20)	0.725	7.43 (3.60) 1-15 (20)	0.734	8.04 (3.57) 1-14 (19)	0.701
Perceived Stress	19.55 (5.75) 10-28 (20)	0.845	17.45 (7.17) 7-31 (20)	0.873	17.79 (5.80) 9-28 (19)	0.787
State Anxiety	42.05 (13.40) 21-67 (20)	0.950	34.00 (9.80) 20-55 (20)	0.922	39.42 (12.79) 20-62 (19)	0.944
Depressive Symptoms	18.45 (11.90) 1-45 (20)	0.918	13.15 (8.72) 1-33 (20)	0.812	14.61 (11.79) 0-38 (18)	0.930
Social Support	34.05 (5.39) 25-40 (20)	0.845	33.05 (7.97) 11-40 (20)	0.935	33.74 (8.69) 10-40 (19)	0.960
Neonatal Morbidity					4.00 (1.08) 2-5 (20)	

Aim 1: Findings

Aim 1: Maternal and Infant Variables

Describe maternal and infant factors which influence sleep quality in this population.

An independent samples *t* test was used to analyze if there was a significant mean difference in the quality of sleep scores at baseline, time 2, and time 3 depending on the dichotomous variables of marital status, ethnicity, race, employment, income, and other children.

Income and Sleep Quality

There was a significant mean difference in quality of sleep scores at baseline depending on income. Results are described in Table 4.3. This was a medium size effect (Field, 2009). Participants with an income of < $30,000 had poorer quality of sleep

scores than those with incomes of ≥ $30,000 at baseline. There were no other significant mean differences for the other variables that were tested at any time point.

Maternal Age and Sleep Quality

Pearson correlations were used to analyze the continuous predictor variables of maternal age and quality of sleep at baseline, time 2, and time 3. There was a significant, negative relationship between maternal age and quality of sleep scores at baseline. Results are described in Table 4.3. This was a large effect size (Field, 2009). As maternal age increased, quality of sleep scores at baseline decreased (lower quality of sleep scores are indicative of better sleep quality). Although not significant, there was a negative relationship for maternal age at time 3 and quality of sleep scores at time 3. This was a medium effect size (Field, 2009). As maternal age increased, quality of sleep scores at time 3 decreased (lower quality of sleep scores are indicative of better sleep quality).

Gestational Age and Sleep Quality

Pearson correlations were used to analyze the continuous predictor variables of gestational age and quality of sleep at baseline, time 2, and time 3. Although not significant, there was a positive relationship for gestational age at baseline and quality of sleep scores at baseline. Results are described in Table 4.3. This was a medium effect size (Field, 2009). As gestational age increased, quality of sleep scores at baseline increased (higher quality of sleep scores are indicative of poorer sleep quality).

Neonatal Morbidity and Sleep Quality

Pearson correlations were used to analyze the continuous predictor variables of neonatal morbidity and quality of sleep at baseline, time 2, and time 3. Although not significant, there was a negative relationship for neonatal morbidity scores at baseline and quality of sleep scores at baseline. Results are described in Table 4.3. This was a medium effect size (Field, 2009). As neonatal morbidity scores decreased (lower scores are indicative of an infant that is less ill), quality of sleep scores at baseline increased (higher quality of sleep scores are indicative of poorer sleep quality).

Table 4.3

Relationship of Maternal/Infant Factors on Mean PSQI Scores (Independent Samples t Test and Pearson Correlations)

Variable	Baseline *t* (*df*) (*p*-value) (*N* = 20)	Time 2 *t* (*df*) (*p*-value) (*N* = 20)	Time 3 t (*df*) (*p*-value) (*N* = 19)
Marital Status	1.153 (12.86) (.270)	-1.508 (18) (.149)	-1.721 (17) (.103)
Race	8.820 (18) (.389)	-0.611 (18) (.549)	0.560 (17) (.583)
Ethnicity	0.874 (18) (.394)	0.559 (18) (.583)	0.962 (17) (.350)
Employed	0.979 (18) (.341)	-0.192 (18) (.850)	-0.377 (17) (.711)
Income	2.427 (18) (.026)*	0.394 (18) (.698)	0.635 (17) (.534)
Other Children	0.295 (18) (.771)	0.422 (18) (.678)	-0.468 (17) (.646)
Variable	**r(*p*-value)**	**r(*p*-value)**	**r(*p*-value)**
Maternal Age	-.488 (.029)*	-.185 (.436)	-.402 (.088)
Gestational Age	.268 (.253)	.177 (.456)	-.017 (.944)
Neonatal Morbidity	-.254 (.279)	-.075 (.754)	.076 (.756)

Note. Asterisk (*) indicated significance at $p < .05$.

Aim 2: Findings

Aim 2: Depression, Anxiety, Stress, Social Support, and Sleep Quality

Examine the relationships between depressive symptoms, anxiety, stress, social support, with sleep quality among a sample of mothers whose preterm babies were admitted to the NICU.

Depressive Symptoms and Sleep Quality

Pearson correlations were used to test whether there was a significant relationship between depressive symptoms at baseline, time 2, and time 3 and quality of sleep scores at baseline, time 2, and time 3. There was a significant positive correlation between depressive symptom scores at baseline and quality of sleep scores at baseline. Results are described in Table 4.4. This was a large effect size (Field, 2009). As depressive symptom scores increased, quality of sleep scores increased (higher quality of sleep scores are indicative of poorer sleep quality). No other correlations between depressive symptoms and quality of sleep were significant; however the relationship between depressive symptom scores at time 2 and quality of sleep scores at time 2 bordered on significance. There was a positive relationship between depressive symptom scores at time 3 and quality of sleep scores at time 3. This was a medium effect size (Field, 2009). As depression scores increased, quality of sleep scores increased.

State Anxiety and Sleep Quality

Pearson correlations were used to test whether there was a significant relationship between state anxiety scores at baseline, time 2, and time 3 and quality of sleep scores at baseline, time 2, and time 3. There was a significant positive relationship between state

anxiety scores at baseline and quality of sleep scores at time 2 ($r = .458, p = 0.042$). This was a large effect size (Field, 2009). Increased state anxiety scores at baseline correlated with increased sleep quality scores at time 2. There was also a significant positive correlation between state anxiety scores at time 2 and quality of sleep scores at time 2. Results are described in Table 4.4. This was a large effect size (Field, 2009). As state anxiety scores increased at time 2, quality of sleep scores increased at time 2 (higher quality of sleep scores are indicative of poorer sleep quality). No other correlations between state anxiety and quality of sleep were statistically significant. However, there was a positive correlation between state anxiety scores at baseline and quality of sleep scores at baseline. This was a medium effect size (Field, 2009). As anxiety scores increased at baseline, quality of sleep scores increased at baseline (higher quality of sleep scores are indicative of poorer sleep quality). There was a positive correlation between state anxiety scores at time 3 and quality of sleep scores at time 3. As state anxiety scores increased at time 3, quality of sleep scores increased at time 3 (higher quality of sleep scores are indicative of poorer sleep quality). This was a medium effect size (Field, 2009).

Perceived Stress and Sleep Quality

Pearson correlations were used to test whether there was a significant relationship between perceived stress scores at baseline, time 2, and time 3, and quality of sleep scores at baseline, time 2, and time 3. There were no statistically significant relationships between perceived stress scores and quality of sleep scores at any time points. However, there was a positive correlation between perceived stress scores at baseline and quality of

sleep scores at baseline. Results are described in Table 4.4. This was a medium effect size (Field, 2009). There was a positive correlation between perceived stress scores at time 2 and quality of sleep scores at time 2. This was a medium effect size (Field, 2009). There was a positive correlation between perceived stress scores at time 3 and quality of sleep scores at time 3. At all three time points as perceived stress scores increased, quality of sleep scores increased (higher quality of sleep scores are indicative of poorer sleep quality).

Social Support and Sleep Quality

Pearson correlations were used to test whether there was a significant relationship between social support scores at baseline, time 2, and time 3, and quality of sleep scores at baseline, time 2, and time 3 (see Table 4.4). There was a significant negative correlation between social support scores at baseline and quality of sleep scores at baseline. This was a large effect size (Field, 2009). As social support scores increased, quality of sleep scores decreased (decreased sleep quality scores are indicative of better sleep quality). There were no other statistically significant relationships between social support scores and quality of sleep scores at any time points. However, there was a negative correlation between social support scores at time 2 and quality of sleep scores at time 2. This was a medium effect size (Field, 2009).

Table 4.4

Relationship of Behavioral Factors and R-GI Use on PSQI Scores Over Time (Pearson Correlations)

Variable	Baseline *r(p-value) (n)*	Time 2 *r(p-value) (n)*	Time 3 *r(p-value) (n)*
Depressive Symptoms	.496 (.026)* (20)	.441 (.052) (20)	.343 (.164) (18)
State Anxiety	.324 (.164) (20)	.514 (.020)*(20)	.391 (.098) (19)
Perceived Stress	.321 (.167) (20)	.353 (.126) (20)	.419 (.074) (19)
Social Support	-.462 (.040)* (20)	-247 (.294) (20)	-.126 (.608) (19)

Note. Asterisk (*) indicated correlation was significant at $p<.05$.

Aim 3: Findings

Aim 3: R-GI Use

Describe the influence of a R-GI intervention on sleep quality.

The average amount of time participants reported listening to the R-GI CD each week is provided in Table 4.5. On average, participants reported listening to the CD most during week 4 and least during week 1.

Table 4.5

Participant's R-GI CD Usage Over 7-Weeks

Week	*M (SD)*	Range
1	3.90 (2.39)	0-9
2	3.88 (2.65)	0-8
3	4.58 (3.53)	0-14
4	4.93 (3.12)	1-14
5	4.71 (2.35)	1-9
6	4.66 (2.06)	2-8
7	4.71 (2.36)	0-9

R-GI Use and Sleep Quality at Time 2 and Time 3

Pearson correlations were used to determine if the amount of time participants spent listening to the R-GI CD influenced quality of sleep scores at time 2 and time 3. First, the mean average time spent listening in weeks 1, 2, 3, and 4 ($M = 4.32$, $SD = 2.02$) was computed for time 2 and correlated with quality of sleep. Next, the mean average time spent listening in weeks 5, 6, and 7 ($M = 4.69$, $SD = 2.00$) was determined for time 3 and correlated with quality of sleep scores. There were no significant relationships between average times spent listening and quality of sleep at time 2 or time 3. Results are described in Table 4.6.

Cumulative R-GI Usage and Sleep Quality

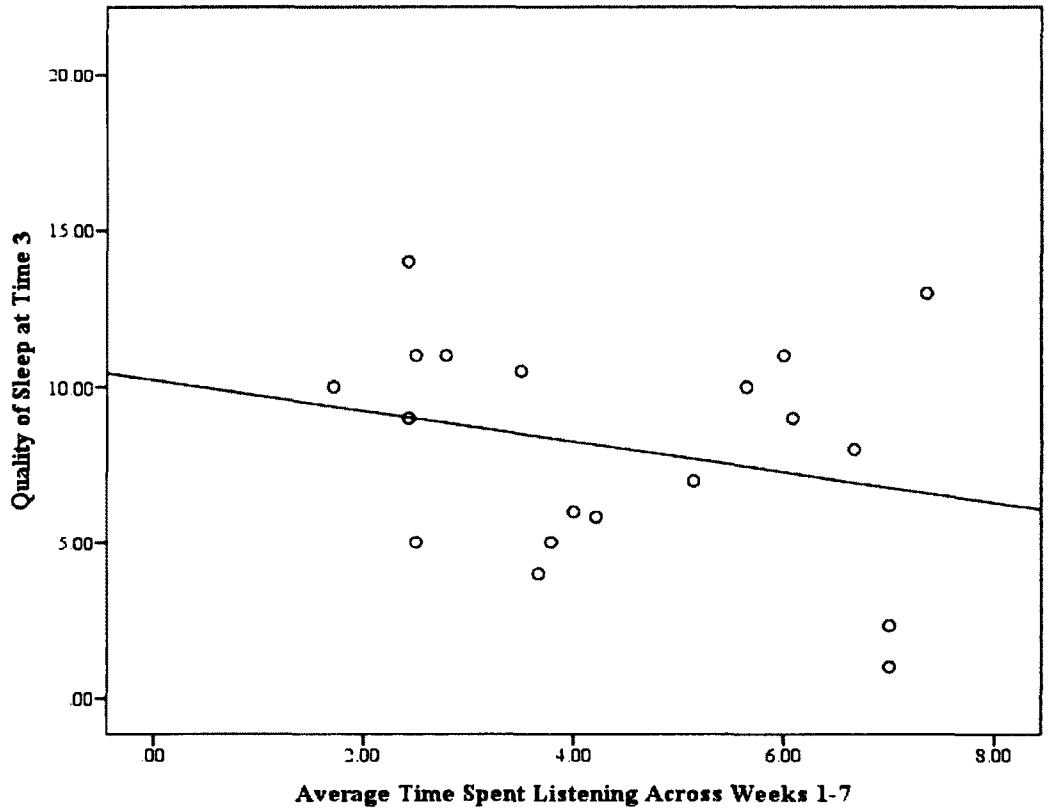
Pearson correlations were used to determine if the amount of cumulative R-GI CD use influenced sleep quality scores at time 3. There was a negative relationship between cumulative R-GI CD use and sleep quality scores for weeks 1-7 that was not significant. See Table 4.6 for results. This was a medium effect size (Field, 2009). The relationship between the average amount of time spent listening per week, across weeks 1-7, and the quality of sleep scores at time 3 (week 8) is shown in Figure 4.1. As the number of times spent listening to the R-GI CD increased, quality of sleep scores decreased (lower scores are indicative of better sleep quality).

Table 4.6

Relationship of R-GI Use on PSQI Scores Over Time (Pearson Correlations)

Variable	Time 2 *r(p-value)* (*n* =20)	Time 3 *r(p-value)* (*n* = 19)
R-GI Use Weeks 1-4	-.207 (.381)	
R-GI Use Weeks 5-7		-.046 (.852)
Cumulative R-GI Use Week 1-7		-.255 (.293)

Figure 4.1. *Plot of the Relationship Between Listening Weeks 1-7 and Quality of Sleep at Week 8*



This chapter has described the profiles of the participants, measurement reliabilities, and the findings of the study. The chapter which follows presents the significance of the investigation, strengths and limitations of the study, and implications for research, policy development, and nursing practice.

Chapter 5

Discussion

Guided by the transactional framework of Lazarus and Folkman (1984), this study sought to describe maternal and infant factors which influence sleep quality; examine the relationships between depression, anxiety, stress, social support, to sleep quality; and describe the influence of a R-GI intervention on sleep quality among a sample of mothers whose preterm babies were admitted to the NICU. This chapter presents the significance of the research findings, strengths and limitations of the study, and implications for research, policy development, and nursing practice.

Significance of Research Findings

This prospective, descriptive, secondary data analysis study ($N = 20$) (mother-infant dyads) was conducted over 8-weeks. An intervention was utilized which consisted of listening to a R-GI CD which contained three tracks structured to influence outcomes. Due to the small sample size, one must be cautious in drawing conclusions as statistical tests utilized in this study measured relationships and not causality. However, the results offer some support for the findings of other investigators. A summary of the aims and significance of the findings follows:

Aim 1: Maternal and Infant Variables

Describe maternal and infant factors which influence sleep quality among a sample of mothers whose preterm babies were admitted to NICU.

In this study, maternal variables were examined to see if there was a significant mean difference in quality of sleep scores at baseline, time 2, and time 3 depending on the dichotomous variables of marital status, ethnicity, race, employment, income, and other children.

Income and Sleep Quality

There was a significant mean difference in quality of sleep scores at baseline depending on income. Results are described in Table 4.3. This was a medium effect size (Field, 2009). Participants with an income of < $30,000 had poorer sleep quality compared to those with incomes of ≥ $30,000 at baseline. Findings in this study supported the previous work of other researchers including Friedman et al. (2007), who found that greater pretax household income predicted lower global *PSQI* scores in a population of aging women (65 or older). In another study, Kachikis and Breitkopf (2012) identified that poor sleep quality was associated with lower income levels in women in the general population ages 18 to 55.

Maternal Age and Sleep Quality

The continuous predictor variables of maternal age and quality of sleep were examined at baseline, time 2, and time 3. There was a significant, negative relationship between maternal age and quality of sleep scores at baseline. Results are described in Table 4.3. This was a large effect size (Field, 2009). As maternal age increased quality of sleep scores at baseline decreased (lower quality of sleep scores are indicative of better

sleep quality). The population in this study ranged in age from 18-37. Although not significant, there was a negative relationship for maternal age at time 3 and quality of sleep scores at time 3. This was a medium effect size (Field, 2009). As maternal age increased, quality of sleep scores at time 3 decreased (lower quality of sleep scores are indicative of better sleep quality). These findings are inverse relationship from what is described in the literature. In studies of the general population (age 5 across the lifespan) sleep quality declined with age (Ohayon, Carskadon, Guilleminault, & Vitiello, 2004). Further study of maternal age and sleep quality with a larger population is necessary to better understand this relationship in mothers of hospitalized preterm infants.

Gestational Age and Sleep Quality

Pearson correlations were used to analyze the continuous predictor variables of gestational age and quality of sleep scores at baseline, time 2, and time 3. Although not significant, there was a positive relationship for gestational age at baseline and quality of sleep scores at baseline. Results are described in Table 4.3. This was a medium effect size (Field, 2009). As gestational age increased, quality of sleep scores at baseline increased (higher quality of sleep scores are indicative of poorer sleep quality). Further study of gestational age and maternal sleep quality with a larger population is necessary to better understand this relationship.

Neonatal Morbidity and Sleep Quality

Pearson correlations were used to analyze the continuous predictor variables of neonatal morbidity and quality of sleep scores at baseline, time 2, and time 3. Although not significant, there was a negative relationship for neonatal morbidity scores at baseline

and quality of sleep scores at baseline. Results are described in Table 4.3. This was a medium effect size (Field, 2009). As neonatal morbidity scores decreased (lower scores are indicative of an infant that is less ill), quality of sleep scores at baseline increased (higher quality of sleep scores are indicative of poorer sleep quality). Further study of this variable with a larger population is necessary to better understand this relationship.

In the current study, no other significant relationships were identified for any of the other maternal and infant variables and sleep quality at any time point. The lack of significant correlations may be related to the small sample size in the current investigation, as Kachikis and Breitkopf (2012) found that poor sleep quality was associated with ethnicity, marital status, employment status, and parity in a study of (N = 2,670) in the general population of women.

Aim 2: Depression, Anxiety, Stress, Social Support, and Sleep Quality

Examine the relationships between depression, anxiety, stress, social support with sleep quality among a sample of mothers whose preterm babies were admitted to NICU.

Depressive Symptoms and Sleep Quality

This study examined if women with higher levels of depressive symptoms reported poorer sleep quality than women with fewer depressive symptoms. There was a significant positive correlation between depressive symptom scores at baseline and quality of sleep scores at baseline. Results are described in Table 4.4. This was a large effect size (Field, 2009). As depressive symptoms increased at baseline, quality of sleep scores at baseline increased (higher quality of sleep scores are indicative of poorer sleep quality). There was a positive relationship between depressive symptom scores at time 2

and quality of sleep scores at time 2. This was a medium effect size (Field, 2009). Although not statistically significant, there was a positive relationship between depressive symptom scores at time 3 and quality of sleep scores at time 3 (higher quality of sleep scores are indicative of poorer sleep quality). This was a medium effect size (Field, 2009).

These findings validate the research of Dorheim et al. (2009) who found that for postpartum participants, poor sleep was associated with depression independent of other risk factors (poor partner relationship, previous depression, depression during pregnancy, and stressful life events in the past year). These findings are important as depression in the postpartum population is associated with impairments in maternal-infant attachment and poor outcomes for both the mother and the child (Shaw et al., 2011).

State Anxiety and Sleep Quality

This study explored if women with higher levels of state anxiety reported poorer sleep quality than women with lower levels of state anxiety. There was a significant positive correlation between state anxiety scores at baseline and quality of sleep scores at time 2 ($r = .458$, $p = 0.042$) (higher quality of sleep scores are indicative of poorer sleep quality). This was a large effect size (Field, 2009). There was also a significant positive correlation between anxiety at time 2 and quality of sleep at time 2. Results are described in Table 4.4. This was a large effect size (Field, 2009). As state anxiety scores increased at time 2, quality of sleep scores increased (higher quality of sleep scores are indicative of poorer sleep quality). There were no other significant relationships between state anxiety scores and sleep quality scores at any time point. However, there was a positive

correlation between state anxiety scores at baseline and quality of sleep scores at baseline. This was a medium effect size (Field, 2009). As state anxiety scores increased at baseline, quality of sleep scores increased at baseline (higher quality of sleep scores are indicative of poorer sleep quality). There was a positive correlation between state anxiety scores at time 3 and quality of sleep scores at time 3. As state anxiety scores increased at time 3, quality of sleep scores increased at time 3 (higher quality of sleep scores are indicative of poorer sleep quality). This was a medium effect size (Field, 2009).

These findings validate efforts of previous researchers as Giakoumaki et al. (2009) found that state anxiety in this population correlated with infant admission to the NICU, giving birth prematurely or delivering a LBW infant. Erdem (2010) identified that increased levels of maternal anxiety were related to the duration of the infant's stay in the NICU with lengthier stays resulting in higher anxiety. Kachikis & Breitkopf (2012) found that poor sleep quality was associated with anxiety in the general population of women. The relationship between sleep quality and anxiety is important as untreated anxiety can lead to depression. In the general population, those who are comorbid for anxiety and depression are more difficult to treat, have poor health outcomes and are at a greater risk for suicide (Rivas-Vasquez et al., 2004).

Perceived Stress and Sleep Quality

This study examined if women with higher levels of perceived stress reported poorer sleep quality. At all three time points, correlations were not statistically significant. However, there was a positive correlation between perceived stress scores at baseline and quality of sleep scores at baseline. Results are described in Table 4.4. There was a

positive correlation between perceived stress scores at time 2 and quality of sleep scores at time 2. There was a positive correlation between perceived stress scores at time 3 and quality of sleep scores at time 3. At all three time points, the effect sizes were medium (Field, 2009). As perceived stress scores increased, quality of sleep scores increased (higher quality of sleep scores are indicative of poorer sleep quality). The relationship between sleep quality and stress is important as untreated stress can lead to depression (Rivas-Vasquez et al., 2004). The relationship between stress and sleep quality in the current study is consistent with the research of Kachikis and Breitkopf (2012), who identified that poor sleep quality was associated with stress in the general population of women. A previous study has highlighted issues involving participant recall when using *The PSS.*

Jallo et al. (2009) utilized an R-GI intervention with a population of African-American women in their second trimester of pregnancy. Participants reported difficulty when asked to complete a self-study measure that required recall over a preceding period of a month (*PSS*). In the current study, *The PSS* was used to measure perceived stress, and *The PSQI* was used to measure subjective sleep quality. These self-report measures examined a time period of a previous month, which may have caused recall bias and affected reliability of self-report measures.

Language facility in English may have affected reliability of self-report measures. This study had 50% Hispanic versus 50% non-Hispanic participants and all were able to read and write English. However, reading levels of the participants were not tested, and translation may have been an issue in understanding the self-report measures. When

asked about suggestions for future studies, one participant stated, "translate forms into Spanish," and another replied, "recommend that you develop this in Spanish".

Although the correlations between perceived stress scores and sleep quality scores were not significant, participants discussed stress and R-GI CD use during intervention fidelity checks and the final face-to-face interview. Representative samples of comments made related to use of the CD for stress reduction included:

"I try to listen daily, because I am really stressed out."

"I felt relaxed as long as I was listening, but then had stressful feelings when I stopped listening."

"I was stressed, I would listen."

"I liked imaging a place I could feel stress-free."

Social Support and Sleep Quality

This study tested if women with less social support reported poorer sleep quality than women with more social support. There was a significant negative relationship between social support scores at baseline and quality of sleep scores at baseline. Results are described in Table 4.4. As social support increased at baseline, quality of sleep scores decreased (lower quality of sleep scores are indicative of better sleep quality). This was a large effect size (Field, 2009). Although not statistically significant, there was a negative relationship between social support scores at time 2, and sleep quality scores at time 2. This was a medium effect size (Field, 2009). As social support scores increased at time 2, quality of sleep scores decreased at time 2 (lower quality of sleep scores are indicative of better sleep quality). This supports the findings of another study in which elderly

participants who reported sleep problems (difficulty falling asleep and sleeping poorly at night) had less social support than participants who did not report sleep difficulties (Costa et al., 2011).

In the current study, participants reported that they used internet blogging, Facebook, and engaged in activities provided by the NICU social work staff to cope with stress. These social-support activities were not measured. Future studies will need to control for these potentially confounding variables as they may pose a threat to validity.

Aim 3: R-GI Use and Sleep Quality

Describe the influence of a R-GI intervention on sleep quality among a sample of mothers whose preterm babies were admitted to NICU.

R-GI Use and Sleep Quality at Time 2 and Time 3

This study examined if women with more frequent use (dosage of R-GI) had improved sleep quality at time 2 or time 3, and if women with more cumulative dosage of R-GI had improved sleep quality at time 3. There were no significant relationships between average times spent listening and quality of sleep scores at time 2 or time 3. Results are described in Table 4.6.

Cumulative R-GI Use and Sleep Quality

There was a negative relationship between cumulative R-GI use and quality of sleep scores at time 3. Results are described in Table 4.6. This was a medium effect size (Field, 2009). As the number of times spent listening to the R-GI CD increased, quality of sleep scores decreased (lower quality of sleep scores are indicative of better sleep quality) (See Figure 4.1).

Although the correlations between *The PSQI* (sleep quality scores) and the cumulative use of the intervention were not significant, several participants commented about the use of the R-GI CD and aspects of sleep quality during weekly telephone intervention fidelity checks. Participants stated in reference to the R-GI intervention (CD):

"I fall asleep when listening."

"Put me in a relaxed state; I fall asleep at the end."

"Track 1 puts me to sleep; track 2 puts me to sleep faster."

"It hypnotizes me; the voice is so calming it puts me to sleep."

In conducting the final face-to-face interviews, participants made the following comments regarding their use of the R-GI CD:

"I've used the CD a couple of times a week at bedtime to help me sleep."

"Still helps me fall asleep."

"When I was stressed out, they helped me to sleep."

"Fall asleep became so relaxed."

"I've never been able to listen to the whole track, because it always puts one to sleep."

"I put on track 2 and then fell asleep."

These comments parallel the findings of another study (Jallo et al. 2009) which found that R-GI helped second trimester pregnant women to fall asleep and stay asleep. Given the small sample size of the current study, power may have been an issue in determining the significance of relationships between the R-GI intervention and sleep quality.

Strengths and Limitations of the Study

Strengths of this inquiry were that it was a prospective, descriptive, secondary data analysis design which used repeated-measures. This provided information regarding several study variables over an 8-week time period with timed measures. This assisted in gaining a better understanding of the population as relationships between the variables were identified at very specific time points. The parent study utilized numerous measures and provided a wealth of data to enable this secondary data analysis study. A void in the literature existed as little information was available regarding factors which influence sleep quality in mothers of hospitalized preterm infants. This study identified some population specific relationships between variables that had previously only been identified in the general population.

Limitations of this inquiry were the small heterogeneous sample size which made it difficult to control for confounding factors and to determine statistical significance for some of the relationships. Participants may have experienced recall bias when completing measures which asked for information for over a previous month period (*PSQI* and *PSS*). Recall bias and language facility in English may have affected reliability of the self-report measures. The study was limited by missing data as one participant dropped out of the study after week 7 and did not complete time 3 measures, and another participant did not complete a page of *The CES-D*, so it could not be used. Other potentially confounding factors (internet blogging, use of Facebook, and activities provided by the NICU social work staff) that mothers used to cope with stress were not measured. However, despite these limitations, this study supported prior research

identifying anxiety, depression, and lower income to poorer sleep quality, and social support and increased age to better sleep quality at a level of statistical significance.

Implications for Future Research

The findings from this study will inform future research regarding factors which influence sleep quality in mothers of hospitalized preterm infants, as well as interventions which promote sleep quality in this population. Many participants in this study sample had difficulties with sleep quality and comorbid issues of anxiety and depression. Since anxiety and depression are amenable to modification, a better understanding of these factors may lead to interventions targeted at improving sleep quality. Research studies are needed to investigate these relationships and the R-GI intervention utilizing a randomized controlled trial to eliminate confounding variables. Biological measures, such as actigraphy in conjunction with the PSQI, may provide a fuller understanding of the effects of the R-GI intervention on sleep quality. Biological measures, such as salivary cortisol levels, may produce data which identifies the effectiveness of the intervention on perceived stress. Maternal age, gestational age, and neonatal morbidity, and their influence on sleep quality are factors which should continue to be examined. Future studies which include a diverse sample of participants sufficient to power a multivariate analysis of the data could potentiate the identification of significant findings.

Implications for Policy Development

National research priorities and funding must focus on improving sleep quality in mothers of preterm infants who are most at risk for affective disorders (Davis et al., 2003) which interfere with maternal-infant attachment (Shaw et al., 2011), maternal

infant caretaking activities (Field, 2010), and negatively affect the growth and development of the child (Paulson, et al., 2006). The consequences of poor sleep quality can harm multiple body systems (Plant & Stephenson, 2009) in this population and in other populations. Curriculum in pre-licensure nursing programs, which is mandated by rules and policies of external regulatory bodies, must include a larger emphasis on sleep quality across the lifespan.

Implications for Nursing Practice

The inquiry has contributed to the knowledge regarding sleep quality and sleep quality interventions which can positively influence health outcomes in this population of clients and their children. This knowledge may be utilized by nurses in daily practice as they can assess mothers who have infants in the NICU for difficulties with sleep quality, stress, anxiety, and depression and make appropriate referrals. Nurses are positioned to implement interventions, such as R-GI with patients that are experiencing difficulties with stress, anxiety, depression, and sleep quality which can promote more optimum health. Advanced practice nurses with specialties in sleep are able to perform a vital role in helping patients to enhance their sleep quality. Nurse researchers with expertise in sleep quality are needed to expand the science of nursing related to factors which influence sleep quality and interventions which enhance sleep.

Conclusion

This investigation examined factors which influence sleep quality among a sample of mothers with hospitalized preterm infants. The findings suggested that anxiety, depression, stress, and lower income are related to poor sleep quality, and that social

support and greater maternal age are related to better sleep quality. Participants reported that the intervention of R-GI assisted them in falling asleep and that reduced their stress. With cumulative R-GI use, sleep quality improved. Findings from this study may be used to inform future intervention studies designed to benefit the health outcomes of mothers of hospitalized preterm infants.

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Appendix B: Maternal Relaxation Study Maternal Demographic Data

Maternal Relaxation Study Subject ID: ☐☐☐

Demographic Date: ☐☐ / ☐☐ / ☐☐

Directions: Please complete the following information. If you have any questions, please ask the available member of the research team.

DG1. Mother's age: ☐☐

DG2. Mother's current marital status:

- ☐ Married
- ☐ Single, never married
- ☐ Separated
- ☐ Divorced
- ☐ Widow

DG3. Mother's current household status:

- ☐ Living alone
- ☐ Living alone with husband or significant other only
- ☐ Living with husband or significant other and children
- ☐ Living with adult family member(s) or friend(s) (not including husband or significant other)
- ☐ Living with children only

DG4. What is your ethnicity?

- ☐ Hispanic or Latino
- ☐ Not-Hispanic or Latino

DG5. What is your race?

- ☐ American Indian/Alaska Native
- ☐ Asian
- ☐ Black or African-American
- ☐ Native Hawaiian or Other Pacific Islander
- ☐ White
- ☐ More than one race
- ☐

DG6. In addition to your baby that is currently in the hospital, how many other children have you given birth to?

- ☐ No other children
- ☐ 1 child
- ☐ 2 children
- ☐ More than 2 children

Maternal Relaxation Study Subject ID: ☐☐☐

Demographic Date: ☐☐ / ☐☐ / ☐☐

DG7. Do you currently breast-feed or provide breast milk for your baby?

- ☐ Yes
- ☐ No

DG8. Baby's birth date: ☐☐ / ☐☐ / ☐☐

DG9. Family total income:

- ☐ Less than $10,000
- ☐ Between $10,000 and $20,000
- ☐ Between $20,000 and $30,000
- ☐ Between $30,000 and $40,000
- ☐ Between $40,000 and $50,000
- ☐ More than $50,000

DG10. Current employment status:

- ☐ Full-time
- ☐ Part-time
- ☐ Retired
- ☐ Unemployed/seeking employment
- ☐ Disabled
- ☐ Student

DG11. Highest level of education:

- ☐ Started High School
- ☐ Completed High School
- ☐ Started Technical Training
- ☐ Completed Technical Training
- ☐ Started College
- ☐ Completed College
- ☐ More than a college degree

Appendix C: Maternal Relaxation Study Infant Data

Maternal Relaxation Study Subject ID: ☐☐☐

Infant Data Date: ☐☐ / ☐☐ / ☐☐

ID1. Gestational age at birth: _____

Circle the correct number for items below.

ID2. Single/multiple birth

Singleton = 1

Twin = 2

Triplet = 3

Quadruplet = 4

ID3. Type of delivery

Vaginal delivery = 1

Cesarean delivery = 2

ID4. Date of discharge or date of Visit 4 if infant has not been discharged:

_____(MM/DD/YY)

Appendix D: Maternal Relaxation Study *PSQI*

Maternal Relaxation Study Subject ID: ☐☐☐

PSQI1 Date: ☐☐ / ☐☐ / ☐☐

Directions: The following questions relate to your usual sleep habits during the past month only. Your answers should indicate the most accurate reply for the majority of days and nights in the past month. Please answer all questions.

1PS1. During the past month, what time have you usually gone to bed at night?

Bed time _____

1PS2. During the past month, how long (in minutes) has it usually taken you to fall asleep each night?

Number of minutes _____

1PS3. During the past month, what time have you usually gotten up in the morning?

Getting up time _____

1PS4. During the past month, how many hours of actual sleep did you get at night? (This may be different than the number of hours you spent in bed.)

Hours of sleep per night _____

For each of the remaining questions, check the one best response. Please answer all questions.

1PS5. During the past month, how often have you had trouble sleeping because you...

	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
a. Cannot get to sleep within 30 minutes	☐	☐	☐	☐
b. Wake up in the middle of the night or early morning	☐	☐	☐	☐
c. Have to get up to use the bathroom	☐	☐	☐	☐
d. Cannot breathe comfortably	☐	☐	☐	☐
e. Cough or snore loudly	☐	☐	☐	☐
f. Feel too cold	☐	☐	☐	☐
g. Feel too hot	☐	☐	☐	☐

Maternal Relaxation Study Subject ID: ☐☐☐

PSQI1 Date: ☐☐ / ☐☐ / ☐☐

h. Had bad dreams	☐	☐	☐	☐
i. Have pain	☐	☐	☐	☐

j. Other reason(s), please describe _____

_____

	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
How often during the past month have you had trouble sleeping because of this?	☐	☐	☐	☐

	Very good	Fairly good	Fairly bad	Very bad
1PS6. During the past month, how would you rate your sleep quality overall?	☐	☐	☐	☐

	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
1PS7. During the past month, how often have you taken medicine to help you sleep (prescribed or "over the counter")?	☐	☐	☐	☐
1PS8. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?	☐	☐	☐	☐

1PS9. During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?

☐ No problem at all

☐ Only a very slight problem

☐ Somewhat of a problem

☐ A very big problem

Maternal Relaxation Study Subject ID: ☐☐☐

PSQI1 Date: ☐☐ / ☐☐ / ☐☐

1PS10. Do you have a bed partner or room mate?

☐ No bed partner or room mate

☐ Partner/room mate in other room

☐ Partner in same room, but not same bed

☐ Partner in same bed

If you have a room mate or bed partner, ask him/her how often in the past month you have had...

	Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
a. Loud snoring	☐	☐	☐	☐
b. Long pauses between breaths while asleep	☐	☐	☐	☐
c. Legs twitching or jerking while you sleep	☐	☐	☐	☐
d. Episodes of disorientation or confusion during sleep	☐	☐	☐	☐

e. Other restlessness while you sleep; please describe: _____

_____

Not during the past month	Less than once a week	Once or twice a week	Three or more times a week
☐	☐	☐	☐

Appendix E: Maternal Relaxation Study *CES-D*

Maternal Relaxation Study Subject ID: ☐☐☐

CES-D1 Date: ☐☐ / ☐☐ / ☐☐

Directions: Below are feelings some people have. Please check the box ☑ next to the response that best fits **how much you have had each feeling during the past week.** If you have not had this feeling at all then check the box next to "less than one day each week or none". There is no right or wrong answer.

		Less than 1 day each week or none	1-2 days per week	3-4 days per week	Most of the time
1D1.	I was bothered by things that usually don't bother me.	☐	☐	☐	☐
1D2.	I did not feel like eating; my appetite was poor.	☐	☐	☐	☐
1D3.	I felt that I could not shake off the blues even with help from my family or friends.	☐	☐	☐	☐
1D4.	I felt that I was just as good as other people.	☐	☐	☐	☐
1D5.	I had trouble keeping my mind on what I was doing.	☐	☐	☐	☐
1D6.	I felt depressed.	☐	☐	☐	☐
1D7.	I felt that everything I did was an effort.	☐	☐	☐	☐
1D8.	I felt hopeful about the future.	☐	☐	☐	☐
1D9.	I thought my life had been a failure.	☐	☐	☐	☐
1D10.	I felt fearful.	☐	☐	☐	☐
1D11.	My sleep was restless.	☐	☐	☐	☐
1D12.	I was happy.	☐	☐	☐	☐
1D13.	I talked less than usual.	☐	☐	☐	☐
1D14.	I felt lonely.	☐	☐	☐	☐
1D15.	People were unfriendly.	☐	☐	☐	☐
1D16.	I enjoyed life.	☐	☐	☐	☐
1D17.	I had crying spells.	☐	☐	☐	☐
1D18.	I felt sad.	☐	☐	☐	☐
1D19.	I felt that people disliked me.	☐	☐	☐	☐
1D20.	I could not get "going".	☐	☐	☐	☐

Appendix F: Maternal Relaxation Study *STAI-1*

Maternal Relaxation Study Subject ID: ☐☐☐

STAI-1 Date: ☐☐ / ☐☐ / ☐☐

Directions: A number of statements which people have used to describe themselves are given below. Read each statement and then check the box next to the appropriate response to indicate how you feel ***right now***, that is, ***at this moment***. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

		Not at all	Somewhat	Moderately so	Very much so
1A1.	I feel calm	☐	☐	☐	☐
1A2.	I feel secure	☐	☐	☐	☐
1A3.	I am tense	☐	☐	☐	☐
1A4.	I feel strained	☐	☐	☐	☐
1A5.	I feel at ease	☐	☐	☐	☐
1A6.	I feel upset	☐	☐	☐	☐
1A7.	I am presently worrying over possible	☐	☐	☐	☐
1A8.	I feel satisfied	☐	☐	☐	☐
1A9.	I feel frightened	☐	☐	☐	☐
1A10.	I feel comfortable	☐	☐	☐	☐
1A11.	I feel self-confident	☐	☐	☐	☐
1A12.	I feel nervous	☐	☐	☐	☐
1A13.	I am jittery	☐	☐	☐	☐
1A14.	I feel indecisive	☐	☐	☐	☐
1A15.	I am relaxed	☐	☐	☐	☐
1A16.	I feel content	☐	☐	☐	☐
1A17.	I am worried	☐	☐	☐	☐
		—	—	—	—

Maternal Relaxation Study Subject ID: ☐☐☐

STAI-1 Date: ☐☐ / ☐☐ / ☐☐

1A18.	I feel confused	☐	☐	☐	☐
1A19.	I feel steady	☐	☐	☐	☐
1A20.	I feel pleasant	☐	☐	☐	☐

Appendix G: Maternal Relaxation Study *PSS*

Maternal Relaxation Study Subject ID: ☐☐☐

PSS1 Date: ☐☐ / ☐☐ / ☐☐

Directions: The questions in this scale ask you about your feelings and thoughts **during the LAST MONTH**. Please check the box next to the response that best describes how often you felt or thought like the statement. There is no right or wrong answer.

		Never	Almost Never	Some-times	Fairly Often	Very Often
1S1.	How often have you been upset because of something that happened unexpectedly?	☐	☐	☐	☐	☐
1S2.	How often have you felt that you were unable to control the important things in your life?	☐	☐	☐	☐	☐
1S3.	How often have you felt nervous and "stressed"?	☐	☐	☐	☐	☐
1S4.	How often have you felt confident about your ability to handle your personal problems?	☐	☐	☐	☐	☐
1S5.	How often have you felt that things were going your way?	☐	☐	☐	☐	☐
1S6.	How often have you found that you could not cope with all the things you had to do?	☐	☐	☐	☐	☐
1S7.	How often have you been able to control irritations in your life?	☐	☐	☐	☐	☐
1S8.	How often have you felt that you were on top of things?	☐	☐	☐	☐	☐
1S9.	How often have you been angered because of things that were outside of your control?	☐	☐	☐	☐	☐

Maternal Relaxation Study

Subject ID: ☐☐☐

PSS1

Date: ☐☐ / ☐☐ / ☐☐

1S10. How often have you felt difficulties were piling up so high that you could not overcome them? ☐ ☐ ☐ ☐ ☐

Appendix H: Maternal Relaxation Study *FSSQ*

Maternal Relaxation Study Subject ID: ☐☐☐

FSSQ1 Date: ☐☐ / ☐☐ / ☐☐

Directions: Here is a list of some things that other people do for us or give us that may be helpful or supportive. Please read each statement carefully and check the box to the corresponding number from **1** (**as much as I would like**) to **5** (**much less**) that is closest to your situation. Answer each item as best you can. There is no right or wrong answer.

	As much as I would like				Much less than I would like
1SS1. I have people who care what happens to me.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
1SS2. I get love and affection.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
1SS3. I get chances to talk to someone about my problems at work or with my housework.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
1SS4. I get chances to talk to someone I trust about my personal and family problems.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
1SS5. I get chances to talk about money matters.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
1SS6. I get invitations to go out and do things with other people.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Maternal Relaxation Study

Subject ID: ☐☐☐

FSSQ1

Date: ☐☐ / ☐☐ / ☐☐

	As much as I would like				Much less than I would like
1SS7. I get useful advice about important things in my life.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
1SS8. I get help when I'm sick in bed.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Appendix I: Maternal Relaxation Study *NMI*

Maternal Relaxation Study Subject ID: ☐☐☐

NMI Date: ☐☐ / ☐☐ / ☐☐

Check the box that applies:

Check box	Rating	Description
☐	1	Birthweight > 1000 g; AND no respiratory distress; AND no major medical complications; AND no oxygen required; AND no apnea, bradycardia; AND no patent ductus arteriosus (PDA)
☐	2	Birthweight > 1000 g AND assisted ventilation/oxygen for <48 hours; AND no periventricular/intraventricular hemorrhage (PVH/IVH)
☐	3	Birthweight < 1000 g; OR ventilation/oxygen for 3-14 days; OR Grade I or II PVH/IVH; OR apnea or bradycardia requiring xanthine treatment; OR PDA requiring medical treatment; OR hyperbilirubinemia requiring exchange transfusion
☐	4	Birthweight < 1000 g; assisted ventilation for 15-28 days; OR resuscitation needed for apnea or bradycardia; OR major surgery including PDA repair
☐	5	Birthweight < 1000 g OR assisted ventilation/oxygen > 29 days; OR meningitis; OR seizures; OR Grade III or IV PVH/IVH; OR periventricular leukomalacia
☐		Neonatal medical index rating (write in the number you have checked)

Appendix J: Maternal Relaxation Study Weekly Phone Call Log

WEEKLY PHONE CALL LOG

ALL CALLS OCCUR AT THE END OF THE WEEK (E.G., "Week 1" OCCURS AT THE END OF THE FIRST WEEK ON THE STUDY)

WEEK 1 DATE OF CALL _____

Hello. This is (*Name of RA*) from the Maternal Relaxation Study. May I please speak with (*Name of Participant*_____)? I'm calling to ask about your use of the relaxation CD this last week, and this call should take less than two minutes.

How often were you able to listen to TRACK #1 this week?

None ☐ Once or Twice ☐ Several Times ☐ Daily ☐

Please tell me what, if any, problems you had listening to the CD daily?

_____

_____

_____

In the coming week, if possible please continue to listen to the FIRST track of the CD. May I call you at this time/day in one week or would you prefer a different time (use a window of +/- one day)? It's really important for this study to know what your real experience is each week and we appreciate your time. Thank you (*Name of Participant*_____). Good-bye.

Next phone call scheduled for (Week 2) _____

==========

WEEK 2 DATE OF CALL _____

Hello. This is (*Name of RA*) from the Maternal Relaxation Study. May I please speak with (*Name of Participant*_____)? I'm calling to ask about your use of the relaxation CD this last week, and this call should take less than two minutes.

How often were you able to listen to TRACK #1 this week?

None ☐ Once or Twice ☐ Several Times ☐ Daily ☐

Please tell me what, if any, problems you had listening to the CD daily?

_____

_____

_____

In the coming week, please begin listening to the SECOND track on the CD. May I call you at this time/day in one week or would you prefer a different time (use a window of +/- one day)? It's really important for this study to know what your real experience is each week and we appreciate your time. Thank you (*Name of Participant*_____). Good-bye.

Next phone call scheduled for (Week 3) _____

==========

WEEK 3 DATE OF CALL _____

Hello. This is (*Name of RA*) from the Maternal Relaxation Study. May I please speak with (Name of Participant_____)? I'm calling to ask about your use of the relaxation CD this last week, and this call should take less than two minutes.

How often were you able to listen to TRACK #2 on the CD this week?

None ☐ Once or Twice ☐ Several Times ☐ Daily ☐

Please tell me what, if any, problems you had listening to the CD daily?

_____

_____

_____

Next phone call scheduled for (Week 4) _____

At the end of this next week please complete the purple questionnaires in your study binder in the tab marked <u>VISIT #2</u>. Do you have any questions about which questionnaires these are? Please complete the forms the day BEFORE or on the DAY OF the second study visit (*the mother can also complete these forms at the hospital if she brings them with her—if the baby is still in the NICU---you can give her this option*). Would you like to bring the study forms to the hospital and leave them with one of the research nurses or would you like to mail them? Once we have received the questionnaires you will receive a $20 gift card in appreciation for your time. If you mail the forms, the gift card will be sent as certified mail to you to ensure you receive it (*please let the mother know that she will have to send the forms in TWO of the envelopes because they won't fit in one).*

In the coming week, please continue listening to the SECOND track on the CD. May I call you at this time/day in one week or would you prefer a different time (*use a window of +/- one day*)? It's really important for this study to know what your real experience is each week and we appreciate your time. Thank you (*Name of Participant*_____). Good-bye.

Next study visit scheduled for (Visit 2/Week 4) _____

Mother to come to NICU _____ Mail questionnaires _____

Location of Visit #2_____

==========

WEEK 4 - Study VISIT 2 DATE OF CALL _____

Hello. This is (*Name of RA*) from the Maternal Relaxation Study. May I please speak with (*Name of Participant*_____)? I'm calling to ask about your use of the relaxation CD this last week, and this call should take less than two minutes.

How often were you able to listen to TRACK #2 this week?

None ☐ Once or Twice ☐ Several Times ☐ Daily ☐

Please tell me what, if any, problems you had listening to the CD daily?

_____

_____

_____

Next phone call scheduled for (Week 5) _____

In the coming week, please begin listening to the THIRD track on the CD. May I call you at this time/day in one week or would you prefer a different time (use a window of +/- one day)? It's really important for this study to know what your real experience is each week and we appreciate your time. Thank you (*Name of Participant*_____). Good-bye.

.==========

WEEK 5 DATE OF CALL _____

Hello. This is (*Name of RA*) from the Maternal Relaxation Study. May I please speak with (*Name of Participant*_____)? I'm calling to ask about your use of the relaxation CD this last week, and this call should take less than two minutes.

How often were you able to listen to TRACK #3 this week?

None ☐ Once or Twice ☐ Several Times ☐ Daily ☐

Please tell me what, if any, problems you had listening to the CD daily?

_____

_____

_____

Next phone call scheduled for (Week 6) _____

In the coming week, please begin continue listening to the THIRD track on the CD. May I call you at this time/day in one week or would you prefer a different time (use a window of +/- one day)? It's really important for this study to know what your real experience is each week and we appreciate your time. Thank you (*Name of Participant*_____). Good-bye.

==========

WEEK 6 DATE OF CALL _____

Hello. This is (*Name of RA*) from the Maternal Relaxation Study. May I please speak with (*Name of Participant*_____)? I'm calling to ask about your use of the relaxation CD this last week, and this call should take less than two minutes.

How often were you able to listen to TRACK #3 this week?

None ☐ Once or Twice ☐ Several Times ☐ Daily ☐

Please tell me what, if any, problems you had listening to the CD daily?

_____

_____

_____

Next phone call scheduled for (Week 7) _____

In the coming week and from now on you may listen to any of the relaxation tracks, but it is important to try to listen to at least one of the relaxation tracks each day at whatever time works best for you. May I call you at this time/day in one week or would you prefer a different time (use a window of +/- one day)? It's really important for this study to know what your real experience is each week and we appreciate your time. Thank you (*Name of Participant*_____). Good-bye.

==========

WEEK 7 DATE OF CALL _____

Hello. This is (Name of RA) from the Maternal Relaxation Study. May I please speak with (Name of Participant_____)? I'm calling to ask about your use of the relaxation CD this last week, and to schedule your next study visit.

How often were you able to listen to one of the relaxation CD this week?

None ☐ Once or Twice ☐ Several Times ☐ Daily ☐

WHICH recording did you listen to most often? _____

Please tell me what, if any, problems you had listening to the CD daily?

_____

_____

_____

At the end of this next week it will be time for your last study visit and you will have completed the Maternal Relaxation Study. Please complete the last set of purple questionnaires in your study binder on the day before or day of your visit. During this visit it will also be time to collect the saliva samples like you did at the beginning of the study. During this last visit one of the researchers would like to meet with you to collect the study forms, and to ask you a few brief questions about your opinion of the relaxation recordings. We can meet you at the hospital or at your home or another location that is convenient for you. The visit will take about a half hour. At the end of that visit you will receive a $40 gift card or cash payment in appreciation for your time and effort on the study.

What day can meet with the researcher (Last study visit) _____

Where would you like to meet for this last visit?_____

Would you like me to call you to remind you of this appointment the night before and review the instructions for the collection of the saliva? _____

Would you prefer to receive a gift card or cash on this final visit? _____

Please try to continue listening to at least one of the relaxation tracks each day. Thank you (*Name of Participant*_____). Good-bye.

At this point if the mother doesn't want a reminder call, please thank her for her time and let her know this will be the last phone call for this study. If she has any questions she should contact me and I can follow-up with her.