PREMATURE INFANTS’ NIGHTTIME AWAKENING AND THEIR MOTHERS’ ATTACHMENT STYLES AND BEDTIME BEHAVIOUR

by

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ABSTRACT

Infants’ sleep problems, especially, nighttime awakenings, are common concerns of parents and may have developmental implications for infants, particularly infants born prematurely. Between one quarter and one third of all children aged six months to five years of age experience sleeping problems. Many factors have been associated with the development of these problems, although none has been shown to be causal. Although theorists have hypothesized that insecure attachment between a mother and her child may lead to intense maternal involvement at bedtime (e.g., active physical comforting), which may be linked to the infant’s inability to develop sleep self-initiation skills, mothers’ styles of attachment with their infants, particularly an anxious style, have not been researched. France and Blampied’s model of infant sleep was used as the guiding framework to examine relationships between mothers’ attachment and bedtime behaviour and premature infants’ sleep.

Using a cross-sectional design, data were collected from a community-based sample of 105 mothers of premature infants aged 5-6 months (gestationally corrected age). Boys represented 61% of the sample and 63% of the infants were first-born children. The main outcome measures were infants’ nighttime awakenings (frequency and duration) and mothers’ perceptions of the quality of their infants’ sleep.

The mothers reported that 55% of their children had sleep problems (17% were considered serious). The reported mean frequency of awakening was 2.1 times per night and the mean duration was 45.7 minutes. Preterm infants’ nighttime awakening was associated with their mothers having an anxious style of attachment and intense involvement at bedtime. The mother’s style of attachment (anxious) and a maternal history of sleep problems were predictors of the duration of infants’ nighttime awakening. Intense maternal involvement and the infant’s birth order were significant predictors of the infants’ frequency of nighttime awakenings. This study directs healthcare providers to focus on maternal factors such as having an anxious style of attachment and over involvement in bedtime settling when assessing infants’ sleep problems. More research is warranted to explain the mechanisms of these associations and to determine whether they are causal in nature.
TABLE OF CONTENTS

ABSTRACT ........................................................................................................................ ii
TABLE OF CONTENTS ................................................................................................... iii
LIST OF TABLES ........................................................................................................ viii
LIST OF FIGURES ........................................................................................................ ix
LIST OF EQUATIONS ................................................................................................. x
LIST OF ABBREVIATIONS ........................................................................................ xi
ACKNOWLEDGEMENTS ........................................................................................... xii
DEDICATION ........................................................................................................... xiii

1 Introduction ................................................................................................................ 1
  1.1 Statement of the Problem ................................................................................. 5
  1.2 Research Questions .......................................................................................... 7
  1.3 Significance of the Study ................................................................................. 7

2 Literature Review...................................................................................................... 10
  2.1 Infants’ Normative Sleep Patterns ................................................................. 10
  2.2 The Development of Sleep Problems in Infancy ........................................... 14
  2.3 Factors Affecting Infants’ Sleep .................................................................... 16
    2.3.1 Intrinsic Factors ......................................................................................... 17
      2.3.1.1 Physiological Factors: Premature Birth ....................................... 17
      2.3.1.2 Infants’ Temperament ............................................................. 22
      2.3.1.3 Infants’ Attachment .............................................................. 24
    2.3.2 Extrinsic Factors ........................................................................................ 25
      2.3.2.1 Mothers’ Bedtime Behaviour to Settle their Infants to Sleep ...... 27
      2.3.2.2 Mothers’ Attachment .............................................................. 29
        2.3.2.2.1 Mothers’ Attachment and Care-Giving Behaviour 32
        2.3.2.2.2 Mothers’ Attachment and Infant’s Sleep .......... 33
      2.3.2.3 Maternal Mental Health: Postpartum Depression ....................... 35
      2.3.2.4 Family Functioning ..................................................................... 37
      2.3.2.5 Other Related Factors ................................................................. 37
        2.3.2.5.1 Cultural and Lifestyle Factors.............................................. 38
        2.3.2.5.2 Co-sleeping ........................................................................ 39
2.3.2.5.3 Breastfeeding ............................................................ 40

2.4 Infants’ Sleep Problems and Research................................................................. 41

2.5 Summary ........................................................................................................ 44

3 Theoretical Framework ............................................................................................. 46

3.1 The Infant Sleep Self-Initiation Model .......................................................... 46

3.1.1 Mothers’ Bedtime Behaviour ..................................................................... 47

3.1.2 Mothers with an Anxious Style of Attachment.......................................... 51

3.2 Summary ........................................................................................................ 53

4 Methods .................................................................................................................... 55

4.1 Research Design............................................................................................. 55

4.2 Research Questions ........................................................................................ 55

4.3 Study Measures and Instruments ................................................................... 56

4.3.1 Factors Related to the Mother........................................................................ 56

4.3.1.1 Maternal Bedtime Behaviour to Settle Infants ............................. 57

4.3.1.1.1 Conceptual Definition............................................ 57

4.3.1.1.2 Operational Definition: Parental Interactive Bedtime Behaviour Scale............................................ 58

4.3.1.2 Mothers with an Anxious Attachment Style ................................. 61

4.3.1.2.1 Conceptual Definition............................................ 61

4.3.1.2.2 Operational Definition: The Attachment Style Questionnaire ........................................................ 63

4.3.1.3 Family Functioning ....................................................................... 66

4.3.1.3.1 Conceptual Definition............................................ 66

4.3.1.3.2 Operational Definition: McMaster Family Assessment Device: General Function ........................ 67

4.3.1.4 Mothers’ Mental Health: Maternal Happiness .............................. 69

4.3.1.4.1 Conceptual definition ............................................. 69

4.3.1.4.2 Operational Definition: Happiness Scale ....................... 70

4.3.2 Infants’ Nighttime Awakening and Sleep Problems............................... 71

4.3.2.1 Conceptual Definition .................................................................... 71

4.3.2.2 Operational Definition: Brief Infant Sleep Questionnaire ............. 72

4.4 The Role of Context....................................................................................... 74

4.5 Summary of the Study Variables ................................................................... 75
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.3.2 Outliers Analysis</td>
<td>109</td>
</tr>
<tr>
<td>5.3.3 Tests of Multicollinearity</td>
<td>112</td>
</tr>
<tr>
<td>5.3.4 Assessment of the Inference Assumptions</td>
<td>113</td>
</tr>
<tr>
<td>5.3.5 Correlations between the Potentially Confounding, Explanatory and Outcome Variables</td>
<td>113</td>
</tr>
<tr>
<td>5.3.5.1 Correlations between Infants’ Frequency of Nighttime Awakening and Study Variables</td>
<td>114</td>
</tr>
<tr>
<td>5.3.5.2 Correlations between Duration of Infants’ Nighttime Awakening and Study Variables</td>
<td>118</td>
</tr>
<tr>
<td>5.3.5.3 Correlations between Mothers’ Perceptions of their Infant’s Sleep and the Study Variables</td>
<td>119</td>
</tr>
<tr>
<td>5.4 An Infant’s Weight and the Mother’s Reports of Sleep Problems</td>
<td>120</td>
</tr>
<tr>
<td>5.5 Categorical Variables Associated with Mothers’ Perceptions of the Quality of their Infant’s Sleep</td>
<td>120</td>
</tr>
<tr>
<td>5.6 The Premature Infant Sleep Self-Initiation Model</td>
<td>121</td>
</tr>
<tr>
<td>5.7 Answering the Research Questions</td>
<td>122</td>
</tr>
<tr>
<td>5.7.1 Research Question 1</td>
<td>122</td>
</tr>
<tr>
<td>5.7.2 Research Question 2</td>
<td>124</td>
</tr>
<tr>
<td>5.7.3 Research Question 3</td>
<td>125</td>
</tr>
<tr>
<td>5.7.3.1 Frequency of Night Awakenings as an Outcome</td>
<td>126</td>
</tr>
<tr>
<td>5.7.3.2 Duration of Nighttime Awakenings as an Outcome</td>
<td>129</td>
</tr>
<tr>
<td>5.7 Summary</td>
<td>132</td>
</tr>
<tr>
<td>6 Discussion</td>
<td>133</td>
</tr>
<tr>
<td>6.1 Description of the Study</td>
<td>133</td>
</tr>
<tr>
<td>6.2 Sample Demographics</td>
<td>135</td>
</tr>
<tr>
<td>6.2.1 The Study Infants’ Demographics and other Characteristics</td>
<td>135</td>
</tr>
<tr>
<td>6.2.2 The Study Mothers’ Demographics and other Characteristics</td>
<td>138</td>
</tr>
<tr>
<td>6.3 Premature Infants’ Sleep Patterns</td>
<td>140</td>
</tr>
<tr>
<td>6.4 A Summary of the Major Findings</td>
<td>147</td>
</tr>
<tr>
<td>6.4.1 Premature Infants’ Frequency of Nighttime Awakening</td>
<td>148</td>
</tr>
<tr>
<td>6.4.2 Premature Infants’ Duration of Nighttime Awakening</td>
<td>148</td>
</tr>
<tr>
<td>6.4.3 Mothers’ Perceptions of the Quality of their Infants’ Sleep</td>
<td>149</td>
</tr>
<tr>
<td>6.5 A Discussion of the Findings in the Context of the Reported Evidence</td>
<td>149</td>
</tr>
<tr>
<td>6.5.1 The Key Study Variables</td>
<td>150</td>
</tr>
</tbody>
</table>
6.5.1.1 Mothers with an Anxious Style of Attachment............................. 150
6.5.1.2 Mothers’ Bedtime Behaviour to Settle their Infants to Sleep ...... 153
6.6 Strengths and Limitations of the Study..................................................... 157
6.7 Study Implications ..................................................................................... 160
6.7.1 Implications for Research ................................................................. 160
6.7.2 Implications for Practice ................................................................. 162
6.7.3 Recommendations for Education ...................................................... 164
6.7.4 Recommendations for Administration.............................................. 165
6.8 Dissemination of Findings...................................................................... 165
6.9 Conclusions............................................................................................. 166
REFERENCES ............................................................................................................... 168
APPENDICES ................................................................................................................ 191
Appendix A: A Summary of the Literature Concerning Children’s Sleeping Problems 192
Appendix B: Questionnaire................................................................................. 200
Appendix C: UBC Behavioural Research Ethics Board Certificate of Approval ... 217
Appendix D: Infant Development Program of British Columbia Certificate of Approval ......................................................................................... 219
Appendix E: Vancouver Coastal Health Research Institute Certificate of Approval .... 220
Appendix F: Attachment Style Questionnaire Psychometric Properties ............ 221
Appendix G: Study Mini Posters ......................................................................... 223
Appendix H: Study Pamphlet .............................................................................. 224
LIST OF TABLES

Table 4.1  Parental Interactive Bedtime Behaviour Scale ................................................................. 59
Table 4.2  Strategy to Obtain Subscale Percentage Scores for the Parental Interactive Bedtime Behaviour Scale ................................................................. 60
Table 4.3  Anxious Style of Attachment Scale ................................................................................. 65
Table 4.4  McMaster Family Assessment Device (FAD): General Function ..................................... 69
Table 4.5  Happiness Scale: Canada’s Health Promotion Survey .................................................... 71
Table 4.6  Study Inclusion and Exclusion Criteria ........................................................................... 77
Table 5.1  Demographic and Health Characteristics of the Infants .................................................. 95
Table 5.2  Demographic and Health Characteristics of the Mothers ............................................... 97
Table 5.3  The Infants’ Sleep-Wake Patterns .................................................................................... 99
Table 5.4  Characteristics and Cronbach’s Alpha Reliability Estimates of the Measurement Scales ........................................................................................................ 102
Table 5.5  Derived (Collapsed) Demographic Variables ................................................................... 109
Table 5.6  Residual Statistics for Linear Regression Models with Frequency and Duration of Nighttime Awakening as Outcomes ..................................................... 112
Table 5.7  Correlations between the Potentially Confounding Variables and the Frequency and Duration of Infants’ Nighttime Awakening .................................................. 115
Table 5.8  Correlations Matrix of Explanatory Variables and Frequency and Duration of Nighttime Awakening and Mothers’ Perceptions of Infant’s Sleep as a Problem ................................................................. 117
Table 5.9  Correlations between the Potentially Confounding Variables and Mothers’ Perceptions of their Infant’s Sleep ........................................................................ 119
Table 5.10 Mothers’ Bedtime Behaviour Stratified by Mothers’ Perceptions of the Quality of their Infant’s Sleep ................................................................................. 123
Table 5.11 Partial Correlations between Mothers’ Bedtime Behaviour and the Frequency and Duration of their Infant’s Nighttime Awakening ................................................. 125
Table 5.12 Frequency of Nighttime Awakenings Regressed on Family Functioning, Birth Order, Mothers’ Use of Active Physical Comforting and Having an Anxious Style of Attachment ..................................................... 128
Table 5.13 Duration of Nighttime Awakenings Regressed on Family Functioning, Mother’s Happiness, History of Sleep Problems, Use of Active Physical Comforting, and Having an Anxious Style of Attachment ..................................................... 131
LIST OF FIGURES

Figure 3.1  Infant Sleep Self-Initiation (ISSI) Model (adapted from France and Blampied (1999)) ............................................................... 50
Figure 3.2  Premature Infants’ Sleep Self-Initiation Model .......................... 53
Figure 4.1  Sample Size Calculation for Linear Regression with Seven Predictors .................................................................................. 81
Figure 5.1  Mothers’ Behavioural Strategies Used to Settle their Infants to Sleep ............................................................................... 104
Figure 5.2  Prevalence of Premature Infants’ Sleep Problems ...................... 106
Figure 5.3  Box Plot of the Standardized Residuals from the Multivariate Regression Model of Frequency of Infants’ Nighttime Awakening. 110
Figure 5.4  Box Plot of the Standardized Residuals from the Multivariate Regression Model of Duration of Infants’ Nighttime Awakening ... 111
Figure 5.5  Revised Premature Infant Sleep Self-Initiation Model............... 122
LIST OF EQUATIONS

Equation 4.1     Sample Size for Multiple Correlations................................. 80
Equation 4.2     Infant Weight-for-Age Z-scores via the LMS Approach ........... 92
### LIST OF ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>AASM</td>
<td>American Academy of Sleep Medicine</td>
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<tr>
<td>APC</td>
<td>Active Physical Comforting</td>
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<tr>
<td>AS</td>
<td>Active Sleep</td>
</tr>
<tr>
<td>ASQ</td>
<td>Attachment Style Questionnaire</td>
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<tr>
<td>BISQ</td>
<td>Bedtime Interactive Sleep Questionnaire</td>
</tr>
<tr>
<td>DNW</td>
<td>Duration of Nighttime Awakening</td>
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<tr>
<td>EEG</td>
<td>Electroencephalographic</td>
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<tr>
<td>FAD</td>
<td>Family Assessment Device</td>
</tr>
<tr>
<td>FF</td>
<td>Family Functioning</td>
</tr>
<tr>
<td>FNW</td>
<td>Frequency of Nighttime Awakening</td>
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<tr>
<td>GERD</td>
<td>Gastro-esophageal Reflux Disease</td>
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<td>GF</td>
<td>General Functioning</td>
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<tr>
<td>BO</td>
<td>Birth Order</td>
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<td>IDP</td>
<td>Infant Development Program</td>
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<td>IH</td>
<td>Infant Health</td>
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<tr>
<td>ISSI</td>
<td>Infant Sleep Self-Initiation</td>
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<tr>
<td>IVH</td>
<td>Intra-Ventricular Hemorrhage</td>
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<tr>
<td>M</td>
<td>Mean</td>
</tr>
<tr>
<td>MH</td>
<td>Maternal Happiness</td>
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<td>MPSP</td>
<td>Mothers’ Perceptions of Infants’ Sleep Problems</td>
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<tr>
<td>MASA</td>
<td>Mothers’ with an Anxious Style of Attachment</td>
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<tr>
<td>MS</td>
<td>Marital Status</td>
</tr>
<tr>
<td>N</td>
<td>Number of Cases</td>
</tr>
<tr>
<td>NICU</td>
<td>Neonatal Intensive Care Unit</td>
</tr>
<tr>
<td>NIMH</td>
<td>National Institute of Mental Health</td>
</tr>
<tr>
<td>Non-REM</td>
<td>Non-Rapid Eye Movement</td>
</tr>
<tr>
<td>OECD</td>
<td>Organization for Economic Co-Operation and Development</td>
</tr>
<tr>
<td>PIBBS</td>
<td>Parental Interactive Bedtime Behaviour Scale</td>
</tr>
<tr>
<td>PISSI</td>
<td>Premature Infant Sleep Self-Initiation</td>
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<tr>
<td>QS</td>
<td>Quiet Sleep</td>
</tr>
<tr>
<td>RDS</td>
<td>Respiratory Distress Syndrome</td>
</tr>
<tr>
<td>REM</td>
<td>Rapid Eye Movement</td>
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<tr>
<td>SD</td>
<td>Standard Deviation</td>
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<tr>
<td>SGA</td>
<td>Small-for-Gestational- Age</td>
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<td>SIDS</td>
<td>Sudden Infant Death Syndrome</td>
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<td>USA</td>
<td>United States of America</td>
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<td>VIF</td>
<td>Variance Inflation Factor</td>
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<td>WHO</td>
<td>World Health Organization</td>
</tr>
</tbody>
</table>
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DEDICATION

This dissertation is dedicated to God who guards me all the way.
It is also dedicated to my parents.
1 Introduction

Sleep constitutes one of the major activities of the brain during infancy and serves many functions, including the promotion of metabolic function, psychomotor development and cognition (Ednick et al., 2009; Gais, Plihal, Wagner, & Born, 2000). Persistent disruptions, irregularities, or diminished quality of sleep during infancy have been associated with attention deficit disorder, impulsivity, obesity, and poor health-related quality of life (Gais et al., 2000; Hiscock, Canterford, Ukoumunne, & Wake, 2007; Sadeh, Gruber, & Raviv, 2002; Taveras, Rifas-Shiman, Oken, Gunderson & Gillman, 2008; Thunström, 2002). Children’s persistent sleep problems may also affect the entire family’s life by disturbing their parents’ sleep, which can give rise to parental fatigue, irritability, and mood disturbances (Boergers, Hart, Owens, & Streisand, 2007; Fiese, Winter, Sliwinski, & Anber, 2007; Meijer & Wittenboer, 2007; Meltzer & Mindell, 2007; Zuckerman, Stevenson, & Bailey, 1987).

After four months of age, most full-term and preterm infants (without neurological complications) are expected to sleep relatively long stretches during the night (approximately six hours) and soothe themselves following night awaking (Anders et al., 1992; Keener, Zeanah, & Anders, 1988; Moore & Ucko, 1957); if infants awaken during the night, parents typically assume that they are able to resume sleep by themselves without signaling (crying) for help. According to various surveys, between one-quarter and one-third of children, aged six months to five years, experience sleeping problems (Johnson, 1991; Thunström, 1999). During infancy, the most common reports of sleep problems are settling difficulties at bedtime and nighttime awakening with signaling (Anders, Carskadon, & Dement, 1980; Johnson, 1991; Richman, 1981). In
particular, nighttime awakenings are a major complaint of parents (Wolke, Meyer, Ohrt, & Riegel, 1995); 50% of infants with problematic night waking require parental intervention to resume sleep after arousal (Goodlin-Jones, Burnham, Gaylor, & Anders, 2001). Although many children grow out of their sleep problems, in one study 32.9% of full-term and preterm infants with sleep problems (signaled nighttime awakening) showed persistence of the problems into toddlerhood (Touchette et al., 2005).

Many factors can influence the development of infants’ sleep problems, although none of these has proven to be causal in nature. Several factors can affect infants’ sleep. For example, mothers’ behaviour when settling their infants (herein referred to as maternal settling behaviour at bedtime), including “co-sleeping” (the sleeping of an infant or child in a parent's bed), remaining present until the onset of sleep, and feeding or rocking infants to sleep, have been linked to infants’ sleep problems (Lozoff, Wolff, & Davis, 1984; Touchette et al., 2005). Nevertheless, knowledge pertaining to preterm infants’ sleep problems is limited.

France and Blampied (1999) theorized that infants’ sleep problems, particularly nighttime awakening, result from infants’ inability to self-regulate or soothe themselves back to sleep (infant sleep self-initiation). Infant sleep self-initiation has a behavioural element that is learned in the context of the maternal-infant relationship (France & Blampied, 1999). Therefore, understanding the interaction between infants and their mothers with regard to the quality of infants’ nighttime sleep and the development of problematic nighttime awakening is important.

Given that sleep and wakefulness regulation, in part, reflect the central nervous system functioning, investigating sleep problems, especially in the preterm infant, is
important for several reasons. Preterm infants are born with immature body systems that place them at high risk for health challenges. The incidence of premature birth (birth occurring before the 37th week of gestation) has increased around the world (Fox, 2002). For example, in British Columbia, Canada, premature birth has increased from 6.4% of live births in 1996 to 7.6% of live births in 2005 (Vital Statistics Agency of British Columbia, 2006). Similar trends can be seen in other locations such as England (7.8%) and Hong Kong (7.4%) (Fox, 2002). Advancements in neonatal medical interventions and technology have dramatically increased the survival rate of premature infants (Crawford & Morris, 2000). This growing population underscores the need for generating knowledge pertaining to premature infants’ health and development, including problematic sleep.

To date, there have been few sleep studies that have been conducted with preterm infants in the home environment. Findings of some studies involving preterm infants that required prolonged hospitalization, suggest that the severity of neurological insults (i.e., respiratory distress syndrome and intra-ventricular hemorrhage) and infant exposure to the neonatal intensive care unit (NICU) environment (e.g., light and sound) and medical interventions (e.g., mechanical ventilation and caffeine) may adversely affect infants’ sleep development during the preterm and early post-term periods (Brandon, Holditch-Davis, & Winchester, 2005; Holditch-Davis, Scher, Schwartz, & Hudson-Barr; 2004; Mirmiran & Ariagno, 2000; Rivkees, Mayes, Jacobs, & Gross, 2004). Other studies that included samples of healthy or “at risk” preterm infants reported no significant differences in the sleep-wake state organization of preterm infants and their full-term counterparts during the first year of life (Anders & Keener, 1985; Wolke et al., 1995).
Notably, Wolke et al. (1995) contended that infants’ immaturity is less important than is their caretakers’ behaviour in the development of sleep problems.

Both immaturity and possible accompanying health challenges affect premature infants’ abilities to demonstrate reciprocity in human interactions (Als, 1982). Compared with full-term infants, preterm infants’ responses to everyday stimuli are highly variable, ranging from a lack of response to hypersensitivity. Variability in infant response patterns likely affects the nature of a mother’s interaction with her infant (Als, 1982). Indeed, differences between the interactions of mothers and full-term infants and mothers and preterm infants have been documented (Feldman & Eidelman, 2006; Forcada-Guex, Pierrehumbert, Borghini, Moessinger, & Muller-Nix, 2006; Muller-Nix et al., 2004; Wolke et al., 1998). Mothers of preterm infants have been found to have increased prevalence of depression, anxiety and stress (Miles, Holditch-Davis, Schwartz, & Scher, 2007; Pierrehumbert, Nicole, Muller-Nix, Forcada-Guex, & Ansermet, 2003). Further, mothers of premature infants have been described as more controlling, less sensitive, more uncoordinated, and more distant during interactions with their infants (Feldman & Eidelman, 2006; Forcada-Guex et al., 2006; Muller-Nix et al., 2004). Such behaviour has been linked to insecure adult attachment styles (Magai, Hunziker, Mesias, & Culver, 2000). The preceding findings suggest a bi-directional pathway of association, although there still remains a lack of clarity about the effects of preterm infants’ and their mothers’ contributions to these interactions. Given the complex and fragile nature of the dyadic relationships of mothers and their preterm infants and that care-giving behaviour can affect infants’ behaviour and development, more studies are needed to clarify these
pathways of association (e.g., infant response capacity, mother’s attachment style) and the possible underlying mechanisms (e.g., mother’s mood).

Although the published literature often refers to “parents”, most of the research that has been conducted about families and infants’ sleep problems has been carried out with mothers. Mothers have been the focus because they typically have more proximal relationships with their infants, compared with fathers (Keener, Zeanah, & Anders, 1988), and are mostly the primary care-giver and the “attached figure” for their infants (Bowlby, 1977). Mothers are generally more involved in dealing with their infants’ problematic nighttime awakening and are thus more affected by the problem (Beltramini & Hertzig, 1983; Boergers et al., 2007). This study, therefore, focused on mothers’ perceptions of their premature infants’ nighttime awakening and sleep problems.

1.1 Statement of the Problem

Sleep problems are common among infants. The sleep patterns of premature infants are not significantly different from those of full-term infants after the first five to six months of life (Wolke et al., 1995). Nevertheless, mothers of preterm infants report experiencing stress related to the worries they have about their infant’s development (Miles, Funk, & Kasper, 1992). Mothers of preterm infants also report more sleep problems compared with mothers of full-term infants at 12 months of age, corrected for prematurity (Asaka & Takada, 2010). Independent of these reports little is known about the maternal factors that affect the development of sleep problems in preterm infants.

Conceptually, sleep self-initiation has a behavioural element that is learned within the context of caregiver-infant interactions at bedtime (France & Blampied, 1999). It is
important to understand mothers’ beliefs about their infants’ sleep behaviour, their settling actions, and their relationships with premature infants’ nighttime sleep patterns. Maternal attachment style has been linked to toddlers’ sleep problems (Benoit et al., 1992), but there is no published evidence describing mothers’ characteristics, such as their attachment style, and premature infants’ problematic nighttime awakening. Knowledge about the sleep problems of this growing population is essential to planning nursing interventions designed to prevent these problems, to reduce their risk of occurrence, and to manage them when they occur.

Understanding the interactions among the factors that affect premature infants’ sleep may help to explain why some premature infants (without neurological complications) have frequent signaled nighttime awakening at six months of age when developmentally they are capable of sustaining longer night sleep periods and are supposed to soothe themselves following arousal, similar to their full-term infants counterparts (Anders and Keener, 1985 Anders et al., 1992; Keener, Zeanah, & Anders, 1988). The purpose of this study was to examine whether mothers of premature infants with an anxious style of attachment and who use particular bedtime behaviours to settle their infants to sleep are more likely to have infants with sleep problems, particularly nighttime awakenings, after controlling for possible confounding factors.
1.2 Research Questions

Three research questions were explicitly posed:

(a) Is maternal bedtime behaviour used to settle infants to sleep associated with mothers’ reports of sleep problems in their infants born prematurely at five to six months of corrected age?

(b) Is there an association between mothers’ bedtime behaviour used to settle their infants to sleep and the frequency of the nighttime awakenings and duration of nighttime awakenings of premature infants at five to six months of corrected age?

(c) Is there an association between the extent to which mothers display an anxious style of attachment and the frequency of the nighttime awakenings and duration of nighttime awakenings of premature infants at five to six months of corrected age, when maternal bedtime behaviour (in particular the use of active physical comforting strategies) to settle infants to sleep, family functioning, maternal happiness, maternal marital status, infant birth order, and infants’ health problems are statistically controlled?

1.3 Significance of the Study

Problematic nighttime awakening during early childhood is a significant challenge for parents, particularly for mothers who are usually the infant’s primary caregiver. Reports in the literature suggest that, during the second half of the first year, between 25% and 50% of infants have problematic nighttime awakening that requires parental intervention (Wolke et al., 1998). The necessity for interventions during the night adds to mothers’ stress levels (Meltzer & Mindell, 2007), whilst teaching mothers to manage their infant’s sleep problems reduces maternal stress (Wolfson, Lacks, &
Futterman, 1992) and improves parental sleep quality (Hall, Clauson, Carty, Janssen, & Saunders, 2006).

Infants’ repeated crying upon nighttime arousal has the potential to put infants at risk for maltreatment (Chavin & Tinson, 1980). For example, crying is an established trigger for Shaken Baby Syndrome (Barr, Trent, & Cross, 2006). Sleep problems that persist during and following the crying peak could put infants at risk for parental frustration and its outcomes. Parental fatigue and depressed mood, which have been associated with infants’ sleep problems (Hall et al., 2006a, 2006b) add to the importance of investigating infants’ signaling (crying) during nighttime awakening.

Parents of prematurely born infants frequently experience stress, which often originates from fears and doubts they have about their infant’s survival and developmental outcomes (Miles, Funk, & Kasper, 1992). Mothers of prematurely born infants have been reported to experience anxiety, as well as feelings of loss, separation, and depression (Gennaro, York, & Brooten, 1990; Holditch-Davis, Bartlett, Blickman, & Miles, 2003a; Locke et al., 1997; Singer, Yamashita, Lilien, Collin, & Baley, 1997), which are thought to contribute to difficulties in developing relationships with their infants (Perehudoff 1990; Poehlmann & Fiese, 2001). Because premature infants have lower levels of developmental maturation, they tend to respond differently to stimulation, which can also affect their ability to establish relationships with their mother (Als, 1982; Oehler, Hannan, & Catlett, 1993).

France and Blampied’s (1999) theoretical framework places premature infants’ nighttime awakening and signaling in the context of the anxious mother-infant attachment relationship. Infants’ sleep regulation has behavioural elements that can be
reinforced, wherein parental behaviour might hinder the development of healthful sleep patterns or contribute to the maintenance of sleep problems for some infants (France & Blampied, 1999). Thus, examining premature infants’ problematic nighttime awakening, within the context of the mother-infant relationship, acknowledges the bidirectional interaction between mothers’ and infants’ characteristics. Supporting or refuting the proposed relationships in the theoretical model through empirical testing makes a useful contribution to theory development. To support the significance of this research and to justify the selection of variables to be examined in relation to premature infants’ nighttime awakening and sleep problems, a thorough review of the pediatric sleep literature, including salient infant and maternal factors is presented in the following chapter.
2 Literature Review

In this chapter, I synthesize and critically analyze the literature concerning normative sleep patterns and the factors that affect infants’ sleep. Because few reports in the literature address premature infants’ sleep and maternal attachment, this review draws heavily on the literature regarding full-term infants’ and older children’s sleep. I consider several potentially relevant factors, including the infants’ health status, and the mothers’ style of attachment, perceptions of the family’s functioning, care-giving routines at bedtime, happiness, and ethnicity. Although the majority of studies have either excluded preterm infants or have included them as a very small percentage of the overall sample, all of the foregoing variables have been found to be associated with infants’ sleep problems particularly in full-term infants (Benoit, Zeanah, Boucher, & Minde, 1992; Mindell & Owens, 2003a; Morgan, Groer, & Smith, 2006; Thunström, 1999; Touchette et al., 2005; Zuckerman, Stevenson, & Bailey, 1987). I begin with a brief description of infants’ normative sleep patterns and factors affecting their sleep to provide some background to the study.

2.1 Infants’ Normative Sleep Patterns

During early development, sleep is one of the primary activities of the brain. Sleep is estimated to occupy about two-thirds of a newborn’s average day and gradually decreases to occupy about one half of the day by the end of infancy (Mindell & Owens, 2003a). The quality of sleep during infancy differs significantly from that of other developmental stages.
Infant sleep has been characterized as having active sleep (AS) or rapid eye movement (REM) and quiet sleep (QS) or non-rapid eye movement (Non-REM) stages (Anders, Carskadon, & Dement, 1980). Active sleep is characterized by low-voltage, autonomic irregularity and rapid electroencephalographic (EEG) waves (Anders et al., 1980). During the AS stage, the infant may show rapid eye movements, twitches, startles, and head movements and may also be easily aroused (Anders et al., 1980). Quiet sleep is characterized by slow EEG waves and more stable somatic and visceral activity. During QS, the infant shows no eye or body movements and is not easily aroused (Anders et al., 1980). Although the differentiation between AS and QS is seen as early as 31 weeks after conception (Curzi-Dascalova, Peirano, & Morel-Kahn, 1988), the organization of sleep states (temporal organization of active-quiet sleep cycles) is more developed during the second half of the first year of life, as a function of brain maturation (Anders et al., 1980).

At birth, the proportions of active and quiet sleep are equal; the two sleep states cycle with each other every 50 minutes (Anders et al., 1980; Kahn, Dan, Groswasser, Franco, & Sottiaux, 1996). Each sleep cycle comprises non-REM stages and REM stage followed by a brief awakening. As a consequence of the normal sleep cycles, neonates normally have nighttime arousals (Mindell and Owens, 2003a). Not surprisingly, newborns awaken 4 to 6 times during the night as part of a normal sleep cycle and for feeding requirements (Anders et al., 1980).

Changes in the proportion of sleep states (AS and QS) have been reported to occur at similar rates for full-term and premature infants (without health restrictions) and both groups have the same amount of wakefulness (Anders & Keener, 1985). As well, both full-term and premature infants begin sleep in active states (Curzi-Dascalova et al.,
However, others reported that preterm infants at 40 weeks showed longer quiet sleep periods and rapid shift from sleep state to state than full-term infants (Watt & Strongman, 1985).

The emergence of sleep-wake circadian rhythm (24 hours cycle of wakefulness and sleep) in both full-term and preterm infants occurs at approximately 3-6 weeks of age, and is established by 12-14 weeks (McMillen, Kok, & Adamson, 1991; Mirmiran, Mass, & Ariagno, 2003; Shimada et al., 1999). As infants develop, they show more mature sleep patterns with the sleep cycles becoming longer – about six hours of night sleep periods at six months of life. By the age of eight months, quiet sleep occupies a greater proportion of the ultradian cycle and reaches two-thirds of the sleep cycle (Anders & Keener, 1985; Kahn et al., 1996).

By the end of the first year, most consolidated sleep1 occurs during the night, with a few hours of napping occurring during the day (Sadeh, Acebo, Aytur, & Carskadon, 1995). In addition, preterm infants have total sleep duration, daytime sleep duration and sleep efficiency at 12 months of corrected age similar to their full-term counterparts (Asaka & Takada, 2010).

The maturation of infants’ sleep patterns is partly physiological, but other interactional factors affect their sleep (Anders et al., 1980; Dreyfus-Brisac, 1970). An important factor that affects the process is environmental stimuli (Dreyfus-Brisac, 1970). McMillen, Kok, Adamson, Deayton, and Nowak (1991) compared the emergence of a circadian sleep-wake rhythm (a 24-hour cycle of wakefulness and sleep) of 22 full-term infants with that of 19 preterm infants and concluded that the environment appeared to be

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1 Sleep consolidation is “defined as a period of sleep without waking from midnight to 5 AM or as defined by parents as a continuous sleep episode without the need for parental intervention from the child’s usual bedtime through the early morning” (Mindell & Owens, 2003a, p 27)
more important in the entrainment (adjustment) of the circadian pattern than neurologic maturity.

As noted above, no marked differences in changes in the sleep patterns of full-term and premature infants have been observed (in the absence of medical pathologies); therefore, their sleep organization appears to be similar (Anders & Keener, 1985; Curzi-Dascalova et al., 1988; McMillen et al., 1991). Nevertheless, sleep parameters that are used to assess infants’ sleep-wake states have varied across studies, including those generated by polygraphic recordings\(^2\), video somnography\(^3\) and visual observation. In addition, the sample sizes of studies that have reported similarities have been relatively small, ranging from 33-64 infants. Thus, concerns about Type II errors (false negative reports) arise. A large prospective study conducted in Germany compared the sleep organization and prevalence of sleep problems of full-term and preterm infants and reported that there were more similarities than differences (Wolke, Meyer, Ohrt, & Riegel, 1995). Based on parental reports, the sleep patterns of 4,427 full- and preterm infants who were discharged from special care units were very similar when compared with a matched control group (n = 1,060) of children at 5 and 20 months of age (age corrected for the preterm infants) (Wolke et al., 1995). Interestingly, in that study, the prevalence of sleep problems was reported to be less for the preterm infants compared with the full-term infants at five months of age. Although the children in the control group had fewer health challenges, parental behaviour related to sleep for all the infants was associated with shifts in sleep patterns and, in particular, sleep problems.

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\(^2\) Polygraphic recording is completed with an instrument that measures and records several physiological indices including respiration, blood pressure, and pulse and breathing pattern.

\(^3\) A somnogram is an instrument that records biophysiologic changes, including brain waves (EEG), musculoskeletal activity, eye movements and heart rhythm (ECG).
2.2 The Development of Sleep Problems in Infancy

Infants’ sleep organization and consolidation are at least partially biologically based because processes of neurodevelopment are involved (Curzi-Dascalova et al., 1988; Dreyfus-Brisac, 1970; Watt & Strongman, 1985). In reference to infants’ normative sleep patterns, nighttime awakening can be considered a normal part of infants’ sleep architecture. Because the majority of infants have multiple awakenings at night during the first few months of life, some of these events (signaling) may need parental attention (Anders, Halpern, & Hua, 1992).

As infants develop, their sleep cycles become longer and nighttime arousals become fewer. Most full-term infants develop the ability to fall back to sleep after nighttime arousal without assistance; that is, they use self-soothing techniques (Anders et al., 1992). Although many opinions have been expressed about infants’ ability to develop self-soothing after nighttime arousal, most authors point out that infants have the ability to learn self-regulation, such as self-soothing and sleep initiation, by as early as 3-8 weeks of age (Pinilla & Birch, 1993; Wolfson, Lacks, & Futterman, 1992), and most full-term infants are established in their ability to self-soothe by about 6-8 months of age (Anders et al., 1992; Keener, Zeanah, & Anders, 1988).

A failure to self-soothe and to re-initiate sleep after nighttime arousal results in consistent signaled nighttime awakening, which can become problematic as full-term infants develop beyond the first five months of life. Actions or medical conditions may increase the number of nighttime waking events. For example, scheduling changes, relocations, vacations, environmental contributors (e.g., noise, heat), illness, ear infection, milk allergies, reflux or colic are all known to disrupt sleep (American Academy of Sleep
The American Academy of Sleep Medicine (AASM) (2001) indicated that infants’ difficulties in settling and their signaled nighttime awakenings are related to inappropriate sleep-onset associations. In such cases, infants need certain objects or sets of self-comforting conditions, such as sucking, rocking, or being held to initiate sleep; the absence of these conditions may prolong sleep onset. Once infants learn these sleep-onset associations, their need for them may persist (AASM, 2001). Such actions constitute an over-involvement of caretakers in their infants’ sleep. Over involvement may be associated with periods of infant illness, social stress, parental overprotection, parental inexperience, or prior established behaviour (AASM, 2001). Parents vary in their use of particular sleep-onset associations, which are related to their beliefs, expectations, and cultural values (Mindell & Owens, 2003a).

Based on the notion that infants’ problematic nighttime awakening is associated with an inability to self-soothe and re-initiate sleep, without parental assistance, a wealth of empirical evidence supports treating or preventing signaled nighttime waking through behavioural interventions (Adams & Rickert, 1989; Durand & Mindell, 1990; Fisher, Feekery, & Rowe, 2004; Minde, Corter, & Goldberg, 1984). Behavioural interventions
have been found to be effective with a greater than 90% success rate in managing sleep problems in children (France, Blampied, & Wilkinson, 1991; Richman, Douglas, Hunt, Lansdown, & Levere, 1985).

Mindell, Kuhn, Lewin, Meltzer, and Sadeh (2006) reviewed 52 studies regarding the efficacy of behavioural interventions in the management of infants’ or toddlers’ bedtime problems and nighttime awakening; the studies ranged from large randomized controlled studies to small prospective studies or case series without control groups. Their review indicated that in 94% of the studies, behavioural interventions of caregivers were reported to significantly reduce bedtime problems and nighttime awakenings. However, because some of the studies did not include a control group, it is difficult to determine whether the infants’ sleep problems were resolved by the intervention or simply resolved over time. Notwithstanding this important limitation, the same level of clinical significance was reported in the stronger randomized controlled studies.

Because behavioural interventions are predicated on changing the nature of maternal bedtime behaviour used to settle infants, the resolution of sleep problems or failure to resolve them are outcomes that reflect the important association between parent-infant interactions at bedtime and children’s sleep problems.

### 2.3 Factors Affecting Infants’ Sleep

The etiology of sleep problems remains unclear. However, normative sleep development and organizational patterns, as well as the development of sleep problems, are believed to be based on multi-factorial interactions, in which certain intrinsic and extrinsic factors play significant roles during different developmental stages (Adams &
Rickert, 1989; Burnham, Goodlin-Jones, Gaylor, & Anders, 2002; Richman, 1981; Wright, Woodcock, & Scott, 1970). In addition to organic and maturational factors affecting sleep, environmental inputs – such as human interaction – have significant effects (Dreyfus-Brisac, 1970; France & Blampied, 1999; Gertner et al., 2002; Mindell et al., 2006; Sadeh, 2003).

The following sections provide a review of the factors that are known to affect sleep development and regulation. The first section introduces the intrinsic factors that affect infants’ sleep regulation followed by a discussion of the extrinsic (contextual) factors that have been reported to be related to infants’ sleep regulation.

2.3.1 Intrinsic Factors

Because infant nighttime awakening and signaling are among the major complaints of parents, they have been widely studied. Many investigators have explored the associations between infants’ characteristics and their sleep problems, such as infant bio-physiological factors (i.e., prematurity), infant temperament, and infant attachment style (e.g., Anders, 1994; Asaka & Takada, 2010; Morrell & Steele, 2003; Scher & Asher, 2004; Scher, 2001; Wolke et al., 1995). In the following sections, I discuss selected intrinsic factors that are thought to be related to infants’ sleep.

2.3.1.1 Physiological Factors: Premature Birth

Premature birth occurs before the 37th week of completed gestation (Crawford & Morris, 2000) and is associated with 7.4% of live births in Canada (Statistics Canada, 2007). Levels of prematurity are classified according to the infant’s gestational age at
birth. Severely premature infants are those born at less than 32 gestational weeks; they have a high risk of mortality, serious morbidity and psychomotor developmental delays (Kramer et al., 2000; Sun, Mohay, & O’Callaghan, 2009). Moderate prematurity is classified as occurring between 32.0 to 33.9 gestational weeks, and mild prematurity occurs between 34 and 36 gestational weeks. Premature infants’ degrees of immaturity in their organ systems depend on their gestational age at birth (Crawford & Morris, 2000; Johnston, Flood, & Spinks, 2003). Infants who are mildly and moderately premature are more common (Kramer et al., 2000) and have fewer health challenges compared with infants characterized as severely premature. For example, moderate and mild preterm infants have some difficulties in sucking and swallowing (Johnston et al., 2003), and severely preterm infants have deficiencies in digestive enzymes and lack mucosal folds in the small intestine, which reduce digestion and absorption (Johnston et al., 2003).

Medical care and length of hospitalization depend on an infant’s level of prematurity. Ultimately, an infant’s experience in the NICU which may include frequent and prolonged exposure to distress-inducing care procedures and developmental care may also differ between levels of prematurity.

The available comparative studies of premature infants’ (without severe health restrictions) and full-term infants’ sleep have revealed more similarities than differences (Anders & Keener, 1985; Asaka & Takada, 2010; Curzi-Dascalova et al., 1988; McMillen et al., 1991; Wolke et al., 1995). Findings about similarities in sleep patterns should not be viewed uncritically, however, because there are limitations to these studies including their having sampled small numbers of participants, enrolled mostly Caucasian participants, and varied geographic or cultural contexts of the samples. For example, the
study of Wolke et al. (1995) was conducted in Germany, the study of Curzi-Dascalova et al. (1988) was conducted in France, and Anders and Keener’s (1985), McMillen et al.’s (1992), and Asaka and Takada’s (2010) studies were conducted in North America, Australia and Japan respectively.

On the basis of the limited evidence, premature birth does not seem to have a major effect on infants’ sleep development and regulation; however, health challenges that accompany prematurity and adjunct treatment (such as oxygen therapy) may interfere with the premature infant’s sleep (Simakajornboon, Beckerman, Mack, Sharon, & Gozal, 2002). As mentioned earlier, in groups with young gestational ages, the prevalence rates of major health challenges and need for treatment are increased (D’Agostino & Clifford, 1998).

Because sleep and waking are behaviours connected to brain activation, any intrauterine growth restriction or neurological insults to the infant’s brain development may affect sleep (Holditch-Davis, 2010; Honomichl, Goodlin-Jones, Burnham, Gaylor, & Anders, 2002; Leitner et al., 2002). Neurological problems that may accompany premature birth, such as intra-ventricular hemorrhage (IVH) and the environmental stress of being in a neonatal intensive care unit may place preterm infants at greater risk of neuro-developmental impairment, such as seizures, hydrocephalus, cerebral palsy, mental retardation, and altered sleep-wake state organization (D’Agostino & Clifford, 1998; Brandon, Holditch-Davis, & Winchester, 2005; Holditch-Davis et al., 2004). IVH is the most common health challenge seen in premature infants. IVH is graded from 1-4,

4Premature infants are born with fragile capillaries that can easily be ruptured by hypoxia or alterations in cerebral blood pressure that place them at greater risk for germinal matrix bleeding (Crawford & Morris, 2000).
where 1-2 is considered low risk, and grades 3-4 are the most severe. The literature clearly documents that IVH may be associated with brain injury; adverse neurological outcomes are related to the severity of IVH (Browne et al., 2005). The incidence of IVH is inversely proportional to gestational age and birth weight (Alistair, Walter, Alison, & Louise, 1989). Grades 3 and 4 IVH are associated with greater risk of neuro-developmental impairments, such as seizures, hydrocephalus, cerebral palsy, and mental retardation (Browne et al., 2005; D’Agostino & Clifford, 1998). Based on the severity of these health challenges, extensive medical support is provided for premature infants in the NICU.

Respiratory problems, such as respiratory distress syndrome (RDS), have an incidence of about 14% at 34 weeks of gestation. Consequently, mechanical ventilation and surfactant is administered to infants younger than 34 weeks of age, at rates of 19% and 11%, respectively (Johnston et al., 2003). RDS incidence is elevated to 66% when the gestational age is about 26 weeks, and mechanical ventilation and surfactant are administered to about 96% and 68% of these infants, respectively (Johnston et al.).

Gastro-esophageal reflux disease (GERD) is also a common phenomenon during infancy (Crawford & Morris, 2000; Johnston et al., 2003). Badriul and Vandenplas (1999), based on a review, described the manifestations of GERD, which include regurgitation – the hallmark of GERD – irritability and restlessness, and respiratory symptoms (such as apnea). The mechanism of GERD is transient increased esophageal sphincter relaxation in both healthy full-term and preterm infants (Omari et al., 2002). The intensity and frequency of GERD determine its severity, but the extent to which GERD is clinically significant remains controversial. There has been minimal
information generated about the prevalence of GERD in preterm infants. In one study Hibbs and Lorch (2006) reported that the prevalence of GERD in premature infants ranges between 40% and 85%.

Although regurgitation is the main manifestation of GERD, regurgitation is more prominent during the first 6 months of life; 67% of infants at 4 months of age have regurgitation of at least one episode a day (Nelson, Chen, Syniar, & Christoffel, 1997). This prevalence decreases dramatically during the second 6 months of life to reach 5% at 10-12 months of age. In other words, it would be less likely that 6-month-old infants would present with consistent regurgitation. Although the prevalence of regurgitation is remarkable during infancy, only 8-10% of infants are reported to develop the pathological form of GERD (Vandenplas, Goyvaerts, Helven, & Sacre, 1991).

GERD mostly occurs in waking states. However, the clearance of the esophageal acidic reflux content is slow during sleep, due to decreased salivary secretion (Badriual & Vandenplas, 1999). Thus, during nighttime sleep, in response to acidic reflux, infants develop heartburn, excessive coughing, or other respiratory symptoms that cause nighttime arousals (Mindell & Owens, 2003a). The pathological form of GERD has been linked to infants’ sleep problems (Ghaem et al., 1998). Ghaem et al. (1998) reported that infants between 3-12 months of age with GERD have a higher prevalence of nighttime awakening that needed parental intervention (more than three times/night), had a significant delay of onset of sleep, and experienced more daytime sleeping in comparison to population norms for the same age group of infants without reflux. The pediatric literature also suggests that physiological conditions causing pain and discomfort, such as
colic, ear infection and itching due to eczema may increase infants’ nighttime arousals (Mindell & Owens, 2003a).

The NICU environment including the physical surrounding and medical/nursing interventions, often exposes premature infants to distress and pain-provoking care procedures which affect infants’ ability to sustain sleep (Brandon, Holditch-Davis, & Belyea, 1999; Zahr & Balian, 1995). Therefore, for the present study infants with severe health challenges were excluded (see exclusion criteria in Table 4.6). As well, to avoid sampling premature infants with health complications and developmental restrictions, this study involved the assessment of sleep in otherwise healthy non-hospitalized preterm infants aged 5-6 months corrected for prematurity who being cared for by their mothers at home.

### 2.3.1.2 Infants’ Temperament

In comparison with full-term infants, a higher percentage of preterm infants (at 6 months of age) have been reported to be “difficult” by their parents, although this difference appears to be less pronounced at 12 months of age (Washington, Minde, & Goldberg, 1986). These findings could reflect an association between maternal feelings about premature delivery and perceptions of their infants’ temperament. Maternal well-being influences how mothers view their infants’ temperament. For example, maternal stress from family conflict has been found to negatively affect mothers’ perceptions of their infants (Sokolowski, Hans, Bernstein, & Cox, 2007). Halpern, Anders, Coll, and Hua (1994), in their prospective longitudinal study, found an association between infants’ temperament and their mothers’ psychological well-being; mothers who reported
relatively more psychological distress, parenting hassles, and parenting stressors rated their infants as more difficult, less adaptable, and predictable. The authors suggested that maternal stress and fatigue could influence mothers’ moods and perceptions.

Adair, Bauchner, Philipp, Levenson and Zuckerman (1991) reported that full-term infants who are described by their mothers as having less negative mood states experience fewer nighttime awakenings. In addition, Spruyt et al. (2008) showed that infants described as being more approachable and rhythmic had longer nocturnal sleep duration. Children who were described as being less malleable with a lower sensory threshold, and are fussy may be more likely to have sleep problems (Carey, 1974; Richman, 1981; Scher, 2001). In particular, infants who spent more time out of their crib during the night for care giving were described by their mothers as being less rhythmic (Keener et al., 1988). On the other hand, Burnham et al. (2002) did not find evidence of a relationship between mothers’ perceptions of their infants’ temperament and the infants’ nighttime self-soothing. These studies all depended on maternal ratings of the infant’s temperament. Linking maternal perceptions of infants’ temperament to sleep problems should probably be framed as a bi-directional interaction between mothers’ characteristics and infants’ temperament. In addition to the strong reliance on maternal reports of infants’ temperament and sleep difficulties, some authors have argued that, during infancy, it might not be useful to consider temperament in attempting to understand a particular behaviour because infants have not established stable patterns of behaviour that mothers can accurately assess (Isabella, Ward, & Belsky, 1985). In addition reducing infants’ behaviour into categories such as “difficult” or “easy” may be useful in describing their behaviour but not as useful in understanding it (Blackwell,
2004). Consequently, maternal perceptions of their premature infant’s temperament was not examined in this study.

2.3.1.3 Infants’ Attachment

Bowlby’s (1973) theory of attachment proposes that infants develop an emotional bond with their caregivers during the first nine months of life. During the second half of the first year, infant attachment behaviour is more explicit, and separation from a caregiver may evoke behaviour such as crying. Within the context of infants’ sleep problems, several studies have linked full-term infants’ style of attachment with their sleep problems (e.g., Anders, 1994; Morrell & Steele, 2003; Scher, 2001). Only one study could be located that examined the maternal side of the attachment relationship (Benoit et al., 1992).

From the perspective of infant-mother attachment, Anders (1994) viewed putting infants to sleep during the night as separation from mothers that initiates infants’ attachment behaviour and affects infants’ sleep. Infants who were classified as having secure attachments were able to transfer their need for their caregivers during the night to objects such as toys or blankets. Thus, by using “security objects,” these infants were likely to soothe themselves and return to sleep upon nighttime awakening (Ander, 1994).

Scher (2001), in a study of 94 Israeli mother-infant dyads at 12 months of age, reported a marginal association between infant attachment and nighttime awakening. The author found that 60% of the “ambivalently” attached infants were described by their mothers as nighttime “wakers,” compared with 55% of the “securely” attached infants. It is possible that the study could not detect differences between the groups because it was
underpowered statistically. Nevertheless, the weak association between infants’ problematic nighttime awakening and their attachment style suggests a complex context of maternal-infant attachment, rather than the problem being singularly related to the infants’ attachment styles. Interestingly, Cassidy and Berlin (1994), in a review of studies of maternal-infant attachment, reported some evidence that suggests that infants who are ambivalently attached are most likely to have ambivalently attached mothers. It is thus important to conceptualize infants’ sleep problems in light of maternal variables, such as mothers’ styles of attachment. No study could be located that examined premature infants’ attachment and the development of sleep problems. In any case, to understand infants’ problematic nighttime awakening, maternal attachment styles need to be taken into consideration. Given the knowledge that infant attachment behaviour is more obvious during the second half of the first year, infants’ attachment was not examined in this study.

2.3.2 Extrinsic Factors

According to a transactional model of development, infants are in consistent interaction with their surroundings (Sameroff & MacKenzie, 2003). The context in which infants grow and interact has a great effect on their developmental outcomes. Infants’ environments consist of physical surroundings and human interactions and infants’ interactions with their caregivers are bi-directional (Sameroff & MacKenzie, 2003). Mothers affect infants’ sleep quality and infants’ sleep patterns affect mothers’ functioning, sleep, and well-being (Eckerberg, 2004; Hall, Clauson, Carty, Janssen, & Saunders, 2006; Richman et al., 1985). Hence, when examining infants’ sleep regulation,
it is important to consider not only the characteristic of the infant but also characteristics of the infant’s mother.

A considerable number of studies have indicated that maternal age, education, marital status, and parity are characteristics associated with infants’ sleep arrangements and practices (e.g., Lozoff et al., 1996; Milan et al., 2007; Moon & Omron, 2002; Ostfeld et al., 2006; Rona, Li, Gulliford, & Chinn; Schachter et al., 1989; Willinger et al., 1998). These studies have focused on maternal practices related to sleep from birth to toddlerhood, with the sample sizes ranging from 129 to 3,000 families, and with people who self-identified as White, Latino, or Black (terms used by authors of the study)\(^5\). For example, a study conducted by Willinger et al. (1998) revealed that significant predictors of infants assuming prone positions for sleep were being Black, having mothers between the ages of 20 and 29 years, and having older siblings. Co-sleeping has been found to be more common in single mother families (Ostfeld et al., 2006; Schachter et al., 1989).

Moore and Ucko’s (1957) findings suggested that the influence of maternal age and education on infants’ sleep consolidation was small. Rona et al.’s (1998) findings, in contrast, indicated that infants of relatively less educated mothers are more likely to have sleeping problems.

Human interactions, including mother-infant interactions at bedtime, are thought to be a pivotal factor in infants’ sleep regulation (Lozoff, Wolf, & Davis, 1984; Morrell & Steele, 2003). Parents’ psychosocial health, lifestyle, and culture are also considered to be factors that have an impact on mother-infant interactions, and that could ultimately

\(^5\) Terms used to identify ethnic background vary between studies. I acknowledge the problem in the usage of the term “white” as a designation of ethnic background. Unless citing references that refer to the term, “white” as part of the study, I use the term “Caucasian” consistent with the study demographic questionnaire. Ethnicity in this dissertation was determined by asking the respondents to define their ethnic background. The response options where adapted from the classification used by Statistics Canada (2006a).
affect infants’ developmental outcomes, such as sleep regulation. Many investigators have explored the associations between infants’ sleep problems and their parents’ characteristics, such as maternal depression and stress (Lam, Hiscock, & Wake, 2003; Thunström, 1999), mood, quality of sleep, and functioning (Fiese, Winter, Sliwinski, & Anber, 2007; Hall et al., 2006a; Meltzer & Mindell, 2007), the mother’s style of attachment (Benoit et al., 1992), fatigue (Dennis & Ross, 2005), and marital satisfaction (Meijer & Wittenboer, 2007). Parental actions, such as parental bedtime management, co-sleeping (Lozoff et al., 1984), and breast-feeding also have been examined (Elias, Nicolson, Bora, & Johnston, 1986; Keener et al., 1988).

In the following sections, extrinsic factors, including mothers’ bedtime behaviour to settle their infants to sleep, mother’s attachment, maternal happiness, family functioning, and other related factors (i.e., culture, lifestyle, co-sleeping, and breastfeeding) are discussed in relation to infants’ sleep problems.

### 2.3.2.1 Mothers’ Bedtime Behaviour to Settle their Infants to Sleep

Contemporary thinking about infants’ sleep regulation and nighttime arousal emphasizes the importance of viewing these areas within the context of a care-giver-infant relationship framework. For example, France and Blampied (1999) viewed sleep problems, such as signaled nighttime awakening, as a problem with infant sleep self-initiation. France and Blampied viewed sleep self-initiation as a learned behaviour. This perspective of infants’ sleep problems was first developed and published in France and Blampied’s (1999) seminal article. The authors proposed a model of infant sleep self-initiation that focused on the role of the caregiver as the infant’s reference for learning
sleep self-initiation skills. They argued that when parents provide appropriate proximal
cues for sleep onset, their infants learn how to develop sleep self-initiation skills.
Conversely, inappropriate and inconsistent cues from parents are said to result in infants’
failure to develop sleep self-initiation skills. Given this framework, to understand the key
aspects of sleep regulation, the contexts in which infants receive and react to such cues
must be acknowledged.

Parent-infant interactions at bedtime are a key element in the infant sleeping
equation (Adair et al., 1991; Anders, 1994; France & Blampied, 1999; Keener et al.,
1988; Morrell & Steele, 2003; Wolke, Sohne, Riegel, Ohrt, & Osterlund, 1998). In a
study of 122 nine-month-old fullterm infants, Adair et al. (1991) reported that infants
whose parents were present when they fell asleep were more likely to awaken during the
night than were infants whose parents were not present. France, Blampied, and
Henderson (2003) theoretically linked infants falling asleep in the presence of parents or
outside the crib to more signaled nighttime waking. That is, these infants are said to
associate sleeping with a parental presence and cannot re-initiate sleep without a parent
being present. Moreover, mothers’ active physical involvement at bedtime, such as,
rocking, cuddling, feeding, stroking, carrying and breast feeding the infant, have all been
correlated with sleep problems (Elias et al., 1986; Keener et al., 1988; Morrell & Cortina-
Borja, 2002).

Interestingly, mothers’ caretaking interactions have been found to vary in
response to an infant’s birth order among any siblings (Dunn, Plomin, & Daniels, 1986;
Jacobs & Moss, 1976; Sigman, Cohen, Beckwith, & Parmelee, 1981). Mothers have been
observed to spend less time in their caretaking interactions with their second born infants
(Jacobs & Moss, 1976). The authors suggested that their findings may be related to the heavier workloads associated with having more than one baby or efficiency in caretaking gained from previous experience. Paret (1983) stated that mothers who, at bedtime, interact less frequently with their children are more willing to reduce their infants’ dependence. Accordingly, this behaviour can provide an opportunity for infants to develop sleep self-initiation skills and soothe themselves upon waking. Thus, it is important to include the ordinal position of an infant as an element that might affect mother-infant interactions at bedtime when examining sleep patterns and nighttime waking problems.

Multiple births have been shown to have an influence on mother-infant interactions. In one study, mothers with premature twins showed preference for one twin over the other (Minde et al., 1984). A twin was preferred when the child was medically stable had more capacity to be awake, and was more responsive to her or his mother. This preference was reflected in the mothers’ behaviour toward their infants; preferred twins were observed to receive more visual attention, more play, and more care-giving time (Minde et al., 1984). These findings were based on 40-minute observations of parent-infant interaction on six occasions for 26 infant twins and 27 singletons. Accordingly, mothers with infants of multiple births should have their bedtime interactions carefully considered in research addressing sleep problems.

2.3.2.2 Mothers’ Attachment

Attachment refers to the ties or relationships between individuals within a social context (Bowlby, 1973). Attachment behaviour is conceptualized as “any form of
behaviour that results in a person attaining or retaining proximity to some other
differentiated and preferred individual” (Bowlby, 1977, p. 203). Based on principles
derived from cognitive psychology and control theory, Bowlby developed attachment
theory as a way of conceptualizing human beings’ affecational bonds with others. His
conceptualization of attachment deals primarily with the emotional bonds formed
between infants and their attached figures (care-givers). He also provided a conceptual
framework to describe secure attachment and insecure attachment and claimed that
attachment is an independent behavioural system that requires a “schema” or “personal
construct” for its activation (Bowlby, 1973/1977). The individual must develop an
“internal working model” of the self as being able to help oneself and deserve help from
others when needed. In addition, individuals need an internal working model of others as
being trustworthy.

Through social interactions with significant persons (usually family members)
during the first nine months of life, individuals construct complex “internal working
models” of the self and others that guide their affecational ties throughout life (Bowlby,
1973/1977). The internal working models or “cognitive affective-motivational schemata”
regulate behaviour, feelings, and thoughts individuals activate during situational
attachment interactions, which have the potential to provide relationship security for
individuals (Berman & Sperling, 1994). In particular, the foundation for internal working
models is constructed within child-caregiver relationships and continues to affect
children’s feelings, thoughts, and behaviour in their later adult relationships (Bowlby,
1973).
As well, Ainsworth et al. (1978) described three major individual differences in infant attachment. By using a strange situation technique, they described three styles of infant attachment: secure, avoidant, and anxious/ambivalent. Supported by Bowlby’s (1973) theory of attachment and Ainsworth et al.’s (1978) descriptions of attachment styles, other authors have extended the principles of attachment theory beyond childhood. For example, Bartholomew and Horowitz (1991) and Hazan and Shaver (1987) proposed that there is a secure style of attachment observed in adults, and two or more insecure styles. Hazan and Shaver (1987) described three styles of adult attachment, which were extrapolated from Ainsworth et al.’s (1978) descriptions of infants’ styles of attachment: secure, avoidant, and anxious.

An individual’s internal model of relationship is believed to be relatively stable across the life span (Bowlby, 1969); however, traumatic life events, such as the effects of premature birth, have been reported to influence maternal attachment. In one study, only 20% of mothers with premature infants were found to have secure attachment at six months (corrected for prematurity) compared with 53% of a control group (Borghini et al., 2006). In particular, an anxious style of attachment was noted among 36% of the mothers of preterm infants and a disengaged or avoidant style of attachment was identified in 44% of the mothers.

Crowell and Feldman (1988) suggested that mothers’ internal models influence their children’s behavioural outcomes, which is congruent with Bowlby’s theoretical perspective. The study by Borghini et al. (2006) suggested that it is possible that the experience of premature birth triggers maternal feelings and cognitions about their premature infants’ health and developmental outcomes that alter their maternal internal
models. Some mothers have reported feeling as if they were not the actual mothers of hospitalized preterm infants, and other mothers have reported feelings of significant worry about their premature infants’ health and developmental outcomes (Borghini et al., 2006). Ultimately, alterations of mothers’ feelings may lead to difficulties in developing a secure relationship with their infants (Borghini et al., 2006). As a consequence, it can be hypothesized that atypical maternal attachment can interfere with a mother’s care-giving behaviour, including her behaviour at her child’s bedtime.

2.3.2.2.1 Mothers’ Attachment and Care-Giving Behaviour

A warm and responsive care-giving environment that a mother provides her infant is regarded as one of the most powerful contributions to infant self-regulation (Gunner & Quevedo, 2007). From the perspective of attachment theory, the care-giving system is a product of the attachment system (Berman & Sperling, 1994). Mothers’ care-giving behaviour, such as bedtime interactions with their infants, is an outgrowth of their attachment to their infants. Although infants and mothers have a reciprocal relationship (Sameroff & MacKenzie, 2003), the mother’s regulatory role is primary during infancy (Bowlby, 1969). Attachment to caregivers is the first social tie that newborns make with the outside world, and through that tie, infants explore, interact, and learn about their surroundings. Within this context, alterations in maternal attachment styles may give rise to alteration in mother-infant interaction at bedtime. Cassidy and Berlin (1994), in their review of the attachment literature, reported that anxiously attached mothers had relatively high levels of anxiety about parenting and were less competent as parents. In addition, anxiously attached mothers exhibited inconsistent responses and unpredictable
behaviour as a function of their emotional variability (Cassidy & Berlin, 1994). During
mother-infant interactions with their infants, anxiously attached mothers can show a
range of responsiveness, disorganized behaviour, intrusiveness, and in some cases,
avoidant behaviour to overcome their internal conflict (Magai, Hunziker, Mesias, &
Culver, 2000; Morrell, 1999). Ultimately, they can exhibit poor problem-solving
strategies (Crowell & Feldman, 1988). Anxiously attached mothers also have been
reported to behave in ways that constrain their children’s autonomy and exploration
(Ainsworth, 1984). They seem to engage in highly interfering behaviour when their
children might not need them and to ignore their children when they might need
attention. Such disorganized and inconsistent maternal behavioural patterns may interfere
with the attempts of their infants to develop autonomy (Cassidy & Berlin, 1994). More
specifically, France and Blampied (1999) linked mothers’ insecure (anxious) styles of
attachment with infants’ nighttime awakening.

### 2.3.2.2 Mothers’ Attachment and Infants’ Sleep

There is empirical evidence to support a link between mothers’ attachment styles
and their children’s health outcomes, specifically failure to thrive (Benoit, Zeanah, &
Barton, 1989), behavioural disorders (Crowell & Feldman, 1988), and poor emotional
development (Wilkinson & Scherl, 2006). In addition, maternal attachment style may
play an important role in mothers’ adjustment to parenting. For example, a secure
attachment style has been found to help mothers adjust to the stress associated with breast
feeding and to continue to breast feed (Wilkinson & Scherl, 2006).
Benoit et al. (1992) investigated the association between insecure maternal attachment and sleep problems. In their study of 41 mother-child dyads, 20 mothers had toddlers with sleep disorders and 21 had toddlers without sleep disorders. The two groups were matched on mothers’ and children’s ages, marital status, family size, education, and socioeconomic status. The researchers reported that all mothers who had toddlers with sleep problems were classified as insecurely attached; specifically, 35% of them were classified as having a preoccupied attachment style (Benoit et al., 1992). The findings support the hypothesis that there is a correlation between mothers’ attachment styles and their children’s sleep (Benoit et al., 1992). Because the study was cross-sectional, however, any claims about the possible mechanisms of how an insecure attachment style relates to young children’s sleep problems could not be made. In addition, the study did not include a sample of premature infants.

Further evidence of the importance of maternal attachment in relation to infants’ sleep is provided by Morrell’s (1999) study. That author investigated the association between mothers’ beliefs about their infants’ sleep and sleep patterns. Twenty-two mothers of 13-16-month-old infants with sleep problems and 37 mothers of infants without sleep problems were studied. The mothers’ beliefs about setting limits, their level of anger over their infant’s demands, and their doubts about their parenting competence were significantly related to the quality of their infants’ sleep. The mothers’ abilities to balance their infants’ needs and their responses were believed to be crucial in allowing the infants to move from total dependence toward autonomy in regulating their sleep. Moreover, there was an association found between the mothers’ attachment style and sensitivity in responding to their children’s sleep needs.
Mothers, as typical care-givers, occupy a large part of infants’ contexts; the way that mothers interact, as a function of their attachment style, is critical for infants’ growth and development. Accordingly, it is important to learn more about how mothers with an insecure (anxious) style of attachment may affect their premature infants’ signaled nighttime awakenings.

2.3.2.3 Maternal Mental Health: Postpartum Depression

Having a baby is a major developmental milestone for women. The biopsychosocial factors (i.e., hormonal changes, stressful life events) associated with pregnancy and childbirth may expose mothers to emotional and psychological alterations (e.g., depression) (Beck, 1996; Bloch et al., 2000; O'Hara, Schlecte, Lewis, & Varne, 1991). Postpartum depression can take a mild form, in which mothers experience mild mood changes, yet can function well with extra support. Mothers with symptoms that meet the clinical criteria for a diagnosis of depression, however, require therapy.

Clinical postpartum depression is a serious and disabling condition that affects mothers’ thoughts and behaviour (American Psychiatric Association, 2010). According to the American Psychiatric Association (2010), 10-20% of new mothers experience clinical postpartum depression. Similar percentage (12.6%) was reported for mothers of premature infants at six-month of corrected age (Korja et al., 2008). Various studies have reported that postpartum depression may affect mother-infant interactions (Bettes, 1988; Paret, 1983; Paris, Bolton, & Weinberg, 2009). In some of those studies, some of the women have been reported to be less sensitive and responsive to their infants (Paris, Bolton, & Weinberg, 2009) or to exhibit more pauses, less vocal behaviour, and slower
responses compared with mothers without clinical depression (Bettes, 1988). In a group of premature infants, maternal depressive symptoms were reflected in the quality of mother-infant interaction, in which depressed mothers had less positive affective involvement and communication with their infants at six-months of corrected age than non-depressed mothers (Korja et al., 2008).

In infant sleep studies, associations between postpartum depression and infants’ sleep problems have been reported (Hiscock & Wake, 2001; Lam et al., 2003; Thunström, 1999). In the study by Hiscock and Wake (2001) mothers with depression were more likely to have infants with frequent and prolonged nighttime awakenings. While the causal direction of these observed association remains unclear, Hall et al. (2006a) reported that improvements in infant sleep had a positive effect on maternal mood. Paret (1983) suggested that depressed mothers who display overly protective behaviour may impede their infants’ sleep autonomy, which may ultimately lead to the development of sleep problems.

To date, no studies have examined the relationship between maternal postpartum depression and sleep problems in premature infants, and dedicated studies in this area are needed. Because this current study focused on mothers’ attachment and interaction styles, it was beyond the scope of the study to have also examined the effects of maternal postpartum depression. Hence, mothers with a diagnosis of clinical depression or other mental illness were excluded.
2.3.2.4 Family Functioning

The relationship between family functioning and children’s developmental outcomes may be reciprocal; however, the impact of family functioning on children’s sleep is well documented (Adam, Snell, & Pendry, 2007; Lozoff, Wolf, & Davis, 1985; Richman, 1981; Rona et al., 1998; Thunström, 1999). For example, experiences that can differentiate children with sleep problems from those without sleep problems include maternal absence during the day because of work or study requirements, family illness or accident (Lozoff et al., 1985), and social disadvantage (e.g., manual social class and mothers with little education) (Rona et al., 1998). Thunström (1999) suggested that infants’ sleep problems are associated with previous sleeping problems within the family.

In his review, Ferber (1987) postulated that when parents are in direct conflict with one another, their parent-infant interactions are affected; specifically, bedtime schedules or routines become inappropriate, chaotic, or even lacking. Furthermore, mothers who experience poor general family functioning have been reported to exhibit poor maternal vocalization (Bettes, 1988), to be less sensitive and more passive, and to use less encouragement and guidance with their infants (Sokolowski et al., 2007). These behaviours may ultimately contribute to mothers having less than optimal interactions with their infants. Thus, it is important to consider the family context when examining specific maternal behaviours related to infants’ sleep.

2.3.2.5 Other Related Factors

Several studies have been focused on maternal practices such as co-sleeping and breastfeeding in relation to infants’ sleep problems, although disagreement is evident in
the literature. Cultural and lifestyle factors also have been considered within the context of infants’ sleep regulation.

### 2.3.2.5.1 Cultural and Lifestyle Factors

Maternal parenting behaviour is entrenched in cultural values and beliefs (Keller et al., 2003). Culture explicitly influences how children’s sleep is configured, including sleep duration and timing, bedtime routines, sleeping arrangements, sleep aids, and views about problematic nighttime awakening (Jenni & O’Connor, 2005). Ethnic variations have been found in mothers’ perceptions and management of their children’s sleep (Lozoff, Askew, & Wolf, 1996; Milan, Snow, & Belay, 2007; Schachter et al., 1989). For example, North American mothers who identified themselves as Caucasian were found to desire regularity in their children’s sleep and place a high value on independence; their expectations have been observed to differ from those of Latino and African-American mothers (Milan et al., 2007). These mothers were also reported to establish their children’s bedtime routines (a specific time and rituals) and to discourage co-sleeping at a young age, while emphasizing self-soothing behaviour (Milan et al., 2007). Caucasian mothers also have been found to be more likely to have children with sleep problems (Lozoff et al., 1996). Milan et al. (2007) speculated that these findings may arise because mothers perceive their children as not meeting their expectations.

In contrast, the parents in Latino and African-American families have been observed to be more involved with their children at bedtime and to place a higher value on body contact and closeness (Lozoff et al., 1984; Schachter et al., 1989). In one study, co-sleeping was reported by about 70% of African-American families (Lozoff et al.,
and in another study, 79% of Latino children shared bedrooms with their parents (Schachter et al., 1989). Mothers from these two ethnic groups may not share the expectations of Caucasian mothers. This may explain why mothers from diverse backgrounds report fewer sleep problems with their children. Although most researchers have focused on Caucasian, African-American, and Latino groups, inferences can be made that mothers from diverse ethnic backgrounds, including Asian, South-Asian and Middle-Eastern origins, would exhibit variation with respect to sleep practices and reporting of infants’ sleep problems. It is important, therefore, to include some measure of ethnicity when conducting studies of infants’ sleep patterns in multicultural communities.

2.3.2.5.2 Co-sleeping

The literature about co-sleeping (bed-sharing) is controversial. Some reports suggest that co-sleeping may expose infants to physical harm such as accidental strangulation or suffocation (Ateah, & Hamelin, 2008; Nakamura, Wind, & Danello, 1999) or hinder infants’ ability to be independent, which may ultimately contribute to sleep problems (Ferber, 1987; Lozoff et al., 1984; Schachter, Fuchs, Bijur, & Stone, 1989). For example, Jenni, Fuhrer, Iglowstein, Molinari, and Largo (2005) found an association between co-sleeping and persistent problematic sleeping patterns. In contrast, another report indicated that co-sleeping promoted breastfeeding (McKenna, Mosko, & Richard, 1997). Morgan et al. (2006), in their review of the literature, interpreted co-sleeping as a healthful practice, which facilitated supervision of infants during sleep and positively affected infants’ emotional development.
Ramos (2003) distinguished intentional or proactive co-sleeping and reactive co-sleeping (a response to a child’s sleep problems) on the basis of parents’ ideological endorsement of family sleep approaches. In other words, it is argued that parents who proactively co-sleep with their children support it as the ideal form of family sleep, whereas reactive co-sleepers do not actively endorse co-sleeping.

Some authors consider co-sleeping to be problematic (e.g., Richman, 1985), while others consider it to be problematic only if it is reactive (Gaylor, Goodlin-Jones, & Anders, 2001). Interestingly, only 3% of mothers who were intentionally co-sleeping with their children (6-24 months of age) reported problematic nighttime awakening, compared with 20% of mothers who were reactive co-sleepers (Ramos, 2003).

2.3.2.5.3 Breastfeeding

Breastfeeding is a controversial issue with regard to the development of infants’ sleep problems, particularly signaled nighttime awakenings. In some studies, breastfeeding has been found to be associated with infants sleeping less than six consecutive hours at night (Touchette et al., 2005) and frequent nighttime awakenings (Elia et al., 1986; Zuckerman et al., 1987). Other researchers have failed to find a relationship between breastfeeding and infants’ signaled nighttime awakening (Adair et al., 1991; Jones, Ferreira, Brown, & Macdonald, 1978; Kahn, Mozin, Rebuffat, Sottiaux, & Muller, 1989).

Given that breast milk is easily digested, breastfed infants may more frequently feel hungry and thus demand more feedings. Pinilla and Birch (1993) and Adair et al. (1991) found that breast feeding per se was not a predictor of sleep problems; rather,
scheduling the time of feeding in close proximity to infants’ sleep time was associated with sleep problems. Mothers’ immediate responses to infants’ feeding needs or interpreting any distress as a feeding need signal also influence infants’ sleep regulation. Some infants associate falling asleep with the motion of feeding, so they require feeding upon nighttime arousal, even if they are not hungry, to help them return to sleep (Ferber, 1996). This highlights the importance of maternal behaviour in settling infants to sleep. Further research is required to examine the possible association between premature infants’ signaled nighttime awakenings and breastfeeding.

2.4 Infants’ Sleep Problems and Research

Sleep serves many functions and plays a major role in many aspects of infants’ health and development (Gais, Plihal, Wagner, & Born, 2000; Mindell & Owens, 2003a); however, knowledge about premature infants’ sleep problems is limited. Many sleep studies have examined the determinants and consequences of childhood sleep disturbances; however, these studies have considerable methodological limitations. The proportion of longitudinal sleep studies that have been conducted, relative to all other types of design, is small (see Appendix A). In addition because most sleep studies pertaining to infants have been conducted with full-term infant subjects, thus this review of the literature may not generalize to the preterm infant population.

Among the studies that have been undertaken with infants, the criteria for classification of sleep problems, and in particular, problematic nighttime awakening, have varied widely (see Appendix A). Inconsistencies in the definition of nighttime, nighttime awakening and the operationalization of its frequency make it difficult to
distinguish problematic nighttime awakening and its severity. Accordingly, comparing the findings across studies is problematic. For example, Anders and Eiben (1997), in their review of pediatric sleep disorders, found that the prevalence of infant dyssomnias (defined as difficulty in initiating or maintaining sleep (e.g., nighttime awakening)) ranged from 25-50% for 1-3-year-old children. This wide range may be due to the various measures used to identify sleep problems, including problematic nighttime awakening.

Other issues related to defining sleep problems are whether one should consider maternal distress about infants’ nighttime awakening as integral to the correct identification of such problems. The most widely used criteria are those developed by Richman (1981), but they do not include maternal distress. Other researchers have included mothers’ perceptions, distress, and frustration with their infants’ sleep behaviour as concerns in their assessments, although it is not clear how they should be integrated into operational definitions of sleep problems (Lozoff et al., 1984; Van-Tassel, 1985). For example, it is not clear when there is a lack of concordance between a mother’s distress about her infant’s nighttime awakening, and the actual frequency or duration of the infant’s nighttime awakening, what criterion should be considered, or considered primarily, in the classification of the sleep behaviour.

Moreover, co-sleeping is a culturally sensitive behaviour (Lozoff et al., 1984) that has not been consistently incorporated into established criteria for the identification of sleep problems. For example, Richman’s (1981) criteria incorporate co-sleeping as an indication of there being sleep problems, but Gaylor et al. (2001) considered only
reactive co-sleeping to be problematic. Other investigators do not include co-sleeping at all (Thunström, 2002).

Pediatric sleep studies also have included children with a wide age range, which raises concerns. Children’s normal nighttime arousals have shown variability across their life trajectories (Moore & Ucko, 1957). Nighttime awakening occurs frequently during the first few months of life, decreases in frequency between 4-6 months of age (Anders et al., 1992; Moore & Ucko, 1957), is increased between 6-12 months of age, and then reduces in frequency during the second year of life (Ferber, 1987). Unfortunately, discussion about developmentally-sensitive, or age-specific, criteria for the classification of sleep problems during infancy is not clearly evident in the literature, except for the work of a very few authors such as Wolke et al. (1995, 1998). Assessing sleep patterns and nighttime awakening in samples of children with large age ranges and applying the same criteria can be highly problematic because it does not account for developmental effects. For example, in an Australian study, all infants aged between 6–19 months were classified with the same sleep problem criteria (Armstrong, 1998). Thunström (1999, 2002) used the same criteria to identify the sleep problems of infants at 6-18 months of age and when they were 5.5 years of age. It is important that better designed studies consider the inclusion of specific developmental age groups so that meaningful conclusions can be drawn about their sleep patterns and problems.

Studies of infants’ sleep problems have investigated parental behaviour at bedtime (Adair et al., 1991) and parental management of nighttime awakening (Jones et al., 1978), including maternal psychosocial variables (Guedeney & Kreisler, 1987; Lozoff et al., 1985), mothers’ cognition and sensitivity about their infants’ sleep needs (Morrell, 1999).
and mothers’ responsiveness (Bernal, 1973). Morrell and Steele (2003) provided support for there being a relationship between mothers’ thoughts about their infants’ sleep (14-16 months old) and the continuity or discontinuity of sleep problems. Maternal cognitions among other factors influenced mother-infant bedtime interaction, and mothers’ active physical involvement predicted the continuation of sleep problems (Morrell & Steele, 2003). Although, France and Blampied (1999) hypothesized associations between maternal attachment and infants’ sleep, only one study has ever investigated the relationship between insecure maternal attachment and toddlers’ sleep problems (Benoit et al., 1992). To date, no study has addressed mothers’ settling behaviour of their premature infants and infants’ sleep problems. The gap in knowledge is evident and research is necessary to explore the relationships between mothers’ styles of attachment with their babies and premature infants’ sleep problems and, in particular, how anxiously attached mothers affect premature infants’ nighttime sleeping.

2.5 Summary

Infants’ sleep patterns do not differ significantly between preterm infants (without neurological complications) and full-term infants, in particular after the first six months of life. Stability in infant sleep-wake states enables the infant to effectively respond and regulate to everyday stimulation which is important to brain development and learning. Persistent alteration in sleep-wake states may have cumulative and long-term neurodevelopmental impacts, especially for the preterm infant (Holditch-Davis, 2010). Several studies have examined the determinants of infants’ sleep problems; however, these studies were fraught with limitations. In one study, preterm infants have
been found to have more sleep problems than compared to full-term infants during the first year of life (Asaka & Takada, 2010). Little is known about preterm infants’ sleeping problems, particularly nighttime awakenings and their relationship with mothers’ behaviour or psychological states.

According to Bowlby (1969), attachment forms part of the context through which infants learn about their surroundings, and inputs from their mothers comprise an influential element of their contexts, eventually affecting their outcomes. Maternal caregiving behaviour is an acknowledged powerful contributor to infant self regulation (Gunner & Quevedo, 2007) and maternal characteristics help shape the quality of the maternal infant interaction and the care-giving system. Mothers’ characteristics and behaviour related to the onset of infants’ sleep have been extensively studied; however, a possible link between mothers’ insecure (anxious) attachment and infants’ signaled nighttime awakening has not been examined in full-term or premature infants. Given that mothers’ attachment style plays a critical role in promoting infants’ sleep regulatory capacity, it is important to examine possible relationships between mothers’ insecure styles of attachment and premature infants’ nighttime awakenings. The theoretical and empirical importance of mothers’ attachment and this gap in knowledge highlight the importance of exploring the possible relationships between premature infants’ nighttime awakenings and their mothers’ style of attachment. In the next chapter, a theoretical model linking mothers’ attachment style, bedtime interaction, and infants’ sleep problems is presented.
3 Theoretical Framework

The nighttime sleep regulation of preterm infants may be better understood through the application of a theoretical framework that incorporates concepts connecting infants’ sleep self-regulation and interactions within the context of the social environment (maternal care-giving). For the purpose of this study sleep regulation is defined as an infant’s ability to manage the sleep-wake transition at sleep onset (bedtime) and following normal nighttime arousals. France and Blampied’s (1999) description of the relationships between infants’ sleep regulation, mothers’ characteristics (i.e., attachment style), and parent-infant bedtime interaction serves as the theoretical framework for this study. The framework links an insecure attachment style, such as an anxious style of attachment, and infants’ problematic nighttime awakening. France and Blampied’s (1999) Infant Sleep Self-Initiation (ISSI) model was selected to guide this work because it incorporates principles from Sameroff and Chandler’s (1975) transactional model of communication development and Bowlby’s (1969) theory of attachment. France and Blampied’s (1999) model was developed as a synthesis of the concepts associated with infants’ self-initiation of sleep. The ISSI model has not been previously tested. In this chapter, an in-depth description of France and Blampied’s (1999) conceptualization of the infant sleep self-initiation model is presented.

3.1 The Infant Sleep Self-Initiation Model

According to France and Blampied’s (1999) ISSI model, infants’ sleep regulation depends on their development of sleep self-initiation skills. Infants’ ability to learn how to initiate sleep is affected by many factors, including the type of sleep cues they receive.
from their caregivers. Maternal characteristics such as mothers’ attachment style is said to affect the quality of maternal-infant interaction and care-giving behaviour. France and Blampied (1999) hypothesized that mothers’ inappropriate bedtime behaviour to settle their infants to sleep lead to disruptions in the infants’ sleep regulatory abilities and to problematic nighttime awakening as a result of a failure, on the part of the infant, to develop self-initiated sleep skills. Thus, the ISSI model links infants’ sleep problems to mothers’ bedtime behaviour and attachment.

3.1.1 Mothers’ Bedtime Behaviour

France and Blampied (1999) proposed the ISSI model (see Figure 3.1) as a means of representing the relationship between infants’ sleep behaviour and learning and mothers’ interactions with their infants. The model is inspired by a transactional model of communication development, in which infants’ interactions with their environments (i.e., the social environment) are considered to be bi-directional (Sameroff & MacKenzie, 2003). Mothers’ care-giving behaviour is said to affect infants’ developmental outcomes, which in turn affect mothers’ behavioural interactions (Sameroff & MacKenzie, 2003). The authors of the ISSI viewed sleep “as a reinforcer to both the infant and the parent, and as such, it increases the likelihood of the behaviour that precedes it” (France and Blampied, 1999, p. 242).

The ISSI not only focuses on maternal behaviour, but also views that behaviour within a larger context in which mother-infant interaction takes place. Based on the principles of the transactional model, the ISSI incorporates both infants’ (e.g., health
status) and parents’ characteristics (e.g., style of attachment) and the interactions between these variables within the development of the infant sleep self-initiation process.

Even though children significantly contribute to parent-child interactions, infants depend on the quality and structure of their parents’ behaviour because these behaviours represent the basis on which they process the information they receive and exchange (Keller, Lohaus, Volker, Cappenberg, & Chasiotis, 1999). For example, Anders (1994) found that infants at four months of age who have developed the ability to soothe themselves after nighttime arousals had more sensitive mothers who showed consistency in their responses to their babies’ demands at bedtime and during the night. The ISSI conceptualization of infants’ sleep self-initiation skills situates the appropriateness of mothers’ behaviour as an aspect of interaction with infants who have either high or low constitutional vulnerability regarding the development of such skills.

According to France, Blampied, and Henderson (2003), each settling or awakening can be seen as a learning opportunity, where the mother has a chance to teach the infant sleep self-initiation through their interactions. The ISSI model links the absence of sleep self-initiation to settling difficulties and nighttime awakening and signaling.

Infants learn through reinforcement and stimulus control. Viewed from the ISSI model, maternal behaviour, in the form of appropriate sleep cues and associations, can enhance infants’ sleep self-initiation. Sleeping and settled infants are reinforced for their silence, and mothers’ behaviour is reinforced for instituting appropriate sleep cues.

A large body of evidence indicates that appropriate sleep cues include regular bedtimes, consistent sleep cues, non-stimulating bedtime routines, and the association of
sleep onset with a cot or crib (American Academy of Sleep Medicine [AASM], 2001; France & Blampied, 1999; Mindell & Owens, 2003a; Morrell, 1999; Morrell & Cortina-Borja, 2002).

For the sleep-disturbed infant, the ISSI model proposes a coercion trap model (see Figure 3.1), where disturbed sleep reinforces the infants’ intensive crying and the parents’ intensive involvement. Within the coercion trap conceptualization, the dysfunctional bi-directional interaction between infants and their mothers is exemplified. A sleep-disturbed infant acts to avoid distress from falling asleep alone by signaling (crying), and the parents act to avoid the infant’s distress behaviour (crying) by carrying out intense parenting (France & Blampied, 1999; France, Blampied, & Henderson, 2003). Infants’ nighttime awakening and crying is reinforced by their mothers’ intense parenting, because the mothers continue the intense parenting in response to the nighttime waking and crying. As a result, infants’ sleep initiations are continually associated with parental involvement or active physical comforting such as prolonged rocking, feeding, and co-sleeping, which are considered to be negative sleep associations (Morrell & Cortina-Borja, 2002).

Sleep-disturbed infants who have complete arousals during the night with crying, and who receive appropriate maternal responses, are able to develop sleep self-initiation skills. The appropriate maternal responses include “regular time cues”, “a simple and non-stimulating bedtime routine”, “a quiet time to allow sleep onset to occur”, and the “association of sleep onset with the cot” (France & Blampied, 1999, p. 270). When mothers do not act to reinforce their infants’ signaling, by avoiding intense involvement, their infants are, instead reinforced to engage in self-soothing behaviour.
Figure 3.1  Infant Sleep Self-Initiation (ISSI) Model (adapted from France and Blampied (1999))
By implementing consistent and long-term reduction in maternal reinforcement, the infant is able to develop sleep self-initiation upon nighttime awakening and resume sleep without signaling.

With reference to the transactional model of communication development, in which infants’ developmental outcomes depend on the nature of their interactions with their environment (Sameroff & MacKenzie, 2003), the ISSI model describes how inconsistent parental interactions with their infants hinder sleep self-initiation. Inconsistent maternal responses to infants’ nighttime waking and signaling, by irregular institution of appropriate sleep cues in the form of short-term reduced parental involvement, serve to intensify infants’ distress behaviour (e.g., crying). Inconsistent responses are intense reinforcers that are likely to result in more inappropriate parental behaviour, such as intense involvement (inappropriate sleep cues), which ultimately strengthen the coercion trap (France & Blampied, 1999; France et al., 2003). Parental irregular and inconsistent sleep cues are echoed through infants’ lack of sleep self-initiation. These approaches are not successful in resolving problematic nighttime awakening. Furthermore, as a result of the coercion trap, sleeping patterns can be difficult to change (France et al., 2003). The ISSI links the variation in maternal bedtime interactions, in part, to insecure adult attachment, in particular, an anxious style of attachment.

### 3.1.2 Mothers with an Anxious Style of Attachment

Associations between the quality of their maternal relationships and children’s health outcomes emphasize the importance of exploring a possible link between
premature infants’ nighttime awakening and sleep problems and mothers’ styles of attachment, such as having an anxious style. An anxious style of attachment is described as having emotional lability, wherein the mothers exhibit both a positive and a negative affect toward the same thing (Magai, Hunziker, Mesias, & Culver, 2000; Weingardt, 2000). Mothers with this style of attachment display variable responses at different times, including overstimulation and withdrawal or avoidance (Bolen & Lamb, 2004; Magai et al., 2000). Thus, anxiously attached mothers may be intensively or actively involved with their infants’ at bedtime and upon their infants’ signaled nighttime awakenings, at some times, and may respond differently by withholding their involvement, at other times.

The ISSI model offers a new perspective for studying preterm infants’ sleep problems. In this research, the ISSI formed the basis for development of the theoretical model of premature infants’ sleep self-initiation (PISSI) (see Figure 3.2). The PISSI incorporates factors including the mothers’ marital status, whether they have an anxious style of attachment, their behaviour when settling their infants to sleep, their happiness and overall family functioning, and the infants’ birth order and health.
3.2 Summary

Based on the principles of attachment theory, an individual’s internal working model of self and others – attachment - influences how the person feels and thinks about distressing experiences (Bowlby, 1973). Maternal attachment not only creates a social tie with the infant, but it is also creates the structure for the care-giving system. Maternal care-giving behaviours, such as bedtime interactions, are an outgrowth of mothers’ attachments with their infants. Therefore, different attachment styles, such as an anxious style of attachment, may contribute to alterations in the mother-infant interactions, and subsequently alterations in infants’ outcomes, including dysregulation in sleep.

France and Blampied’s (1999) ISSI model links mothers with anxious styles of attachment to an inappropriate overly stimulating mothers’ behaviour at bedtime and to resettle their infants to sleep. Thus, inappropriate sleeping cues hinder the infants’ development of self-regulation. If infants fail to develop sleep self-initiation skills, their
sleep patterns can be affected, which may have long term effects on brain development and learning. Within this conceptualization, preterm infant-signaled nighttime awakening is linked to infants’ failures to develop sleep self-initiation as a function of their mothers’ inappropriate interaction at bedtime.

Enlightened by France and Blampied’s (1999) conceptualization of infants’ nighttime awakening, the current study examined how variations in mother-infant bedtime interactions and in particular intense involvement and having an anxious style of attachment, are related to premature infants’ nighttime awakenings and sleep problems.
4  Methods

This chapter begins with a description of the research design of the study then proceeds with a presentation of the research questions. The majority of the chapter provides a comprehensive description of the survey questionnaire employed, which includes a discussion of the conceptual and operational definitions of the study variables, as well as the procedures used to collect and analyze the data.

4.1 Research Design

This was a cross-sectional study that used self-reported surveys to collect information from mothers of premature infants. Specific study aims were to examine the relationships between mothers having an anxious style of attachment, their bedtime behaviour to settle their infants to sleep (the explanatory variables), and premature infants’ nighttime awakening (measured by the frequency and duration of nighttime awakening per night), and maternal perceptions of their premature infant’s sleep as a problem. We took into account other possible confounding variables that could influence infants’ sleep, including the mothers’ marital status, maternal happiness, family functioning, the infants’ birth order and health status, and other demographics. The population of interest was mothers who had preterm infants with a corrected age of approximately five to six months.

4.2 Research Questions

This study had three research questions:
(a) Is maternal bedtime behaviour used to settle infants to sleep associated with mothers’ reports of sleep problems in their infants born prematurely at five to six months of corrected age?

(b) Is there an association between mothers’ bedtime behaviour used to settle their infants to sleep and the frequency of the nighttime awakenings and duration of nighttime awakenings of premature infants at five to six months of corrected age?

(c) Is there an association between the extent to which mothers display an anxious style of attachment and the frequency of the nighttime awakenings and duration of nighttime awakenings of premature infants at five to six months of corrected age, when maternal bedtime behaviour (in particular the use of active physical comforting strategies) to settle infants to sleep, family functioning, maternal happiness, maternal marital status, infant birth order, and infants’ health problems are statistically controlled?

4.3 Study Measures and Instruments

This section describes how the variables of interest were conceptualized and operationalized in this study. The section begins with the explanatory variables followed by the outcome variables.

4.3.1 Factors Related to the Mother

This section presents an overview of the conceptual and operational definitions of the explanatory variables: mothers’ bedtime behaviour to settle their infants to sleep and their attachment style.
4.3.1.1 Maternal Bedtime Behaviour to Settle Infants

A large body of literature (Anders, 1994; Keener, Zeanah, & Anders, 1988; Mindell, Meltzer, Carskadon, & Chervin, 2009; Morrell, 1999) has postulated the importance of mother-infant interaction at bedtime in infants’ sleep regulation. Thus the nature of the behaviour that an infant’s mother brings to this interaction, to settle her infant for sleep, is central to the exploration of premature infants’ nighttime sleep and sleep problems. Theoretically, the more mothers are involved at bedtime, the more difficulty their infants will have developing sleep self-initiation (France & Blampied, 1999).

4.3.1.1.1 Conceptual Definition

Conceptually, infants’ sleep self-initiation is viewed as a function of autonomy or independence, which is affected by the bedtime behaviour used to settle them to sleep. Morrell and Cortina-Borja (2002) suggested that appropriate parental strategies such as offering the infant a special toy, cloth, or music tape, provides positive sleep associations and reinforces infants’ abilities to develop sleep self-initiation, thereby enabling the infant to develop self-soothing and to return to sleep upon nighttime awakening. Conversely, mothers’ over stimulating/ intense involvement at bedtime, as exemplified by using active physical comforting strategies, such as carrying the infant and settling on the sofa or in the parent’s bed, considered inappropriate strategies, were found to contribute to infants’ nighttime awakening (Morrell & Cortina-Borja, 2002). Hence, intense physical involvement of mothers in infants’ sleep initiation may foster...
dependency and inability to initiate or return to sleep independently, resulting in nighttime awakening and signaling by crying.

For the purpose of this study, mothers’ behaviour used to settle their infants at bedtime were measured using the Parental Interactive Bedtime Behaviour Scale (Morrell & Cortina-Borja, 2002). Specifically, maternal over stimulating/intense involvement as measured by active physical comforting strategies, was examined to determine the extent to which it contributed to the frequency and duration of infants’ nighttime awakening and sleep problems.

4.3.1.1.2 Operational Definition: Parental Interactive Bedtime Behaviour Scale

The Parental Interactive Bedtime Behaviour Scale (PIBBS) (Morrell & Cortina-Borja, 2002) (see Table 4.1) is a 17-item questionnaire that identifies parental sleep cues and contingent responses for infants’ behaviour at bedtime ranging from leaving infants to sleep on their own to “active physical comforting”. The measure consists of five subscales: “active physical comforting”, “encourage autonomy”, “settle by movement”, “passive physical comforting”, and “social comforting”.
### Table 4.1  Parental Interactive Bedtime Behaviour Scale

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Active physical comforting</td>
<td>1. Stroke part of child or pat.</td>
</tr>
<tr>
<td></td>
<td>2. Cuddling or rocking in arms.</td>
</tr>
<tr>
<td></td>
<td>3. Carrying around house in arms.</td>
</tr>
<tr>
<td></td>
<td>4. Give a feed/drink.</td>
</tr>
<tr>
<td></td>
<td>5. Settle on sofa with parent.</td>
</tr>
<tr>
<td></td>
<td>6. Settle in parent’s bed</td>
</tr>
<tr>
<td>(2) Encourage autonomy</td>
<td>1. Music tape or musical toy.</td>
</tr>
<tr>
<td></td>
<td>2. Offer a special toy/cloth.</td>
</tr>
<tr>
<td></td>
<td>3. Leave to cry.</td>
</tr>
<tr>
<td>(3) Settle by movement</td>
<td>1. Walks in pram or buggy.</td>
</tr>
<tr>
<td></td>
<td>2. Car rides.</td>
</tr>
<tr>
<td>(4) Passive physical comforting</td>
<td>1. Stand near cot without picking baby up.</td>
</tr>
<tr>
<td></td>
<td>2. Lie with child next to their cot.</td>
</tr>
<tr>
<td>(5) Social comforting</td>
<td>1. Talking softly to child.</td>
</tr>
<tr>
<td></td>
<td>2. Singing a lullaby.</td>
</tr>
<tr>
<td></td>
<td>3. Reading a story to child.</td>
</tr>
<tr>
<td></td>
<td>4. Playing with child.</td>
</tr>
</tbody>
</table>


The responses to each of these items were rated on a 5-point scale ranging from 0 to 4 (0 = never) and (4 = very often), where a higher score indicated more of the behaviour. A percentage score of each approach was computed separately. Strategies for obtaining subscale percentage scores are outlined in Table 4.2.

For this study, scores on the five subscales were used to explore how the comforting measures operated in this sample. The “active physical comforting” subscale scores were used as an explanatory variable to predict the premature infants’ nighttime awakenings and to differentiate between infants with sleep problems and those without.
Morrell and Cortina-Borja (2002) found that the “active physical comforting” items, such as settling in the parent’s bed were significantly correlated with infants’ sleeping problems while settling strategies that “encourage autonomy” were negatively associated with infants’ sleeping problems.

Table 4.2  Strategy to Obtain Subscale Percentage Scores for the Parental Interactive Bedtime Behaviour Scale

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Sub-scale Score</th>
<th>% Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Active physical comforting</td>
<td>Subscale total/24*100</td>
<td>A</td>
</tr>
<tr>
<td>(2) Encourage autonomy</td>
<td>Subscale total/12*100</td>
<td>B</td>
</tr>
<tr>
<td>(3) Settle by movement</td>
<td>Subscale total/8*100</td>
<td>C</td>
</tr>
<tr>
<td>(4) Passive physical comforting</td>
<td>Subscale total/8*100</td>
<td>D</td>
</tr>
<tr>
<td>(5) Social comforting</td>
<td>Subscale total/16*100</td>
<td>E</td>
</tr>
</tbody>
</table>


The psychometric properties for the PIBBS have been investigated and found to be satisfactory. Morrell and Cortina-Borja (2002) reported that the internal consistency reliability of the PIBBS subscales, using Cronbach’s alpha, ranged from .63-.72, and that they can reliably discriminate between groups of infants with and without sleep problems. The sleep problem group, identified by the PIBBS, had scores that were moderately correlated (r = .63) with scores calculated according to Richman’s (1981) criteria for sleep problems (Richman’s Sleep Diary and Composite Score) and there was a strong correlation (r = .72) between the two scales for the group of children without
sleep problems (Morrell & Cortina-Borja, 2002). This tool including all its subscales was selected for use in this study to measure maternal bedtime behaviour. The intense physical involvement of mothers in their infants’ sleep preparation is hypothesized to enhance their dependency in initiating sleep, which leads to nighttime awakening and signaling (Morrell & Cortina-Borja, 2002). Therefore, the “active physical comforting” (APC) subscale was selected to represent the intense and inappropriate strategies used by mothers to settle their infants to sleep.

4.3.1.2 Mothers with an Anxious Attachment Style

Maternal care-giving behaviour is viewed as an outgrowth of the mothers’ attachment to their infants (Berman & Sperling, 1994). Thus, examining mothers’ bedtime behaviour, from an attachment perspective, would enrich the exploration of premature infants’ nighttime awakening.

4.3.1.2.1 Conceptual Definition

The basic tenet of Bowlby’s attachment theory is that infants need to establish ties with a primary caregiver so that healthy social and emotional development occurs (Bowlby, 1977). The attachment has both psychoanalytical and evolutionary components concerning emotional connectedness between humans. Bowlby believed that early attachment experiences in childhood have an influence on later social and emotional development in life. In addition, he believed that attachment has an evolutionary adaptive component that is necessary for survival, in which an infant seeks proximity to an attachment figure in stressful situations.
According to Bowlby (1977), attachment behaviour requires a “schema” or “internal working model” of the self and of others to be activated. Based on a notion of internal working models, Bowlby described secure and insecure attachment styles. Although, he formulated the attachment theory for clinical use, Bowlby’s conceptualization of the affectional bonds between humans contributed to the field of developmental psychology. The concept has been used in the development of childcare policies to promote the early attachment relationships in children (Berlin, Zeanah, & Lieberman, 2008).

The conceptualization of attachment as a trait is one used most often in adult attachment definitions (Bretherton, 1985; Feeney & Ryan, 1994; Hazan & Shaver, 1987; Lapsly & Edgerton, 2002; McCarthy & Taylor, 1999). An attachment trait or style refers to a particular internal working model that guides an individual’s behavioural responses to emotional experiences (Berman & Sperling, 1994). The number of attachment traits or styles in adults is yet to be determined, although several theorists have identified one secure style and many insecure styles (Bartholomew, 1990; Hazan & Shaver, 1987; Feeney, Noller, & Hanrahan, 1994). According to Hazan and Shaver (1987), insecure attachment can include anxious and avoidant styles, although for Bartholomew, it includes preoccupied, dismissing, and fearful elements.

Feeney et al. (1994) adopted the three styles of adult attachment formulated by Hazan and Shaver (1987), which were later expanded to include one secure attachment style (confident) and four insecure styles of attachment. The secure style is conceptualized as having confidence in one’s self and others. The anxious style pertains to an attitude of one’s self that features preoccupation with relationships and consistent
need for approval from others. In so doing, Feeney et al. (1994) distinguished the anxious attachment style into two styles: “need for approval” and “preoccupied with relationships.”

The different attachment styles exhibited by mothers may result in different bedtime settling behaviour with their infants, and with the potential of affecting their premature infants’ sleep. For example, an anxious style of attachment is associated with emotional lability because the individual experiences simultaneous positive and negative affect toward a person, object, or behaviour and, as a result, experiences internal conflict (Weingardt, 2000). Anxiety in affect or cognition results in anxious behaviour, which includes overlapping approach-avoidance tendencies and patterns (Bolen & Lamb, 2004). Mothers exhibiting an anxious style of attachment might be more likely to be more involved in their infants’ bedtime preparation and might employ “active physical comforting” strategies (e.g., carrying in arms and rocking) to settle their infants at sometimes. Such behaviour may have adverse consequences for their infants’ sleep self-initiation and, therefore, might be associated with more frequent nighttime awakenings and signaling.

For this study, the Attachment Style Questionnaire (ASQ) developed by Feeney et al. (1994) was used to assess the extent to which mothers had an anxious style of attachment.

4.3.1.2.2 Operational Definition: The Attachment Style Questionnaire

The Attachment Style Questionnaire (ASQ), developed by Feeney et al. (1994), consists of 40 items, with responses rated in a Likert-type format ranging from 1 to 6,
where 1 = totally disagree and 6 = totally agree. The ASQ can delineate five different attachment styles: “confidence,” “discomfort with closeness,” “need for approval,” “preoccupation with relationships,” and “relationships as secondary.” The “confidence” style represents a secure style of attachment, while the “preoccupation with relationships” and “need for approval” styles represent an anxious style of attachment. Finally the “discomfort with closeness” and “relationships as secondary” styles represent an avoidance style of attachment (Feeney et al., 1994).

I directly asked Judith Feeney whether I could combine the scores from the “preoccupation with relationships” and “need for approval” scales because they represent an anxious style of attachment, Dr. Feeney (personal communication, February 1, 2009) reported that the results of cluster and factor analysis suggested that 13 items of the ASQ represented an anxious style of attachment; the items are listed in Table 4.3. Because some of the items from the anxious subscale overlapped with items from the other subscales, data were collected with all five ASQ subscales. Only the 13 items that delineated an anxious style attachment were used for the analytic purposes set out here.

Evidence of the internal consistency reliability of the Anxious Style of Attachment Scale has been provided in the literature. In a study of coping strategies in the transition to parenthood, Alexander, Feeney, Hohaus, and Noller (2001) reported an alpha coefficient of .86 for 92 new mothers studied six weeks after they had given birth. In addition, Feeney (2003) reported that the anxious subscale had an alpha coefficient of .86 for both men and women in a study of 76 couples and their attachment and adjustment to new parenthood. Using the anxious subscale of the ASQ, Alexander et al.
(2001) reported that having an anxious style of attachment was predictive of mothers’ emotion-focused coping strategies.

Table 4.3 Anxious Style of Attachment Scale

<table>
<thead>
<tr>
<th>Anxious Style of Attachment Scale Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. It’s important to me that others like me.</td>
</tr>
<tr>
<td>2. I find it hard to make a decision unless I know what other people think.</td>
</tr>
<tr>
<td>3. Sometimes I think I am no good at all.</td>
</tr>
<tr>
<td>4. I find that others are reluctant to get as close as I would like.</td>
</tr>
<tr>
<td>5. I worry that others won’t care about me as much as I care about them.</td>
</tr>
<tr>
<td>6. I worry that I won’t measure up to other people.</td>
</tr>
<tr>
<td>7. I wonder why people would want to be involved with me.</td>
</tr>
<tr>
<td>8. I worry a lot about my relationships.</td>
</tr>
<tr>
<td>9. I wonder how I would cope without someone to love me.</td>
</tr>
<tr>
<td>10. I feel confident about relating to others (R).</td>
</tr>
<tr>
<td>11. I often feel left out or alone.</td>
</tr>
<tr>
<td>12. I often worry that I do not really fit in with other people.</td>
</tr>
<tr>
<td>13. I am confident that other people will like and respect me (R).</td>
</tr>
</tbody>
</table>

*Note.* The items were obtained from J. Feeney, personal communication, February 1, 2009. Items marked (R) were reverse scored.

Anxiously-attached mothers were found to be highly aware of their emotional distress and focused on managing the distress when faced with challenges, rather than activating problem-solving coping strategies. In a study of 76 couples’ adjustment to new parenthood, mothers’ dissatisfaction with their partners’ efforts in caring for their infant was predicted by the woman having an anxious style of attachment (Feeney, 2003). These findings contribute to the evidentiary base for claims made about the validity of the scale. The anxious subscale of the ASQ was used to measure the extent to which mothers display anxious style of attachment, an explanatory variable in this study. For further
discussion about the reliability and validity of the five subscales of the ASQ, see Appendix F.

4.3.1.3 Family Functioning

It is well documented that alterations in family functioning are linked to alterations in parenting behaviour, parents’ views of their infants, and ultimately, the parent-infant relationship (Bettes, 1988; Sokolowski, Hans, Bernstein, & Cox, 2007; Thunström, 1999). Consequently, it is important to assess family functioning as a variable that may affect premature infants’ nighttime awakening and signaling.

4.3.1.3.1 Conceptual Definition

The family environment, in which the parent-infant system functions, influences both parental and infant behaviour and ultimately affects a child’s developmental outcomes (Adam, Snell, & Pendry, 2007; Caldera & Lindsey, 2006; Thunström, 1999). No single definition is available for the “family”, especially because any definition would be culturally, traditionally, and ideologically sensitive. The definition of family as a “social unit”, based on its structure and function, seems defensible (Byles, Byrne, Boyle, & Offord, 1988; Taylor, 2001). The family can be viewed as “a system or unit of persons-in-relation, with strong social bonds and commitment and attachment; the central purpose of the family is to create, maintain, and promote the social, mental, physical, and emotional development of each and all of its members” (Taylor, 2001, p. 7). The structure and organization of the family and patterns of transactions among family members contribute to the behaviour of its members (Byles et al., 1988). Conceptually,
dimensions of family functioning can include: problem-solving, communications, roles, affective responsiveness, affective involvement, and behaviour control (Byles et al., 1988). For this study, the McMaster Family Assessment Device (FAD): General Function developed by Epstein, Baldwin and Bishop (1983) was used to measure healthy and unhealthy family functioning.

4.3.1.3.2 **Operational Definition: McMaster Family Assessment Device: General Function**

The McMaster Model of Family Functioning provides the conceptual basis for the McMaster Family Assessment Device (FAD) (Epstein, Baldwin, & Bishop, 1983). This model includes six dimensions of family functioning: problem-solving, communications, roles, affective responsiveness, behaviour control, and affective involvement. The McMaster Family Assessment Device (FAD) consists of seven subscales, six of which measure the above mentioned dimensions of family functioning and the seventh subscale assesses the general functioning (GF) of a family. Although the FAD enables a comprehensive assessment of family functioning, the general function subscale allows for an overall assessment of a family’s functioning. According to Byles et al. (1988), the FAD and FAD-GF scales are highly correlated. Therefore, the General Function scale was included in this study because it is accurate and brief.

Generally, the GF provides information about perceptions of “how the family unit works together on essential tasks” (Byles et al., 1988, p. 103). Unhealthy functioning of a family, as measured by the GF, has been found to be significantly associated with variables such as parental deviance, alcohol abuse, emotional disorders of parents, marital disharmony, parental separation, and spousal abuse.
The GF consists of 12 items measuring overall healthy or unhealthy functioning (See Table 4.4). The 12 items have response categories of “strongly agree,” “agree,” “disagree,” and “strongly disagree;” six items describe healthy functioning and six items describe unhealthy (pathological) functioning. A higher total score on the GF is indicative of greater family pathology. Byles et al. (1988) reported that mean scores above 2.17 on the GF scale are considered indicative of pathological family functioning.

The internal consistency reliability of the GF has been found to be satisfactory in community samples. Byles et al. (1988) and Georgiades, Boyle, Jenkins, Sanford, and Lipman (2008) reported Cronbach's alpha values of .86 and .89, respectively. In addition, the reliability of the GF has been further supported through a psychometric study conducted by Kabacoff, Miller, Bishop, Epstein, and Keitner (1990) in which Cronbach’s alphas for nonclinical (community; n = 296), clinical (private psychiatric hospital; n = 439) and medical (outpatient clinics; n = 298) samples were found to range from .83-.86. Kabacoff et al. (1990) recommended using the GF as a single index to represent overall family functioning. They reported high correlations between the GF and the first principal component of the remaining 48 items, which provides evidence of the GF’s reliability and validity.
### Table 4.4  McMaster Family Assessment Device (FAD): General Function

<table>
<thead>
<tr>
<th>Family Assessment Device – General Functioning Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Planning family activities is difficult because we misunderstand each other.</td>
</tr>
<tr>
<td>2. In times of crisis we can turn to each other for support.</td>
</tr>
<tr>
<td>3. We cannot talk to each other about sadness we feel.</td>
</tr>
<tr>
<td>4. Individuals (in the family) are accepted for what they are.</td>
</tr>
<tr>
<td>5. We avoid discussing our fears and concerns.</td>
</tr>
<tr>
<td>6. We express feelings to each other.</td>
</tr>
<tr>
<td>7. There are lots of bad feelings in our family.</td>
</tr>
<tr>
<td>8. We feel accepted for what we are.</td>
</tr>
<tr>
<td>9. Making decisions is a problem in our family.</td>
</tr>
<tr>
<td>10. We are able to make decisions about how to solve problems.</td>
</tr>
<tr>
<td>11. We don’t get on well together.</td>
</tr>
<tr>
<td>12. We confide in each other.</td>
</tr>
</tbody>
</table>


#### 4.3.1.4  Mothers’ Mental Health: Maternal Happiness

Findings of a link between maternal postpartum mental health and infants’ sleep problems (Hall, Clauson, Carty, Janssen, & Saunders, 2006; Hiscock & Wake, 2002) stress the importance of including a measure of maternal happiness in explorations of premature infants’ nighttime awakening and signaling and mothers’ perceptions of sleep problems in their infants.

#### 4.3.1.4.1  Conceptual Definition

According to the National Institute of Mental Health (NIMH, 2008), people’s mental health affects their families, relationships, and physical health. A person’s
extreme inappropriate or limited range of feelings indicate mental disturbance (American Psychology Association, 1994). For the present study, mental health is defined as a person’s ability to enjoy life (happiness) and maintain socially balanced relationships that avert isolation or loneliness, which was measured using items from Canada’s Health Promotion Survey (Stephens & Graham, 1993).

4.3.1.4.2 Operational Definition: Happiness Scale

Overall maternal happiness (MH) was assessed using four items that were taken from Canada’s Health Promotion Survey (Stephens & Graham, 1993): feelings of being “cheerful and light hearted,” “loved and wanted,” “downhearted and blue,” and “lonely.” The items are scaled from 1 to 4 were summed and averaged, and higher scores indicated more happiness (See Table 4.5). The composite scale of these four items has demonstrated acceptable internal consistency reliability, in which Cronbach's alpha was reported to be .76 for 251 women, six months after delivery of an infant (Johnson, Ratner, Bottorff, Hall, & Dahinten, 2000). Using factor analysis, Johnson et al. (2000) reported that these four items measured one dimension in which the smallest loading of an item on the factor was .45.
Table 4.5  Happiness Scale: Canada's Health Promotion Survey

<table>
<thead>
<tr>
<th>Items of the Happiness Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Describe how often you experience feeling cheerful and light hearted.</td>
</tr>
<tr>
<td>2. Describe how often you experience feeling loved and wanted.</td>
</tr>
<tr>
<td>3. Describe how often you experience feeling downhearted and blue (R).</td>
</tr>
<tr>
<td>4. Describe how often you experience feeling lonely (R).</td>
</tr>
</tbody>
</table>


### 4.3.2 Infants’ Nighttime Awakening and Sleep Problems

Infants’ nighttime awakening with signaling (crying) and mothers’ perceptions of their infants’ sleep problems were the outcome variables for this study. These variables were conceptually defined in light of France and Blampied’s (1999) theory of infants’ sleep self-initiation. This section provides an overview of the conceptual and operational definitions of infants’ nighttime awakening and signaling, and infants’ sleep problems.

#### 4.3.2.1 Conceptual Definition

France and Blampied’s (1999) theoretical framework was used to explore infants’ sleep, based on their ability to self-initiate sleep. Because nighttime awakening is normal for infants, concerns arise when infants are unable to independently fall back to sleep after nighttime arousal. Infants who are unable to self-soothe, because they lack sleep self-initiation skills, signal (cry) for their parents to help them to re-initiate sleep, which may be problematic for some parents (Frances & Blampied, 1999). These sleep problems, in the absence of underlying medical conditions that account for nighttime awakening, are classified as dyssomnias because they are related to difficulties with initiating sleep.
after nighttime arousal without the presence of certain conditions (American Academy of Sleep Medicine, 2001). According to France and Blampied (1999), mothers’ sleep cues can facilitate infants’ development of sleep self-initiation skills. Conversely, the presence of maternal sleep cues that can be considered negative sleep associations, such as intense involvement at bedtime, might favor nighttime awakening and signaling by infants as they fail to self-initiate sleep upon arousal. The Brief Infant Sleep Questionnaire developed by Sadeh (2004) was used to assess the infants’ sleep.

4.3.2.2 Operational Definition: Brief Infant Sleep Questionnaire

The Brief Infant Sleep Questionnaire (BISQ) was employed to provide information about infants’ nighttime awakening, sleep problems and sleep context. Sadeh (2004) designed the instrument to be applicable to infants from 6-30 months of age. The BISQ is a 10-item questionnaire that assesses infants’ sleep routines, including nocturnal and daytime sleep duration, the number or frequency of nighttime awakenings (FNW), the duration of wakefulness at night (DNW), the time it takes to settle, the method of falling asleep, and the location of sleep during the past week. It also captures the reporting parent’s perceptions of any sleep problems the infant may have.

Evidence has been provided of the BISQ’s reliability and validity. Test-retest reliability has been reported to range between .82-.95 (Sadeh, 2004). Sadeh also reported correlations between the BISQ and other sleep measures, which provide evidence of the concurrent validity of the BISQ. Specifically, two measures of the BISQ (nocturnal sleep duration and number of nighttime awakening) were significantly correlated with: (a)
actigraphic sleep measures of sleep duration and wakes and (b) daily logs of infants’ sleep kept by their parents.

The BISQ has been found to be a sensitive measure in assessing children’s sleep consolidation among different age groups ranging from 0 to 36 months (Sadeh, Mindell, Luedtke, & Wiegand, 2009). The children’s sleep consolidation was based on the average number of nighttime awakenings, duration of nighttime awakenings, and longest continuous nighttime sleep episode. The number and duration of nighttime awakenings was found to decrease with age, while the longest nighttime sleep episode extended (Sadeh et al., 2009).

For the purpose of the present study, nighttime was defined as occurring one hour after the child’s bedtime until the start of the next day, and the frequency and duration of nighttime awakening were based on the mothers’ reports. Different perspectives about what constitutes problematic nighttime awakening are evident in the pediatric literature (see appendix A). Issues regarding maternal distress, the frequency and duration of nighttime awakening and co-sleeping are still controversial, and ultimately a unified criterion for problematic nighttime awakening is lacking. More detail regarding this issue was presented in the literature review (see Chapter 2). Guided by Frances and Blampied’s (1999) perspective that infants’ nighttime awakening is a result of infants’ inability to self-initiate sleep, I defined nighttime awakening as the incidence (frequency and duration) of infants’ nighttime arousal per night during a typical week. Infants’ nighttime awakening was measured as the average frequency and total duration of nighttime

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6 An actigraph is a small instrument that is worn on the wrist or ankle to measure changes in body movement. Actigraph produces a graphic record of rest/activity process. It is useful in recording sleep-wake cycles by measuring and recording accelerations, which are used to create an activity pattern.

7 The study cohort included children aged 0-2 months, 3-5 months, 6-8 months, 9-11 months, 12-17 months, 18-23 months, and 24-36 months, for a total of 5,006 of infants and toddlers (Sadeh et al., 2009).
awakening per night during a typical week reported by mothers on two separate items of the BISQ.

A second outcome measure was the mothers’ perceptions of their infants’ sleep, which was measured with a single item of the BISQ. This approach has been widely adopted by researchers in the field. The validity of mothers’ characterizations of their infants’ sleep problems was supported by a study conducted by Sadeh et al. (2009), in which they reported that observations such as greater numbers of nighttime awakenings, longer sleep latency (the amount of time that it takes to fall asleep), and relatively short nighttime sleep episodes increase the likelihood of mothers reporting that their infants have sleep problems.

4.4 The Role of Context

Relevant demographic data were collected to provide information about both the mothers and the infants enrolled in the study. The infants’ demographic information and other characteristics including birth weight and current weight, sex, birth order, type of birth, and type of current feeding were collected. Data about any health problems were collected, including gastric reflux, allergies, and other transient illnesses (e.g., cold, ear infection). Data regarding the mothers’ previous experience of older children with sleep problems were also collected. Several researchers have reported that cultural and lifestyle factors and infants’ sleeping arrangements (co-sleeping) are associated with sleep problems (Lozoff, Askew, & Wolf, 1996; Milan, Snow, & Belay, 2007; Moon & Omron, 2002; Ostfeld et al., 2006; Rona, Li, Gulliford, & Chinn, 1998; Willinger et al., 1998). Consequently, information was collected about the mothers’ age, educational attainment,
marital status, ethnicity,\(^8\) household income\(^9\), employment status, general health status, and history of sleep problems. Measures used to collect these characteristics are provided in Appendix B.

### 4.5 Summary of the Study Variables

In summary, there were two outcome variables evaluated in this study. Premature infants’ nighttime awakening was measured with: (a) the frequency of the infants’ nighttime awakening (FNW) and (b) the duration of nighttime awakening (DNW). The second outcome variable was the mothers’ perceptions of their infant having sleep problems (MPSP).

The primary explanatory variables included (a) the mother having an anxious style of attachment (MASA), as measured by a subscale of the ASQ and (b) the mother’s bedtime behaviour, particularly the use of “active physical comforting” (APC), as measured by the PIBBS. Control variables included: (a) family functioning (FF) as measured by the FAD-General Function, (b) maternal happiness (MH) as measured by four items from Canada’s Health Promotion Survey, (c) the infant’s health problems (IH), (d) the mother’s marital status (MS), and (e) the infant’s birth order (BO).

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\(^8\) Ethnicity was determined by asking the respondents to define their ethnic background with the question, “How would you define your ethnic background”? The response options where adapted from the classification used by Statistics Canada (2006a). These options included: Caucasian, Aboriginal/First Nations, Chinese, Japanese, Arab/West Asian, South Asian, South East Asian, Black, Latin American, Filipino, Korean, and other).

\(^9\) Categories for household income were adapted from Statistics Canada (2006a)
4.6 The Survey Questionnaire

To enhance the clarity and comprehensibility of the questionnaire, before launching the study, a pilot questionnaire was distributed to 10 mothers who had infants between the ages of 6-12 months. They completed the questionnaire and provided comments about the questions. The respondents were encouraged to provide suggestions to improve the clarity of the survey questionnaire. The pilot study revealed that the questions were generally clear and relevant to the topic.

4.7 Sample and Setting

Mothers of premature infants were recruited when their babies were approximately five to six months of age (corrected age).\textsuperscript{10} The sample represented mothers caring for their infants at home. The study inclusion and exclusion criteria were determined on the basis of the theoretical framework and relevant literature, and are provided in Table 4.6.

\textsuperscript{10} Age correction was obtained by subtracting the duration between expected birth date and actual birth date from the actual age.
Table 4.6  Study Inclusion and Exclusion Criteria

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inclusion Criteria</strong></td>
<td>Premature infants born between 26 and 36 ( \frac{6}{7} ) weeks of gestation have fewer physiological challenges in adapting to the extra-uterine environment than do premature infants born before 26 weeks of gestation. According to Statistics Canada (2002), the mortality rate for preterm babies born before 28 weeks gestational age has been observed to be 439.31 per 1,000 live births, and 11.76 per 1,000 live births for preterm babies born at 28-36 weeks gestational age. Lower gestational age at birth corresponds with higher risk of severe health problems, which necessitate hospitalization. Premature infants’ health challenges (i.e., neurological problems) and neonatal intensive care unit experience may affect infant growth and development. In addition to possible association with difficult in mother-preterm interactions (Feldman &amp; Eidelman, 2006), such as maternal-infant interactions at bedtime. Therefore, non-hospitalized preterm infants with no diagnosed health problems or congenital abnormalities and who had required minimal medical attention were eligible to be enrolled in this study</td>
</tr>
<tr>
<td>Criteria</td>
<td>Rationale</td>
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<td>----------------------------------</td>
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<tr>
<td>2. Boy or girl</td>
<td>Very few reports showed that male infants have more sleep problems (Van-Tassel, 1985) and more nighttime awakenings than do female infants (Anuntaseree et al., 2008), However, the literature generally reports no significant difference between male and female infants in terms of sleep problems (Richman, Douglas, Hunt, Lansdown, &amp; Levere, 1985).</td>
</tr>
<tr>
<td>3. Singleton or multiple birth</td>
<td>There have been no reports of differences between singleton and multiple births with regard to problematic nighttime waking. Multiple births would increase the demands on parents, which could aggravate their stress, ultimately affecting their interactions at bedtime, in comparison with parents with singleton babies. It is possible that one twin’s problematic night waking could interfere with the sleeping of the other twin. Although it might be argued that multiple births should not be included, their exclusion would limit the ability to enroll participants because of the high prevalence of multiple births among the premature population, which would also limit the generalizability of any research completed. For the purpose of this study, mothers were asked to describe only one of her twins when completing the survey questionnaire (she determined which infant to describe). This technique was used by Borghini et al. (2006).</td>
</tr>
<tr>
<td>4. Parents read and speak English.</td>
<td>To enable communication with the parents.</td>
</tr>
<tr>
<td>Criteria</td>
<td>Rationale</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Exclusion Criteria</strong></td>
<td>**Rationale</td>
</tr>
<tr>
<td>1. Medical diagnosis of congenital abnormalities or developmental delays.</td>
<td>Conditions including Down syndrome, galactosemia, hydrocephalus, hypothyroidism and mental retardation might be associated with restrictions in brain development which, in turn, could interfere with the sleep regulation process. Sleep problems in children with special needs are mostly more chronic and difficult to treat (Mindell and Owens, 2003a)</td>
</tr>
<tr>
<td>2. Medical diagnosis associated with high degrees of intraventricular hemorrhage and respiratory distress syndrome.</td>
<td>Grade 3 and 4 intraventricular hemorrhages (IVH) have a significant association with neuro-pathological consequences such as hydrocephaly. Broncho-pulmonary dysplasia (BPD) may interfere with the oxygen supply to the brain. IVH (Grades 3 and 4) and BPD are associated with higher risks of developing chronic problems that could significantly interfere with normal brain functioning. Brain injuries/malfunctioning may interfere with sleep-wake rhythm or respiration and increase the likelihood of sleep disturbances (Mindell and Owens, 2003a)</td>
</tr>
<tr>
<td>3. Behavioural intervention for sleep problems from health care providers.</td>
<td>These interventions are designed to alter parent-infant bedtime interactions to treat infants’ sleep problems, and this study is concerned with the nature of mother-infant interactions at bedtime.</td>
</tr>
<tr>
<td>4. Parents currently receiving therapy for mental health problems</td>
<td>Mental health problems might interfere with parent-infant interactions.</td>
</tr>
</tbody>
</table>


4.8 The Nature and Size of the Sample

A convenience sample was collected. Using non-probability sampling was appropriate in this situation because the purpose of the study was to explore premature infants’ nighttime awakening in the natural home setting. Because the study explored the associations between mothers’ styles of attachment and their behaviour to settle their infants to sleep, and premature infants’ nighttime awakening and sleep problems, the primary analyses employed were correlational techniques, specifically multiple linear regressions.

Estimation of appropriate sample size, for a study such as this, should be based on the number of independent variables included, the hypothesized magnitude of the relationship between the explanatory and outcome variables, and the alpha and beta values (Tabachnick & Fidell, 1996). In this case, the selected values of alpha and beta were .05 and .20, respectively, for two-tailed tests, and the magnitude of the relationship between the explanatory and outcome variables was assumed to be of medium size. According to Green (as cited in Tabachnick & Fidell, 1996), to test multiple correlations, the minimum required cases can be calculated using the equation:

**Equation 4.1 Sample Size for Multiple Correlations**

\[ N = 50 + 8 \times m, \]

where \( N \) is the number of cases and \( m \) is the number of explanatory variables. According to Green, to test individual predictors, the sample size should be at least \( 104 + m \). In the current study, there were seven explanatory variables (i.e., mother’s style of attachment
and mother’s settling behaviour at bedtime) and confounder variables (i.e., family functioning, maternal happiness, infant birth order, marital status, and infant’s health status). The \textit{a priori} estimated sample size for the study, thus, was $104 + 7 = 111$ participants. The requisite sample size obtained by this approach ($N = 111$) was very similar to the sample size calculation ($N = 103$) that was obtained with the use of the software package, G*Power 3.0.10 (Buchner, Erdfelder, & Faul, 1997). Figure 4.1 displays the G* Power software sample size calculation for regression with seven predictors, medium effect sizes, .05 alpha, and .80 power. Thus, a sample size between 103 and 111 was considered adequate to determine whether the relationships between the explanatory variables and outcome measures remained statistically significant after adjusting for potentially confounding factors.

**Figure 4.1** Sample Size Calculation for Linear Regression with Seven Predictors
4.9 Procedures

A description of the study procedures including the logistics of obtaining ethical approval from multiple sites, development of the survey tool, the recruitment strategy, and the data collection processes are presented.

4.9.1 Ethics

Ethical approval to conduct the study was obtained from the University of British Columbia Behavioural Research Ethics Board (see Appendix C), the Infant Development Program of British Columbia (see Appendix D), and the Vancouver Coastal Health Authority (see Appendix E). The UBC Access and Privacy Office was consulted with regard to the online survey because the questionnaire was administered in a paper format and via SurveyMonkey™, which is a web survey company located in the USA. Because the responses to the survey would be stored and accessible in the USA the UBC Access and Privacy Office raised concerns about the maintenance of privacy and recommended that a statement about online data storage and accessibility be added to the information letter provided to participants.

Participation in the present study was completely voluntary. On the first page of the questionnaire, the participants were provided with detailed information about the handling of data including how the data would be stored and the publication of the aggregate information. Emphasis was placed on the participants’ right to withdraw at anytime during the data collection process or to refrain from responding to any question in the survey without negative consequences. Information about the study, including the name of the organization carrying out the study, the names of all organizations that
provided financial support, and a brief description of the purposes of the study were presented in the introductory page of the survey questionnaire.

4.9.2 Recruitment

Recruitment for the study was conducted by advertising in a local newspaper (Vancouver Sun), the Craigslist website, and a variety of relevant websites at national and international levels. These websites including Fussybaby,11 Babyvibe,12 Sleep network, Canadian babies, Twins clubs, Canadian Multiple births, and the Infant Development Program (IDP) of British Columbia (BC). The IDP of BC provides services for about 2,500 children between the ages of 0 and 3 years, annually (10% of these children are preterm infants).

The ads on selected websites provided participants with a direct link to the online survey and complete contact information for those who wanted more information about the study or preferred to obtain a hard copy of the questionnaire by mail. Posters and flyers (see Appendix G, H) containing a brief description of the study, the inclusion criteria, the researcher’s contact information, and the website address for the online survey were placed in pediatricians’ private clinics, and in several Vancouver community health centers. These centers provide primary health care and prevention services for infants. Study posters were presented at baby shows in Vancouver, such as the Westcoast Moms’ Community Baby and Toddler Show. The study was also introduced by IDP workers to prospective participants along with flyers.

11 Fussybaby is a website devoted to helping parents deal with high-needs babies during the first year. Infant colic, excessive crying, and sleeping are among the major issues that the Fussybaby site provides information about to support parents.

12 Babyvibe is a free electronic newsletter that is delivered three times a week. This newsletter offers expert knowledge about different topics, including nutrition and pre- and postnatal fitness for mothers.
Participants’ confidentiality was maintained by assigning numbers to the mailed questionnaires, which were kept in a locked cabinet in a secure location, separately from the mothers’ identifying information. For the online survey, no identifiable information was required and all data were entered into a password-protected computer. In addition, all online data were downloaded from the SurveyMonkey™ server and stored securely by the researcher. Data were accessible only by the researcher and the research supervisors. Although no direct benefits were obtained as a consequence of participation in the study, the participants were entered into a draw for four gifts if they provided their contact information. The gifts (money orders) were worth $100 Canadian dollars each and sent to the participants as a token of appreciation for devoting their time to the study. For participants who completed the survey online, entering their e-mail addresses to be eligible for the gift draw was voluntary. The gifts were approved by the UBC Behavioural Research Ethics Board.

4.9.3 Study Survey

The survey began with the eligibility criteria (see Table 4.6). For infants who met most of the eligibility criteria but were too young to be enrolled in the study, their mothers were requested to contact the investigator so that they could be put on a wait list and contacted when their infants were 5-6 months corrected of age. The order of the items in both the paper-based and web-based versions of the questionnaire was the same. Each participant began the questionnaire with general information about their premature infants, followed by demographic information, the maternal happiness questions, the
BISQ, ASQ, and PIBBS, and the survey ended with the FAD-General Function Scale (see Appendix B).

4.9.4 Data Collection

The study employed both paper-based and online web-based surveys. Mothers who were interested in the study and preferred to have the paper-based survey contacted the researcher for a complete package including the introductory letter, questionnaire, and prepaid envelope. Mothers, who wished to complete the survey online, were free to choose the SurveyMonkey™ website. The potential feasibility of this approach for adult Canadians has been established by Statistics Canada. According to Statistics Canada (2006b), the Canadian Internet Use Survey in 2005 revealed that 68% of adult Canadians (over 18 years of age) have accessed the Internet. Using the online survey facilitated recruitment not only from Canada, but also from other English-speaking countries, including the United States of America, Australia, New Zealand, and England. In addition to the feasibility of the web-site survey, the approach has many other advantages over a paper-based survey. First, web-based surveys offer flexibility and convenience in completing questionnaires and promote speed in communicating with participants and in receiving their responses. Second, selected features of SurveyMonkey™ alerted participants to incomplete or missing data and mistakes in their responses to items. The potential reduction in errors has been supported by other research studies with regard to electronic-based surveys (Cobanoglu, Warde, & Moreo, 2001; Kiesler & Sproull, 1986). Furthermore, the anonymity attained by using an online survey facilitated responding to socially sensitive self-reported measures such as attachment style. Finally, it has been
found that the psychometric proprieties of web-based surveys are similar to those obtained by paper-based surveys (Meyerson & Tryon, 2003; Pettit, 2002).

Because the data were collected from many countries, and SurveyMonkey™ provided information about the source of the responses, in the form of the IP address, the origin of the survey was easily located. As well, a unique number was assigned for each participant. In addition, SurveyMonkey™ facilitated exporting the dataset directly into Microsoft Office Excel and SPSS files. This avoided the necessity to enter these data manually and eliminated any errors in transcribing the data.

4.10 Pre-analysis Data Management

Preparing the dataset for analysis included transferring the data from the SurveyMonkey™ server, via the website, into an SPSS file and then screening the entire dataset. These steps are fully described in the next section.

4.10.1 Transferring the Dataset

Only five of 105 (4.8%) questionnaires were completed with the paper format; the remaining 100 were accessed and completed online. All the paper-format surveys were coded and entered into the SPSS file by the researcher. The online survey responses were converted to an Excel spreadsheet then transferred into SPSS format. The online surveys were automatically assigned a unique identifier number for each participant. All the response items in the SPSS data file were matched with the online items to ensure the accuracy of the importing and merging process. All of the paper-format questionnaires were given unique identifiers when entering the data into the SPSS data file. In addition,
a codebook was created to correspond with items in the SPSS dataset and to describe the derived variables.

4.10.2 Screening the Data

The guidelines provided by Tabachnick and Fidell (1996) for screening data prior to analysis were used. The means of the variables were used to replace missing data prior to analysis in the case of any missing data. By using this conservative, the imputation of these missing data was not subject to guessing and the means of the distributions were not changed (Tabachnick & Fidell, 1996). On the other hand, the variances of the variables may have been marginally reduced, which would have reduced the correlations of the variable with other variables (Tabachnick & Fidell, 1996). Estimating the missing values was only used if more than 50% of the data for the particular case was available. In addition, to avoid excluding cases with missing demographic data from the analysis, the “exclude cases pair-wise” option was used. This option excluded cases with missing values only when the missing values were required for a particular analysis.

According to Cohen (1988), a correlation coefficient ranging between .10 and .29 is considered “small.” The contribution of such small correlations to the variance in multiple linear regressions would be trivial. Therefore, the decision was made to exclude variables, from the multivariate analysis, if they were correlated at less than .20 with the outcome variables.

Before the analysis, the SPSS data file was inspected for missing data or values outside the expected range by creating frequency reports for all the survey items. Very few data points were missing from the demographic section. There were no out of range
points in the study scales because this potential problem was avoided by the online questionnaire design. All scaled variables in the study had complete data.

### 4.10.3 Outlier Analysis

The criterion for considering outliers was designated as any value of a standardized residual greater than \( |2| \). Using SPSS 17, box plots of all the explanatory and outcome variables were examined. Box plots of the standardized residuals of both multiple linear regression analyses were also examined to detect any multivariate outliers. If outliers were detected, further examination was deemed necessary to assess the impact of the particularly cases on the regression analyses. To determine the impact of these cases, Cook’s distances were checked and any cases greater than 1 were deemed problematic (Tabachnick & Fidell, 1996). In addition, the leverage and Mahalanobis distance values were examined.

### 4.10.4 Distributions of the Variables

The significance of the skewness values of all the study scaled variables was examined to ascertain the symmetry of the distributions. When the value of skewness was more than 2 or less than -2, the skewness value was considered significant (Tabachnick & Fidell, 1996).

### 4.10.5 Tests of Multicollinearity

It was deemed necessary to evaluate the correlations among the explanatory variables to identify any multicollinearity (Tabachnick & Fidell, 1996). A bivariate
correlation of .90 or higher is typically indicative of multicollinearity (Tabachnick & Fidell, 1996). Additional collinearity diagnostics including tolerance and variance inflation factor (VIF) values of the explanatory variables were assessed. If the value of tolerance was less than .10 and the value of VIF was more than 10, multicollinearity was considered likely (Pallant, 2007).

4.10.6 The Reliability of the Study Instruments

The internal consistency reliability of the scales was calculated using Cronbach’s alpha. Ideally, the value of Cronbach’s alpha coefficient should be more than 0.70 to assure reliability (Pallant, 2007).

4.10.7 Testing of Inference Assumptions

1. Linearity assumptions were assessed by inspecting scatter plots for each explanatory variable with the outcome variables to determine that there was a straight line relationship, if any (Tabachnick & Fidell, 1996).

2. Independence: The data were visualized to detect violations of independence.

3. Normality: The normal probability plots (Normal Q-Q Plot) of the standardized residuals scores were inspected to determine that there were straight lines and thus normal distributions.

4. Homoscedasticity: To determine whether the homoscedasticity assumption had been violated, the bivariate scatter plots of the standardized residuals against the explanatory variables were examined.
4.11 Statistical Analysis

In this study, adjusted correlation coefficients were used to examine the relationships among the variables. Mann Whitney nonparametric statistics were used to explore the relationships between mothers’ bedtime strategies to settle their infants to sleep and the infants’ sleep problems.

Given that France and Blampied’s conceptualization of infant nighttime awakening guided the current exploration hierarchical regression analysis was appropriate to examine the relationships between mothers’ having an anxious style of attachment and their bedtime behaviour to settle their infants (as measured by active physical comforting), and the infants’ nighttime awakening (as measured by the number and duration of nighttime awakenings). France and Blampied’s model suggests that maternal behaviour to settle infants to sleep are more important than infants’ constitutional vulnerability. Therefore, the infants’ birth order (BO) infant health (IH) variables were entered in the first block of the regression model so that their effects were controlled. To control for potential confounding effects, the mothers’ reports of family functioning (FF), their marital status (MS), and maternal happiness (MH) were entered in the second block of the regression.

The mothers’ behaviour at bedtime, particularly “active physical comforting” (APC) strategies and the extent to which they had an anxious style of attachment (MASA), the variables of primary interest, were added to the model in the last two steps.

The hierarchical multiple regression analysis, conducted to answer Question 3, produced two separate models: the premature infants’ frequency of nighttime awakenings
(FNW) and the duration of nighttime awakenings (DNW). For the frequency of nighttime awakenings (FNW), the proposed regression formula was as follows:

\[
\text{FNW} = \beta_0 + [\beta_1(BO) + \beta_2(IH)] + [\beta_3(FF) + \beta_4(MS) + \beta_5(MH)] + \beta_6(APC) + \beta_7(MASA) + \text{error}
\]

The second regression model formula, for the duration of infants’ nighttime awakenings was as follows:

\[
\text{DNW} = \beta_0 + [\beta_1(BO) + \beta_2(IH)] + [\beta_3(FF) + \beta_4(MS) + \beta_5(MH)] + \beta_6(APC) + \beta_7(MASA) + \text{error}
\]

All statistical analyses were conducted using SPSS for Windows 17. To avoid overestimation of the true value of \( R^2 \) in the population, due to the small sample size, the adjusted \( R^2 \) was used to report the regression output (Tabachnick & Fidell, 2007). The adjusted \( R^2 \) indicates the amount of variance in the outcome variable, if the model had been derived from the population from which the sample had been taken (Tabachnick & Fidell, 2007).

4.12 Infants’ Weight (Standard Deviation (“Z”) Scores)

 Mothers of prematurely born infants show concerns about the future welfare of their infants (Jackson, 2003; Miles, Funk, & Kasper, 1992), and often report feeling worried and concerned about their preterm infants’ health and development six months after birth (Borghini et al., 2006; Holditch-Davis & Miles, 2000). Weight gain is one of the major growth parameters during infancy that concerns mothers. Preterm infants with poor weight gain may intensify their concerns and affect their perceptions of their infants’ sleep regulation. Hence, it was important to examine whether infants of relatively
low weight, compared with the general population of preterm infants, had more sleep problems, as reported by their mothers.

To study the infants’ weight, weight-for-age z-scores were required, which were obtained via the LMS parameters approach (Centers for Disease Control and Prevention; Growth Charts, 2000) provided by the Neonatal Follow-up Program at Children’s Hospital in Vancouver. The LMS approach summarizes the distribution of BMI by age and sex in terms of three curves: L (lambda), M (mu), and S (sigma), where L is the power in a Box-Cox transformation needed to transform the data to near normality, M is the median, and S is the standard deviation. These parameters are provided in tables for male and female infants corresponding to the corrected age in months. To obtain the weight-for-age z-scores, the following equation was used:

**Equation 4.2 Infant Weight-for-Age Z-scores via the LMS Approach**

\[ Z = \left( \frac{X}{M} \right)^L - \frac{1}{LS}, \]

where X refers to the infant’s current weight in kilograms. After generating the weight-for-age z-scores for the infants in the study, a \( t \)-test was used to investigate whether the z-scores for the infants with sleep problems were statistically different from the scores of infants without sleep problems.
5 Findings

The focus of this chapter is to present findings concerning study mothers’ attachment styles and bedtime behaviour used to settle their infants to sleep, and their infants’ nighttime awakenings and sleep problems. The first part of this chapter provides a description of the study sample and includes pre-analytic procedures, information about missing data, and characteristics of the premature infants and their mothers. In the second part of the chapter, findings from the univariate and bivariate analyses of the study variables are presented. These findings are followed by the results of non-parametric and hierarchical multiple linear regression analyses. The research questions that were addressed are:

(a) Is maternal bedtime behaviour used to settle infants to sleep associated with mothers’ reports of sleep problems in their infants born prematurely at five to six months of corrected age?

(b) Is there an association between mothers’ bedtime behaviour used to settle their infants to sleep and the frequency of the nighttime awakenings and duration of nighttime awakenings of premature infants at five to six months of corrected age?

(c) Is there an association between the extent to which mothers display an anxious style of attachment and the frequency of the nighttime awakenings and duration of nighttime awakenings of premature infants at five to six months of corrected age, when maternal bedtime behaviour (in particular the use of active physical comforting strategies) to settle infants to sleep, family functioning, maternal happiness, maternal marital status, infant birth order, and infants’ health problems are statistically controlled?
5.1  Sample

One hundred and five mother-preterm infant dyads met the inclusion criteria and voluntarily completed the study questionnaire. Tables 5.1 and 5.2 provide a summary of the characteristics of the maternal and infant study participants.

5.1.1 Demographic and Health Characteristics

As shown in Table 5.1, 61.0% of the infant sample were boys, 49.5% were delivered by Cesarean section, and 62.9% were first-born infants, (second-, third-, and fourth- or more born infants represented 24.8%, 9.5%, and 2.9% of the sample, respectively). The infants’ gestational age at birth ranged from 26 weeks plus 5 days (26\(\frac{5}{7}\) weeks) to 36 weeks plus 6 days (36\(\frac{6}{7}\) weeks). Based on mothers’ report of their infants’ birth weight, the majority of the infants (86.7%) had an appropriate birth weight for their gestational age.\(^{13}\) Upon entry to the study, the mean age of the infants was 5.5 months (SD = 0.5), they ranged from 5 to 6 months plus 28 days. Because only four infants were one of a set of twins, comparisons between twins and singletons were not possible. Finally, 19.0% of the infants were exclusively breastfed, 11.4% were bottle fed, and 2.9% were on solid food only at the time of data collection. The remainder of the infants received mixed feedings.

\(^{13}\) Babson and Benda’s (1976) growth graphs were used to assess the premature infants’ birth weight for gestational age.
Table 5.1  Demographic and Health Characteristics of the Infants

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>N</th>
<th>f</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>61.0</td>
<td>64</td>
</tr>
<tr>
<td>Type of Birth (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vaginal</td>
<td>41.0</td>
<td>43</td>
</tr>
<tr>
<td>Cesarean</td>
<td>49.5</td>
<td>52</td>
</tr>
<tr>
<td>Vacuum/Forceps</td>
<td>8.6</td>
<td>9</td>
</tr>
<tr>
<td>Gestational age (weeks) (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26.5 - 30.6</td>
<td>9.5</td>
<td>10</td>
</tr>
<tr>
<td>31.1 - 34.0</td>
<td>21.9</td>
<td>23</td>
</tr>
<tr>
<td>34.1 - 36.6</td>
<td>68.6</td>
<td>72</td>
</tr>
<tr>
<td>Infant Birth Weight in Kilograms (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.02 - 1.56</td>
<td>10.5</td>
<td>11</td>
</tr>
<tr>
<td>1.62 - 2.02</td>
<td>13.3</td>
<td>14</td>
</tr>
<tr>
<td>2.05 - 2.50</td>
<td>41.9</td>
<td>44</td>
</tr>
<tr>
<td>2.53 - 3.02</td>
<td>29.5</td>
<td>31</td>
</tr>
<tr>
<td>3.04 - 3.83</td>
<td>4.8</td>
<td>5</td>
</tr>
<tr>
<td>Birth Weight for Gestational age (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Appropriate for age</td>
<td>86.7</td>
<td>91</td>
</tr>
<tr>
<td>Small for age</td>
<td>4.8</td>
<td>5</td>
</tr>
<tr>
<td>Large for age</td>
<td>8.6</td>
<td>9</td>
</tr>
<tr>
<td>Days of hospitalization after birth (mean (SD))</td>
<td>15.9 (16.6)</td>
<td>105</td>
</tr>
<tr>
<td>Multiples (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Singleton</td>
<td>96.2</td>
<td>101</td>
</tr>
<tr>
<td>Twins</td>
<td>3.8</td>
<td>4</td>
</tr>
<tr>
<td>Corrected age in months (mean (SD))</td>
<td>5.5 (0.5)</td>
<td>105</td>
</tr>
<tr>
<td>Birth Order (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>First born</td>
<td>62.9</td>
<td>66</td>
</tr>
<tr>
<td>Second born</td>
<td>24.8</td>
<td>26</td>
</tr>
<tr>
<td>Third born</td>
<td>9.5</td>
<td>10</td>
</tr>
<tr>
<td>Fourth or more</td>
<td>2.9</td>
<td>3</td>
</tr>
<tr>
<td>Infant Current Weight in Kilograms (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.91 - 5.96</td>
<td>10.5</td>
<td>11</td>
</tr>
<tr>
<td>6.00 - 7.06</td>
<td>29.5</td>
<td>31</td>
</tr>
<tr>
<td>7.09 - 8.02</td>
<td>30.5</td>
<td>32</td>
</tr>
<tr>
<td>8.18 - 9.54</td>
<td>23.8</td>
<td>25</td>
</tr>
<tr>
<td>10.0 - 14.55</td>
<td>5.7</td>
<td>6</td>
</tr>
</tbody>
</table>
The mothers’ demographic characteristics are presented in Table 5.2. Most of the participants were from North America (40.0% from Canada and 43.8% from the USA) with 81.9% identifying themselves as “Caucasian”. The majority of the mothers were married (83.8%) or cohabiting (9.5%); few mothers had never married (3.8%), were widowed (1.0%), or were divorced (1.9%). Most (83.4%) reported obtaining a college degree or higher level of education and a large percentage of the mothers (63.8%) were not engaged in paid work. The median yearly household income was in the range of $67,212-$98,000 Canadian, which is higher than the yearly median family income of Canadians in general ($66,550 CDN) in 2007 (Statistics Canada, 2009a) and of Americans ($52,029 US which equals $54,184 CDN) in 2008 (United States Census Bureau, 2009).

14 This category was “ear infection” in the original survey, due to low frequency of ear infection in this sample as reported by mothers and at the same time mothers reported other transient health problems such as flu, cough or stomach upset. These health complaints were pooled in one category which is transient health problems.

15 The IP address was used to identify the origin of the online survey. Two websites were used for this purpose: (a) “IP locators Geobytes” available at www.ipaddresslocation.org/ip-address-locator.php and (b) “IP Tracing” available at www.ip-adress.com/ip tracer.
### Table 5.2  Demographic and Health Characteristics of the Mothers

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>$N$</th>
<th>$f$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (mean (SD))</td>
<td>31.5 (5.4)</td>
<td>105</td>
</tr>
<tr>
<td>Ethnicity/Race (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chinese</td>
<td>1.0</td>
<td>1</td>
</tr>
<tr>
<td>Arab/West Asian</td>
<td>1.0</td>
<td>1</td>
</tr>
<tr>
<td>South Asian</td>
<td>1.9</td>
<td>2</td>
</tr>
<tr>
<td>South East Asian</td>
<td>1.0</td>
<td>1</td>
</tr>
<tr>
<td>Caucasian</td>
<td>81.9</td>
<td>86</td>
</tr>
<tr>
<td>Black</td>
<td>2.9</td>
<td>3</td>
</tr>
<tr>
<td>Latin American</td>
<td>4.8</td>
<td>5</td>
</tr>
<tr>
<td>Filipino</td>
<td>1.0</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>4.8</td>
<td>5</td>
</tr>
<tr>
<td>Marital Status (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never Married</td>
<td>3.8</td>
<td>4</td>
</tr>
<tr>
<td>Married</td>
<td>83.8</td>
<td>88</td>
</tr>
<tr>
<td>Widowed</td>
<td>1.0</td>
<td>1</td>
</tr>
<tr>
<td>Divorced/Separated</td>
<td>1.9</td>
<td>2</td>
</tr>
<tr>
<td>Cohabitating</td>
<td>9.5</td>
<td>10</td>
</tr>
<tr>
<td>Education (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than high school</td>
<td>1.0</td>
<td>1</td>
</tr>
<tr>
<td>High school</td>
<td>14.3</td>
<td>15</td>
</tr>
<tr>
<td>College</td>
<td>24.8</td>
<td>26</td>
</tr>
<tr>
<td>Bachelor’s degree</td>
<td>40.0</td>
<td>42</td>
</tr>
<tr>
<td>Graduate degree</td>
<td>19.0</td>
<td>20</td>
</tr>
<tr>
<td>Household Income (CDN$) (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Under $25,941</td>
<td>6.7</td>
<td>7</td>
</tr>
<tr>
<td>$25,941 - $44,196</td>
<td>13.3</td>
<td>14</td>
</tr>
<tr>
<td>$44,197 - $67,211</td>
<td>15.2</td>
<td>16</td>
</tr>
<tr>
<td>$67,212 - $98,000</td>
<td>16.2</td>
<td>17</td>
</tr>
<tr>
<td>Over $98,000</td>
<td>40.0</td>
<td>42</td>
</tr>
<tr>
<td>Declined</td>
<td>8.6</td>
<td>9</td>
</tr>
<tr>
<td>Paid work (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engaged in paid work</td>
<td>36.2</td>
<td>38</td>
</tr>
<tr>
<td>Country of Residence (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>40.0</td>
<td>42</td>
</tr>
<tr>
<td>USA</td>
<td>43.8</td>
<td>46</td>
</tr>
<tr>
<td>Australia</td>
<td>4.8</td>
<td>5</td>
</tr>
<tr>
<td>UK</td>
<td>4.8</td>
<td>5</td>
</tr>
<tr>
<td>New Zealand</td>
<td>6.7</td>
<td>7</td>
</tr>
<tr>
<td>History of Sleep Problems (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sleep Problems</td>
<td>24.8</td>
<td>26</td>
</tr>
<tr>
<td>Previous experience with infant sleep problems (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>18.1</td>
<td>19</td>
</tr>
<tr>
<td>Yes</td>
<td>19.0</td>
<td>20</td>
</tr>
<tr>
<td>Not applicable (first born infant)</td>
<td>62.1</td>
<td>66</td>
</tr>
</tbody>
</table>
5.1.2 The Infants’ and Mothers’ Health Status

Sixty five percent of the infants were reported by their mothers to have spent less than two weeks in the hospital after birth, while 24% were reported to have spent between 2-4 weeks in the hospital. The days spent in the hospital ranged from no hospitalization (zero days) to 81 days, and the mean was 15.9 days. At the time they entered study, most of the infants had been at home for more than 3 months. In addition, 71% of the study mothers reported that their infants had no, or only transient health problems (e.g., flu, cough, ear infection, or stomach upset) during the past three weeks. Almost all (94%) of the mothers rated their own general health to be excellent or good, and 75% reported having no history own of sleep problems.

5.1.3 The Infants’ Sleep Arrangements

Information about the infants’ sleep patterns and sleep arrangements is presented in Table 5.3. More than one half (57.1%) of the infants slept in separate rooms; 8.6% of the infants slept in their parents’ bed, 26.7% slept in their parents’ room, and 7.7% slept in a sibling’s room. The mothers reported that 56.2% of the infants slept on their backs while 22.9% slept on their abdomens.

The mean length of nighttime sleep for the infants was 9.2 hours and the mean length of their daytime naps was 3.5 hours. The mothers reported that, on average, their infant’s sleep latency was 33.1 minutes. Finally, of the 37.1% of mothers with prior born children, 48.7% reported having had previous experience with infant sleep problems.
Table 5.3  The Infants' Sleep-Wake Patterns

<table>
<thead>
<tr>
<th>Variable</th>
<th>Range</th>
<th>Mean (SD)</th>
<th>Median</th>
<th>25th Percentile</th>
<th>75th Percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of nighttime awakenings</td>
<td>0-10</td>
<td>2.1 (1.6)</td>
<td>2.0</td>
<td>1.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Duration of nighttime awakenings (min)</td>
<td>0-240</td>
<td>45.7 (50.8)</td>
<td>30.0</td>
<td>15.0</td>
<td>60.0</td>
</tr>
<tr>
<td>Sleep latency (min)</td>
<td>0-180</td>
<td>33.1 (31.0)</td>
<td>20.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total daytime naps (hours)</td>
<td>1.5-8.0</td>
<td>3.5 (1.5)</td>
<td>3.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total nighttime sleep (hours)</td>
<td>2-12</td>
<td>9.2 (1.9)</td>
<td>10.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total sleep in 24 hours (hours)</td>
<td>5.0-18.5</td>
<td>12.7 (2.5)</td>
<td>13.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sleep arrangement (n (%)):
- Infant crib in separate room: 60 (57.1)
- In parents’ bed: 9 (8.6)
- Infant crib in parents’ room: 28 (26.7)
- Infant crib in room with sibling/others: 8 (7.7)

Infant sleep position (n (%)):
- On belly: 24 (22.9)
- On side: 20 (19.0)
- On back: 59 (56.2)

Consider sleep a problem (n (%)):
- Serious problem: 10 (9.5)
- Small problem: 48 (45.7)
- No problem: 47 (44.8)

Note. N for all variables =105 except for the infant sleep position variable = 103 (two missing values).

5.2 Study Measures and Instruments

Table 5.4 presents characteristics of the various instruments used in the study including the obtained score ranges, means, standard deviations, and reliability estimates.

To evaluate the nighttime sleep patterns of these premature infants, their mothers were asked to report the number of nighttime awakenings per night, the duration of nighttime awakenings in minutes per night during the last week, and their perceptions of
their infant’s sleep problems. Table 5.3 presents a detailed description of the infants’ sleep.

### 5.2.1 Reliability

The anxious subscale of the Attachment Style Questionnaire (ASQ) scale scores ranged from 13-78 (see Table 5.4). The higher value is indicative of higher levels of having an anxious style of attachment. The anxious subscale demonstrated adequate internal consistency reliability (Cronbach’s alpha = .88). Similar findings were reported by Feeney (2003) and Alexander, Feeney, Hohaus, and Noller (2001); both studies found Cronbach’s alpha of .86. Although the other subscales of the ASQ were not used in the analysis, information about their reliability is reported in Appendix F.

Family functioning, measured with the Family Assessment Device-General Function Scale, achieved internal consistency reliability of .91 in the present study. The Happiness Scale also showed adequate psychometric properties, with a Cronbach’s alpha of .75, in this sample (see Table 5.4).

The “active physical comforting”, “settle by movement”, and “social comforting” subscales of the PIBBS scale demonstrated adequate reliability; the Cronbach’s alphas were .75, .77, and .73, respectively. The “passive physical comforting” and “encourage autonomy” subscales demonstrated unacceptable values; the Cronbach’s alphas were .33 and -.22. Given that these scales contained very few items, low Cronbach’s values are not particularly surprising (Pallent, 2007). For this reason, the mean inter-item correlation matrixes for these subscales were examined. For the three items in the “encourage autonomy” subscale, the correlations ranged from .01-.27. For the two items in the
“passive physical comforting” subscale, the correlation was -.09. Because the recommended range of inter-item correlation is .20 to .40, for items in a scale (Pallant, 2007), these findings raised concerns about the internal consistency of these subscales for the population for mothers of premature infants.
Table 5.4  Characteristics and Cronbach's Alpha Reliability Estimates of the Measurement Scales

<table>
<thead>
<tr>
<th>Variables</th>
<th>Scale</th>
<th>Possible Range</th>
<th>Observed Range</th>
<th>Mean</th>
<th>SD</th>
<th>Number of Items</th>
<th>Cronbach’s Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal Happiness (averaged)</td>
<td>1-4</td>
<td>1-4</td>
<td>1.8-4.0</td>
<td>3.2</td>
<td>0.5</td>
<td>4</td>
<td>.75</td>
</tr>
<tr>
<td>Family Functioning; unhealthy (averaged)</td>
<td>1-4</td>
<td>1-4</td>
<td>1.0-3.5</td>
<td>1.7</td>
<td>0.5</td>
<td>12</td>
<td>.91</td>
</tr>
<tr>
<td>Parental Interactive Bedtime Sleep Behaviour Subscales (%):</td>
<td>0-4</td>
<td>0-100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Active Physical Comforting</td>
<td>0-100</td>
<td></td>
<td>53.8</td>
<td>22.7</td>
<td>6</td>
<td></td>
<td>.75</td>
</tr>
<tr>
<td>2. Encourage Autonomy</td>
<td>0-100</td>
<td></td>
<td>43.0</td>
<td>24.1</td>
<td>3</td>
<td></td>
<td>.33</td>
</tr>
<tr>
<td>3. Settle by Movement</td>
<td>0-100</td>
<td></td>
<td>26.2</td>
<td>27.2</td>
<td>2</td>
<td></td>
<td>.77</td>
</tr>
<tr>
<td>4. Passive Physical Comforting</td>
<td>0-100</td>
<td></td>
<td>28.3</td>
<td>21.1</td>
<td>2</td>
<td></td>
<td>-.22</td>
</tr>
<tr>
<td>5. Social Comforting</td>
<td>0-100</td>
<td></td>
<td>46.3</td>
<td>27.0</td>
<td>4</td>
<td></td>
<td>.73</td>
</tr>
<tr>
<td>Anxious Style of Attachment</td>
<td>1-6</td>
<td>13-78</td>
<td>13-64</td>
<td>35.5</td>
<td>10.8</td>
<td>13</td>
<td>.88</td>
</tr>
<tr>
<td>Frequency of Infants’ Nighttime Awakening</td>
<td>&gt;0</td>
<td>0-10</td>
<td>2.1</td>
<td>1.6</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duration of Infants’ Nighttime Awakening (in minutes)</td>
<td>&gt;0</td>
<td>0-240</td>
<td>45.7</td>
<td>50.8</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* The number of cases was 105 for all measures. In all scales, the larger value indicates a higher level of the variable. For example, a large value on the mother’s anxious style of attachment scale indicates higher levels of anxious attachment.
5.3 Preliminary Analyses

Two procedures were used to check the data for any violations of the linear regression assumptions. For the continuous variables, descriptive statistics were obtained. Skewness and kurtosis statistics were used to examine the distributions of the scores. For the categorical variables, frequencies and cross-tabulations were obtained and non-parametric statistics including chi-square analysis were employed to assess the appropriateness of the variables for subsequent analysis including. The findings for those procedures are reported in the following section.

5.3.1 Descriptive Statistics

Means, standard deviations, and ranges for all continuous variables are reported in Table 5.4. The means of all the variables were very similar to those that have been cited in the literature. As well as univariate analysis, analysis of outliers, tests of multicollinearity, and tests of the inference assumptions were performed (Field, 2005). In general, all the scaled variables that were used in the parametric statistics had acceptable distributions and no multi-collinearity between these variables was evident. However, a few outliers were found. The detailed results of these tests are organized by scale.

5.3.1.1 Maternal Bedtime Behaviours

All the scores of the PIBBS subscales were converted into percentages to permit comparisons among the maternal strategies used to settle the infants to sleep. Using the median percentage scores for all the PIBBS subscales, Figure 5.1 shows the relative frequency of the mothers’ strategies. “Active physical comforting” strategies accounted
for 54.2% of all the strategies used by the mothers. This strategy was followed by the “encourage autonomy” strategies (50.0%), “social comforting” (43.7%), “settle by movement” (25.0%), and “passive physical comforting” (25%).

**Figure 5.1 Mothers’ Behavioural Strategies Used to Settle their Infants to Sleep**

The PIBBS subscale “active physical comforting” (APC) was normally distributed and had a negative skewness value of less than 2, which raised no concern about its distribution. The “encourage autonomy” and “social comforting” subscales were also normally distributed. However, the distributions of the other subscales, including the “settle by movement” and “passive physical comforting” subscales were not normal with
significant skewness values of more than 2 (4.23 and 3.09, respectively). Therefore, non-parametric statistics were performed with these variables.

5.3.1.2 Having an Anxious Style of Attachment

Scores on the anxious style of attachment scale had a positive skewness value (1.43) of less than 2. Most people report lower values on the anxiety index, which explains a tendency for the scores to have a positive skew (Cassidy & Berlin, 1994). The mean for the anxious style of attachment variable (mean = 35.5; SD = 10.8) is consistent with that reported by others including Alexander, Feeney, Hohaus, and Noller (2001).

5.3.1.3 Family Functioning

The scores for the family functioning scale demonstrated a positive skewness statistic of 1.10. Some positive skewness was expected because most people report few symptoms of unhealthy family functioning (Byles et al., 1988). The value of skewness for this variable raised no concern about the normality of the distribution for statistical purposes, however.

The mean for the family functioning scores (mean = 1.7; SD = 0.5) is consistent with the findings of Byles, Byrne, Boyle, and Offord (1988) (they reported a mean score for family functioning of 1.8 (SD = 0.4). The median of the variable was 1.6, which is equivalent to the value reported by Lam, Hiscock, and Wake (2003) (i.e., median = 1.6). Only 11.4% of the mothers in the current study scored above 2.2, which is the cut point between healthy versus pathological family functioning (Byles et al. 1988), and is congruent with the prevalence observed in a community-based sample (Byles et al.).
5.3.1.4 Maternal Happiness

The maternal happiness variable demonstrated a negative skewness value of less than 2 (-1.72) as expected because people generally report that they are happy. The mean score on the maternal happiness scale was 3.2 and the standard deviation was 0.5, which is consistent with the findings reported by Johnson et al. (2000).

5.3.1.5 Infants’ Nighttime Awakening and Sleep Problems

About one half of the mothers (55.2%) reported that their infant had sleep problems and 17% rated the problem as serious (Figure 5.2). The remainder (44.8%) indicated that their infants had no sleep problems at all. The infants were reported to have had on average 2.1 times of nighttime awakenings and for 45.7 minutes duration on average per night duration (see Table 5.3).

Figure 5.2 Prevalence of Premature Infants’ Sleep Problems
Scores on the continuous outcome variables (the frequency and duration of nighttime awakenings/night) demonstrated a positive skew; the data showed that the infants generally had few nighttime awakenings and they were of short duration. The skewness value for the frequency of nighttime awakenings was 1.5 and the skewness value for the duration of nighttime awakenings was slightly greater than 2 (2.06). The distributions of these outcomes variables were consistent with reports in the published literature about infants’ of nighttime awakenings, in which about 25-30% of premature infants are reported to have problematic nighttime awakening (Wolke, Sohne, Riegel, Ohrt, & Osterlund, 1998).

Because normal distribution of the variables is required for parametric statistical techniques, a square root and logarithm transformation was used to try to render the duration of nighttime awakenings normally distributed. Because the distribution remained the same, the original scores were retained for further analysis. Many social scales, such as depression or anxiety, are skewed in the general population because of the nature of the constructs being measured (Pallant, 2007). Given that in linear regression analysis it is the normality of the standardized residual, rather than univariate normality, that is most important (Field, 2005), linear regression was applied.

5.3.1.6 Demographic Variables

The frequencies of the categorical variables are presented in Tables 5.1, 5.2, and 5.3. Some of the variables had very small numbers of cases in particular categories, which created challenges for chi-square analysis. For example, infant’s birth order, and
feeding methods, the mother’s ethnicity/race and marital status, and the infant’s sleeping arrangements had fewer than 5 expected frequencies in many cells when cross-tabulation was performed. For this reason, the responses to these variables were collapsed into two categories (see Table 5.5). Given that the majority of the mothers in the sample were “Caucasian”, the ethnicity/race categories were collapsed into: “Caucasian” and “other”. Similarly, the infant’s birth order was recategorized as “first born” and “later born”, and marital status was collapsed into a binary variable of “married/cohabiting” and “no spouse.”

In this study, the category indicating that the infant slept in a separate room was retained, while the categories indicating that the infant slept in the parents’ bed or room, or shared a room with siblings, were collapsed into a single “bed or room sharing” category. The decision to collapse the latter two categories into a single category was made on the assumption that any form of sharing of the bedroom, either with parents, siblings or others, may disturb infants’ sleep (Mindell et al., 2006). In addition, in the variable that captured the mothers’ perceptions of their infant’s sleep, fewer than 10% reported the problem as serious, thus this category was collapsed with the “small problem” responses: infant with sleep problems versus infant with no sleep problems. The feeding methods categories were pooled into exclusive breast feeding versus other feeding methods (see Table 5.5).

Even after collapsing the marital status variable, there were few mothers without a spouse (6.7%). Dichotomous variables with 90%-10% splits between two categories can produce outliers and can deflate correlation coefficients (Rummel as cited in Tabachnick
& Fidell, 2007). Rummel suggested deleting these variables from multivariate analyses.

Therefore, the marital status variable was not included in further analyses.

### Table 5.5 Derived (Collapsed) Demographic Variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethnicity/Race (%)</td>
<td></td>
</tr>
<tr>
<td>“Caucasian”</td>
<td>81.9</td>
</tr>
<tr>
<td>Other</td>
<td>18.1</td>
</tr>
<tr>
<td>Birth order (%)</td>
<td></td>
</tr>
<tr>
<td>First born</td>
<td>62.9</td>
</tr>
<tr>
<td>Later born</td>
<td>37.1</td>
</tr>
<tr>
<td>Marital Status (%)</td>
<td></td>
</tr>
<tr>
<td>Married/Cohabiting</td>
<td>93.3</td>
</tr>
<tr>
<td>No Spouse</td>
<td>6.7</td>
</tr>
<tr>
<td>Consider sleep a problem (%)</td>
<td></td>
</tr>
<tr>
<td>Small or Serious Problem</td>
<td>55.2</td>
</tr>
<tr>
<td>No problem</td>
<td>44.8</td>
</tr>
<tr>
<td>Sleep arrangement (%)</td>
<td></td>
</tr>
<tr>
<td>Infant crib in separate room</td>
<td>57.0</td>
</tr>
<tr>
<td>Bed or room sharing with</td>
<td>43.0</td>
</tr>
<tr>
<td>parent(s)/sibling</td>
<td></td>
</tr>
<tr>
<td>Feeding Methods (%)</td>
<td></td>
</tr>
<tr>
<td>Exclusive breast feeding</td>
<td>19.0</td>
</tr>
<tr>
<td>Other</td>
<td>81.0</td>
</tr>
</tbody>
</table>

*Note. The new derived birth order variable was coded as; 1= first born and 0 = later born for subsequent analysis*

### 5.3.2 Outliers Analysis

Box plots of the variables, revealed the presence of a few outliers in the maternal happiness, family functioning and anxious style of attachment variables. A few outliers also were detected in the outcome variables, frequency and duration of infants’ nighttime awakening). These outliers were verified to be accurate responses. The box plots of the standardized residuals of both multivariate regression analyses revealed multivariate
outliers (see Figures 5.3 and 5.4), thus further analysis of the residuals was deemed necessary to determine the extent of their influence on the regressions models.

**Figure 5.3** Box Plot of the Standardized Residuals from the Multivariate Regression Model of Frequency of Infants’ Nighttime Awakening
The maximum lever value for both regression models of the outcome variables was 0.15, which was within “safe” boundaries (Huber, 1981). In addition, the critical chi-square value of the Mahalanobis distances, when there are five explanatory variables in a regression model, is 20.5, and 18.5 when there are four variables. The maximum values of the Mahalanobis distance were 12.7 and 15.3 for the frequency of nighttime awakening and duration of nighttime awakening models, respectively. Thus, the outliers were not influential. The residual statistics are reported in Table 5.6.
Table 5.6  Residual Statistics for Linear Regression Models with Frequency and Duration of Nighttime Awakening as Outcomes

<table>
<thead>
<tr>
<th></th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Outcome variable 1: Frequency of nighttime awakening/night</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standardized residuals</td>
<td>-2.05</td>
<td>4.55</td>
<td>0.00</td>
<td>0.98</td>
</tr>
<tr>
<td>Centered leverage values</td>
<td>.01</td>
<td>.12</td>
<td>.04</td>
<td>.02</td>
</tr>
<tr>
<td>Cook’s Distance</td>
<td>.00</td>
<td>.18</td>
<td>.01</td>
<td>.02</td>
</tr>
<tr>
<td>Mahalanobis Distance</td>
<td>0.73</td>
<td>12.73</td>
<td>3.96</td>
<td>2.48</td>
</tr>
<tr>
<td><strong>Outcome variable 2 : Duration of nighttime awakening/night</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standardized residuals</td>
<td>-1.80</td>
<td>3.48</td>
<td>0.00</td>
<td>0.98</td>
</tr>
<tr>
<td>Centered leverage values</td>
<td>.01</td>
<td>.15</td>
<td>.05</td>
<td>.03</td>
</tr>
<tr>
<td>Cook’s Distance</td>
<td>.00</td>
<td>.20</td>
<td>.01</td>
<td>.03</td>
</tr>
<tr>
<td>Mahalanobis Distance</td>
<td>0.70</td>
<td>15.29</td>
<td>4.95</td>
<td>3.04</td>
</tr>
</tbody>
</table>

Note. N = 105.

5.3.3 Tests of Multicollinearity

The strongest correlation was between the anxious style of attachment variable and the maternal happiness variable, at -.58 (see Table 5.8). Thus, there was no evidence of multicollinearity among the explanatory variables (none of the correlation coefficients exceeded .90 (Tabachnick & Fidell, 1996)). In addition, the collinearity diagnostics (tolerance and variance inflation factor [VIF]) for the study variables showed large tolerance values and small VIF values (less than 10), which also indicated that there was
no multicollinearity present (Pallant, 2007). The results of the collinearity diagnostics obtained from the multiple regression analyses are presented in Tables 5.12 and 5.13.

5.3.4 Assessment of the Inference Assumptions

Upon inspection of the scatter plots of all the explanatory variables against each outcome (e.g., frequency and duration of nighttime awakening), it was apparent that there were no violations of linearity. Visualization of the data also revealed no evidence of a violation of independence. The presence of reasonably straight lines suggested that normality was present. Bivariate scatter plots of the standardized residuals against the explanatory variables showed a reasonable cluster of data around the means with no evidence of curved or fan shapes, thus the homoscedasticity assumption was met. Based on the univariate and bivariate analyses of the explanatory variables and the standardized residuals, and confidence that the assumptions for inference had been met, further statistical analyses were performed to answer the research questions.

5.3.5 Correlations between the Potentially Confounding, Explanatory and Outcome Variables

Tables 5.7, 5.8, and 5.9 show the correlations (Pearson’s/ Spearman’s rho) between the outcome variables (frequency of nighttime awakenings, duration of nighttime awakenings per night, and mothers’ perceptions of infant’s sleep) and all explanatory and potentially confounding variables. Variables with correlation coefficients that were .20 or smaller were not considered for further analysis.
5.3.5.1 Correlations between Infants’ Frequency of Nighttime Awakening and Study Variables

The demographic and health variables, including ethnicity/race, mother’s age, mother’s education, feeding method for the infant, and the infant’s sleep position had very weak correlations with the frequency of nighttime awakening (e.g., .02 to .08). The variables describing other characteristics of the mothers (e.g., history of sleep problems, employment, general health, and household income) and of the infants (i.e., sex, birth order, sleeping arrangements, and health problems) also demonstrated correlations that were less than .20. The direction of these correlations were as expected, where mothers that were employed, reported poor health, had a history of sleep problems, had relatively low income, and practiced co-sleeping reported that their infants had relatively more frequent nighttime awakening. The strongest correlation occurred between the frequency of nighttime awakening and the infant’s birth order \( r = -.27, p < .01 \). Mothers with more than one child reported more frequent nighttime awakening. The infant’s birth order was the only potentially confounding variable that met the inclusion criteria for the multivariate regression modeling.

All correlations between the continuous variables and the frequency of nighttime awakening were in the expected direction and ranged from .11 to .27. Table 5.8 presents the correlations between the explanatory variables and the outcome variables.
Table 5.7  Correlations between the Potentially Confounding Variables and the Frequency and Duration of Infants’ Nighttime Awakening

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency of Nighttime Awakening</th>
<th>Duration of Nighttime Awakening</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethnicity/Race (Caucasian/other)</td>
<td>-.02</td>
<td>-.07</td>
</tr>
<tr>
<td>Mother’s Age</td>
<td>-.03</td>
<td>.12</td>
</tr>
<tr>
<td>Education</td>
<td>-.07</td>
<td>.00</td>
</tr>
<tr>
<td>Employment</td>
<td>.14</td>
<td>.07</td>
</tr>
<tr>
<td>Mother’s General Health</td>
<td>-.14</td>
<td>-.16</td>
</tr>
<tr>
<td>Household Income</td>
<td>-.16</td>
<td>-.11</td>
</tr>
<tr>
<td>Infant’s Sex</td>
<td>-.11</td>
<td>-.10</td>
</tr>
<tr>
<td>Birth Order (First/Second or more)</td>
<td>-.27**</td>
<td>-.10</td>
</tr>
<tr>
<td>Infant Health Problems</td>
<td>-.14</td>
<td>.04</td>
</tr>
<tr>
<td>Previous Experience of Infant Sleep Problems</td>
<td>-.11</td>
<td>.06</td>
</tr>
<tr>
<td>Feeding Methods (Breast feeding/Other)</td>
<td>.03</td>
<td>.04</td>
</tr>
<tr>
<td>Sleeping Arrangements</td>
<td>.19</td>
<td>.06</td>
</tr>
<tr>
<td>Infant’s Sleep Position</td>
<td>.08</td>
<td>.05</td>
</tr>
<tr>
<td>Maternal History of Sleep Problems</td>
<td>.13</td>
<td>.42**</td>
</tr>
</tbody>
</table>

*Note.* *p* < .05 **p* < .01; N = 105 except for the income variable (n = 96), previous experience of infant sleep problems (n = 39) and infant’s sleep position (n = 103).

Spearman’s rho was used to correlate, education, mothers’ general health, and income with the outcome variables.

Although, several authors (Fiese, Fiese, Winter, Sliwinski, & Anber, 2007; Lozoff, Wolf, & Davis, 1985; Zuckerman, Stevenson, & Bailey, 1987) have suggested that there is a significant relationship between mothers’ mental health status and infants’
sleep problems, maternal happiness had a small correlation ($r = -.11$) with the frequency of nighttime awakening. Thus, maternal happiness did not meet the criterion to be included in the multivariate regression analysis. Of the potentially confounding variables studied, only the infant’s birth order (BO) was retained for further analysis.
Table 5.8  Correlations Matrix of Explanatory Variables and Frequency, Duration of Nighttime Awakening and Mothers’ Perceptions of Infant’s Sleep as a Problem

<table>
<thead>
<tr>
<th>Measure</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Frequency of Nighttime Awakening</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Duration of Nighttime Awakening</td>
<td>.48**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Mothers’ Perceptions of Infant’s Sleep</td>
<td>.51**</td>
<td>.40**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Infant’s Birth Order</td>
<td>-.27**</td>
<td>-.10</td>
<td>.02</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Infant’s Health Problems</td>
<td>-.14</td>
<td>.04</td>
<td>.10</td>
<td>.19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Maternal Happiness</td>
<td>-.11</td>
<td>-.23*</td>
<td>-.09</td>
<td>.05</td>
<td>-.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Family Functioning (unhealthy)</td>
<td>.23*</td>
<td>.34**</td>
<td>.19</td>
<td>-.24*</td>
<td>.00</td>
<td>-.56**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Mother’s Anxious Style of Attachment</td>
<td>.24*</td>
<td>.37**</td>
<td>.15</td>
<td>-.11</td>
<td>-.00</td>
<td>-.58**</td>
<td>.57**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Mother’s History of Sleep Problems</td>
<td>.13</td>
<td>.42**</td>
<td>.21*</td>
<td>.08</td>
<td>.03</td>
<td>-.23*</td>
<td>.31**</td>
<td>.26**</td>
<td></td>
</tr>
<tr>
<td>10. Active Physical Comforting</td>
<td>.26**</td>
<td>.27**</td>
<td>.27**</td>
<td>.02</td>
<td>.04</td>
<td>.02</td>
<td>.21*</td>
<td>.09</td>
<td>.27**</td>
</tr>
</tbody>
</table>

* $P < .05$  ** $P < .01$. N = 105 for all variables.
5.3.5.2 Correlations between Duration of Infants’ Nighttime Awakening and Study Variables

All the demographic and health status variables, potentially confounding variables, were very weakly correlated with the duration of nighttime awakenings; the coefficients ranged from .00 to .12, except for mother’s history of sleep problems, which was moderately correlated at $r = .42$ ($p < .01$) (see Table 5.7). Thus, the maternal history of sleep problems variable was the only potentially confounding variable included in the multivariate regression models.

All the correlations between the explanatory variables listed in Table 5.8 and the duration of nighttime awakening were in the expected direction and exceeded the criterion of .20, thus all of these variables were included in the multivariate analysis. For example, the maternal happiness variable had a negative correlation with the duration of nighttime awakening, which is consistent with the literature about infants’ sleep disruptions and mothers’ mental health status (Fiese et al., 2007; Lozoff et al., 1985; Zuckerman et al., 1987). Interestingly, the correlation between mothers having an anxious style of attachment and their use of “active physical comforting” during bedtime interactions, which was postulated to be strongly correlated in the theory guiding this study, was very small ($r = .09$).

It is noteworthy that all the variables related to the mothers, including whether they had an anxious attachment style, used “active physical comforting” techniques, were relatively happy, had healthy family functioning, and reported a history of sleep problems demonstrated stronger correlations with the duration of nighttime awakenings compared with their correlations with the frequency of those awakenings.
5.3.5.3 Correlations between Mothers’ Perceptions of their Infant’s Sleep and the Study Variables

The correlations between the mothers’ perceptions of the quality of their infant’s sleep, which was treated as a third outcome variable, and the potentially confounding variables are provided in Table 5.9.

Table 5.9 Correlations between the Potentially Confounding Variables and Mothers’ Perceptions of their Infant’s Sleep

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mothers’ Perceptions of their Infant’s Sleep</th>
<th>Spearman’s rho</th>
<th>Chi-Square Statistic</th>
<th>Pearson’s Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethnicity/Race (Caucasian/Other)</td>
<td>-.02</td>
<td>Phi = -.02</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Mother’s Age</td>
<td>---</td>
<td>---</td>
<td>.10</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>.06</td>
<td>Cramer’s V = .19</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>Employment</td>
<td>.00</td>
<td>Phi = .00</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>Infant’s Health Status</td>
<td>.11</td>
<td>Cramer’s V = .11</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>Mother’s General Health</td>
<td>-.08</td>
<td>Cramer’s V = .14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Household Income</td>
<td>-.13</td>
<td>Cramer’s V = .17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infant’s Sex</td>
<td>-.18</td>
<td>Phi = -.18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Birth Order (First/Second or more)</td>
<td>.02</td>
<td>Phi = .02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of Birth</td>
<td>.07</td>
<td>Cramer’s V = .08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feeding Methods (Breast feeding/Other)</td>
<td>-.00</td>
<td>Phi = .00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sleeping Arrangements</td>
<td>.10</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infant’s Sleep Position</td>
<td>-.07</td>
<td>Cramer’s V = .15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Previous Experience of Infant Sleep Problems</td>
<td>-.08</td>
<td>Phi = -.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maternal History of Sleep Problems</td>
<td>.21*</td>
<td>Phi = .21*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Because this outcome variable was binary, the correlations calculated for the continuous variables were Pearson’s Product Moment Correlations and the correlations
with other categorical variables were calculated using a chi-square statistic (phi/Cramer’s and Spearman’s rho).

All of the potentially confounding variables had weak correlations with the mother’s perceptions of the quality of her infant’s, except whether the mother reported a history of sleep problems for herself (phi = .21, \( p = .03 \)). The direction of these correlations was as expected (see Table 5.9). Among the explanatory variables of interest, the infant’s birth order and health status had relatively small correlations with the mother’s perceptions of the infant’s sleep quality. The mother’s level of happiness and whether she had an anxious style of attachment were also weakly correlated with her perceptions of the quality of her infant’s sleep (see Table 5.8).

### 5.4 An Infant’s Weight and the Mother’s Reports of Sleep Problems

An analysis of independent \( t \)-tests revealed that there were no significant differences in the mean \( Z \) weight scores (current weights) for infants reported to have sleep problems by their mothers (\( M = -0.31, SD = 1.60 \)) and infants without sleep problems (\( M = -0.25, SD = 1.84 \) \( t(103) = 0.17, p = .86 \)). The magnitude of the difference in the means (mean difference = 0.06, 95% CI: -0.61 - 0.72) was trivial (eta squared = .00).

### 5.5 Categorical Variables Associated with Mothers’ Perceptions of the Quality of their Infant’s Sleep

There were no significant correlations between whether a mother reported that her infant had sleep problems and her ethnicity/race (\( \chi^2 (1, n = 105) = 0.06, p = .80, \phi = - .02 \)). Chi-square analysis also failed to reveal significant associations between the
mother’s perceptions and the mother’s income, education, health status, and previous experience with an infant with sleep problems.

Cross tabulation of the infant’s birth order and the mother’s perceptions of the quality of the infant’s sleep revealed that 56.1% of the first-born infants had sleep problems, which was very similar to the rate found for the later-born infants (53.8%) ($\chi^2 = 0.00, p < .99, \phi = .02$). Mothers who reported that they had a history of sleep problems of their own were more likely to report that their infant also had sleep problems (73.1% versus 49.4% of the mothers who did not report sleep problems of their own) ($\phi = .21, p < .03; \chi^2 = 3.54, p < .06$).

A significant association was noted between ethnicity/race (“Caucasian” vs. other) and the infant’s sleeping arrangements (i.e., slept in a separate room vs. shared a bed or room with a parent or other person) ($\chi^2 = 7.53, p < .00$ (with Yates continuity correction), $\phi = .29$). The “Caucasian” mothers practiced less bed- or room- sharing. There was also a significant association between the sex of the infant and the sleeping arrangements (slept in a separate room vs. bed- or room- sharing) ($\chi^2 (1, n = 105) = 5.74, p < .00$ (with Yates continuity correction), $\phi = .25$). Female infants were more likely than male infants to be placed in beds or rooms with other people to sleep.

5.6 The Premature Infant Sleep Self-Initiation Model

Based on the values of the simple correlations between the explanatory, potentially confounding, and outcome variables, some study variables, which had been selected because of the hypotheses generated from the Premature Infant Sleep Self-Initiation Model (PISSI), were excluded from the analyses conducted to answer the
research questions. An additional variable, mother’s history of sleep problems, was added to the list of potentially confounding factors, although the variable had not been addressed in the context of the PISSI. Thus a revision of the model is provided in Figure 5.5.

**Figure 5.5 Revised Premature Infant Sleep Self-Initiation Model**

![Diagram](image)

5.7 Answering the Research Questions

5.7.1 Research Question 1

Is maternal bedtime behaviour used to settle infants to sleep associated with mothers’ reports of sleep problems in their infants born prematurely at five to six months of corrected age?

A Mann-Whitney U test was used to address the first research question because some of the subscales that measured the mothers’ bedtime behaviour when settling their
infant to sleep were not normally distributed. There were significant differences found between the strategies to settle the infants used by the mothers who reported that their infant had sleep problems and by those who reported no sleep problems.

The analysis revealed that all the Z-values were significant, except for the “passive physical comforting” subscale scores. The mothers that reported sleep problems used more “active physical comforting” strategies (median = 62.5 (n = 58) for infants with sleep problems and median = 45.8 (n = 47) for infants without sleep problems; \( p = .01 \)). The mothers who reported sleep problems were also found to have higher scores on the “settle by movement”, “social comforting”, and “encourage autonomy” subscales (see Table 5.10). Although it was expected that using excessive movement to settle the infants to sleep would be associated with sleep problems, using “social comforting” and “encourage autonomy” were contrary to the model-based speculation.

### Table 5.10  Mothers’ Bedtime Behaviour Stratified by Mothers’ Perceptions of the Quality of their Infant’s Sleep

<table>
<thead>
<tr>
<th>Mother’s Bedtime Behaviour</th>
<th>Infant with Sleep Problems (Median)</th>
<th>Infant with No Sleep Problems (Median)</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active Physical Comforting</td>
<td>62.5</td>
<td>45.8</td>
<td>.01</td>
</tr>
<tr>
<td>Encourage Autonomy</td>
<td>50.0</td>
<td>33.3</td>
<td>.01</td>
</tr>
<tr>
<td>Settle by Movement</td>
<td>25.0</td>
<td>12.5</td>
<td>.01</td>
</tr>
<tr>
<td>Passive Physical Comforting</td>
<td>25.0</td>
<td>25.0</td>
<td>.11</td>
</tr>
<tr>
<td>Social Comforting</td>
<td>50.0</td>
<td>37.5</td>
<td>.02</td>
</tr>
</tbody>
</table>
5.7.2 Research Question 2

Is there an association between mothers’ bedtime behaviour used to settle their infants to sleep and the frequency of the nighttime awakenings and duration of nighttime awakenings of premature infants at five to six months of corrected age?

To answer research question 2, adjusted correlations were computed between the mothers’ bedtime behaviour, which included the five assessed strategies to settle their infant and the frequency and duration of their infant’s nighttime awakenings (see Table 5.11). When controlling for the potentially confounding variables, including family functioning, mother’s happiness, infant’s health status, mother’s style of attachment (anxious), and the infant’s birth order, the frequency of nighttime awakenings was found to be significantly positively correlated with “active physical comforting” ($r = .25, p < .05$). “Settle by movement” and “social comforting” also had significant adjusted correlations with the frequency of nighttime awakenings and were of similar magnitude. The frequency of infants’ nighttime awakening was greater when their mothers reported using more “active physical comforting”, “settle by movement”, and “social comforting” strategies to settle their infants at bedtime.

The duration of the infants’ nighttime awakenings was significantly positively correlated with “active physical comforting” ($r = .22, p < .05$). The use of the “social comforting” strategy ($r = .23, p < .05$) and “passive physical comforting” ($r = .21, p < .05$) also had significant, positive correlations with the duration of nighttime awakenings. The “encourage autonomy” strategy had a trivial adjusted correlation with the duration of the infants’ nighttime awakenings.
These results support the hypothesis that there is a relationship between mothers’ behaviour at their infant’s bedtime and their infant’s frequency and duration of nighttime awakening. These moderately sized correlations explained up to 6% of the variance in the infants’ frequency and duration of nighttime awakening.

Table 5.11  Partial Correlations between Mothers’ Bedtime Behaviour and the Frequency and Duration of their Infant’s Nighttime Awakening

<table>
<thead>
<tr>
<th>Interactive Bedtime Behaviour</th>
<th>Frequency of Nighttime Awakening</th>
<th>Duration of Nighttime Awakening</th>
<th>Partial correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Active Physical Comforting</td>
<td>.25*</td>
<td>.22*</td>
<td></td>
</tr>
<tr>
<td>2. Encourage Autonomy</td>
<td>.10</td>
<td>.05</td>
<td></td>
</tr>
<tr>
<td>3. Settle by Movement</td>
<td>.20*</td>
<td>.17</td>
<td></td>
</tr>
<tr>
<td>4. Passive Physical Comforting</td>
<td>.17</td>
<td>.21*</td>
<td></td>
</tr>
<tr>
<td>5. Social Comforting</td>
<td>.23*</td>
<td>.23*</td>
<td></td>
</tr>
</tbody>
</table>

*Note. *p* < .05, **p* < .01. N = 105 for all variables. Correlations adjusted for infant’s health problems and birth order, and mother’s happiness, family functioning, and having an anxious style of attachment.

5.7.3 Research Question 3

Is there an association between the extent to which mothers display an anxious style of attachment and the frequency of the nighttime awakenings and duration of nighttime awakenings of premature infants at five to six months of corrected age, when maternal bedtime behaviour (in particular the use of active physical comforting strategies) to settle infants to sleep, family functioning, maternal happiness, maternal
marital status, infant birth order, and infants’ health problems are statistically controlled?

5.7.3.1 Frequency of Night Awakenings as an Outcome

The following hierarchical regression equation was used to investigate whether mothers who had an anxious style of attachment were likely to report greater frequency in their infant’s nighttime awakenings, after controlling for other variables. Only the candidate variables identified in the bivariate analyses were included in the model.

\[
\text{FNW} = \beta_0 + [\beta_1(BO) + \beta_2(FF)] + \beta_3(APC) + \beta_4(MASA) + \text{error},
\]

where FNW = frequency of nighttime awakening, BO = birth order, FF = family functioning, APC = active physical comforting, and MASA = mother has an anxious style of attachment.

The results of the regression analysis are provided in Table 5.12. After the birth order and family Functioning variables were entered into the model in the first step, the adjusted \( R^2 = 8.2\% \). In step two, the mother’s use of active physical comforting was entered into the model. The model, at this stage, explained 13\% of the variance in the frequency of nighttime awakening; there was a significant change in the adjusted \( R^2 \) of 5.4\%. At the last step, step 3, the extent to which the mother had an anxious style of attachment was entered into the model. The model, as a whole, with all four predictors, accounted for 14.4\% of the variance in the frequency of nighttime awakening. However, the change in the adjusted \( R^2 \) of 2.4\% was not significant (the significance of the \( F \) change value was .09). The ANOVA tables indicated that all the models were statistically significant. Model 3, which included all the variables was significant, \( F(4, 100) = 5.40, p \)
< .001. Because models 1 and 2 demonstrated a significant $F$ change values, and model 3 did not, it can be concluded that the extent to which the mothers had an anxious style of attachment did not improve the ability to predict the frequency of nighttime awakening.

In examining the coefficients for regression model 3, two variables made a statistically significant contribution when the other two predictors were held constant: infant’s birth order ($B = -.82$) and mother’s use of active physical comforting ($B = .02$). Neither family functioning nor whether a mother had an anxious style of attachment made unique contributions to the regression model. As reported earlier, the infant’s birth order had a small negative relationship ($\beta = -.25$) with the frequency of nighttime awakenings; first born premature infants had less frequent awakenings, on average, compared with later born infants, while controlling for the effects of the other explanatory variables. The standardized beta for the active physical comforting variable revealed that for every standard deviation increase in this variable there was a corresponding 0.24 of a standard deviation increase in the frequency of nighttime awakening, while controlling for the effects of the other explanatory variables.
Table 5.12  Frequency of Nighttime Awakening Regressed on Family Functioning, Birth Order, Mothers’ Use of Active Physical Comforting and Having an Anxious Style of Attachment

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE</th>
<th>β</th>
<th>Collinearity Statistic.</th>
<th>Adjusted $R^2$</th>
<th>$R^2$ Change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Tolerance</td>
<td>VIF</td>
<td></td>
</tr>
<tr>
<td>Model 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Birth Order</td>
<td>-0.75*</td>
<td>.32</td>
<td>-.22*</td>
<td>.94</td>
<td>1.06</td>
<td>.08</td>
</tr>
<tr>
<td>Family Functioning (unhealthy)</td>
<td>0.52</td>
<td>.29</td>
<td>.17</td>
<td>.94</td>
<td>1.06</td>
<td>$p = .005$</td>
</tr>
<tr>
<td>Model 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Birth Order</td>
<td>-0.80*</td>
<td>.31</td>
<td>-.24*</td>
<td>.94</td>
<td>1.07</td>
<td>$p = .001$</td>
</tr>
<tr>
<td>Active Physical Comforting</td>
<td>0.02*</td>
<td>.01</td>
<td>.24*</td>
<td>.95</td>
<td>1.05</td>
<td></td>
</tr>
<tr>
<td>Model 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Birth Order</td>
<td>-0.82*</td>
<td>.31</td>
<td>-.25*</td>
<td>.94</td>
<td>1.07</td>
<td>$p = .001$</td>
</tr>
<tr>
<td>Active Physical Comforting</td>
<td>0.02*</td>
<td>.01</td>
<td>.24*</td>
<td>.95</td>
<td>1.05</td>
<td></td>
</tr>
<tr>
<td>Anxious Style of Attachment</td>
<td>0.03</td>
<td>.02</td>
<td>.19</td>
<td>.67</td>
<td>1.48</td>
<td></td>
</tr>
</tbody>
</table>

Note. VIF = variance inflation factor. *$p < .05$; **$p < .01$; ***$p < .001$. Birth order coded as first born = 1 and second and later born = 0. N = 105
5.7.3.2 Duration of Nighttime Awakenings as an Outcome

The following regression equation was analyzed hierarchically:

(2) \[ DNW = \beta_0 + [\beta_1(FF) + \beta_2(MH) + \beta_3(MSP)] + \beta_4(APC) + \beta_5(MASA) + \text{error}, \]

where DNW = duration of nighttime awakening, FF = family functioning, MH = mother’s happiness, MSP = mother’s history of sleep problems, APC = active physical comforting, and MASA = mother has an anxious style of attachment.

The output generated from hierarchical regression model 2 is reported in Table 5.13. After the variables, family functioning, mother’s happiness, and mother’s history of sleep problems of her own were entered in the first step of the analysis, the overall model explained 20.4% of the variance in the duration of nighttime awakening. The \( R^2 \) change value was .23, with a significant \( F \) change (\( p < .001 \)). When the second block was entered, the model explained 21.5% of the variance in the duration of nighttime awakening. In other words, adding the mother’s use of active physical comforting to settle her infant explained an additional 1.9% of the variance in the duration of nighttime awakening; however, the \( R^2 \) change value for model 2 was not statistically significant.

When the variable representing whether the mother had an anxious style of attachment was added in the third block, the overall model explained 24.2% of the total variance, as indicated by the adjusted \( R^2 \) value. This represented an additional 3.3% of the variance in the duration of nighttime awakening; the significant \( F \) change of model 3 indicated that the contribution was statistically significant.

Examining the ANOVA table for the hierarchical regression model indicated that each model step was statistically significant (model 1: \( F = 9.86, p < .001 \); model 2: \( F = 8.14, p < .001 \); and model 3: \( F = 7.65, p < .001 \)).
In evaluating the coefficients of model 3, only the mother’s history of sleep problems of her own (B = 34.0) and whether she had an anxious style of attachment (B = 1.13) uniquely explained some of the variance in the duration of premature infants’ nighttime awakenings. Mothers with previous sleep problems tended to have infants that were awake for about one half hour longer during the night, on average, compared with the infants of mothers without previous sleep problems, even after controlling for the mother’s happiness, family functioning, extent of active physical comforting, and whether she had an anxious style of attachment. The model also revealed that for every standard deviation increase in the extent to which a mother’s style of attachment was anxious, the duration of her infant’s nighttime awakening increased by 0.24 of a standard deviation, when all the other explanatory variables in the model were controlled.
Table 5.13  
Duration of Nighttime Awakening Regressed on Family Functioning, Mother’s Happiness, History of Sleep Problems, Use of Active Physical Comforting, and Having an Anxious Style of Attachment

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE</th>
<th>β</th>
<th>Collinearity Statistic</th>
<th>Adjusted $R^2$</th>
<th>$R^2$ Change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Tolerance</td>
<td>VIF</td>
<td></td>
</tr>
<tr>
<td><strong>Model 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family Functioning (unhealthy)</td>
<td>20.47</td>
<td>10.29</td>
<td>.22</td>
<td>.65</td>
<td>1.54</td>
<td></td>
</tr>
<tr>
<td>Mother’s History of Sleep Problem</td>
<td>40.23**</td>
<td>10.82</td>
<td>.34**</td>
<td>.90</td>
<td>1.11</td>
<td>.20</td>
</tr>
<tr>
<td>Mother’s Happiness</td>
<td>-3.60</td>
<td>11.12</td>
<td>-.03</td>
<td>.68</td>
<td>1.47</td>
<td>$p &lt; .001$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$p &lt; .001$</td>
</tr>
<tr>
<td><strong>Model 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family Functioning (unhealthy)</td>
<td>16.90</td>
<td>10.46</td>
<td>.18</td>
<td>.62</td>
<td>0.62</td>
<td>.21</td>
</tr>
<tr>
<td>Mother’s History of Sleep Problem</td>
<td>35.99**</td>
<td>11.06</td>
<td>.31**</td>
<td>.84</td>
<td>0.84</td>
<td>$p &lt; .001$</td>
</tr>
<tr>
<td>Mother’s Happiness</td>
<td>-7.03</td>
<td>11.25</td>
<td>-.07</td>
<td>.65</td>
<td>0.65</td>
<td>$p = .115$</td>
</tr>
<tr>
<td>Active Physical Comforting</td>
<td>0.33</td>
<td>0.21</td>
<td>.15</td>
<td>.87</td>
<td>0.87</td>
<td></td>
</tr>
<tr>
<td><strong>Model 3</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family Functioning (unhealthy)</td>
<td>9.33</td>
<td>10.88</td>
<td>.10</td>
<td>.55</td>
<td>1.81</td>
<td>.24</td>
</tr>
<tr>
<td>Mother’s History of Sleep Problem</td>
<td>34.03**</td>
<td>10.91</td>
<td>.29**</td>
<td>.84</td>
<td>1.19</td>
<td>$p &lt; .001$</td>
</tr>
<tr>
<td>Mother’s Happiness</td>
<td>2.39</td>
<td>11.91</td>
<td>.02</td>
<td>.57</td>
<td>1.77</td>
<td>$p = .036$</td>
</tr>
<tr>
<td>Active Physical Comforting</td>
<td>0.32</td>
<td>0.20</td>
<td>.14</td>
<td>.87</td>
<td>1.14</td>
<td></td>
</tr>
<tr>
<td>Anxious Style of Attachment</td>
<td>1.13*</td>
<td>0.53</td>
<td>.24*</td>
<td>.57</td>
<td>1.74</td>
<td></td>
</tr>
</tbody>
</table>

Note. VIF = variance inflation factor. *$p < .05$;  **$p < .01$; ***$p < .001$.  N = 105. Mother with sleep problem = 1; without = 0.
5.7 Summary

Overall, the bivariate correlations between the explanatory and outcome variables were small to moderate in magnitude, ranging from .11 to .42. Some of the initially proposed predictors were omitted from the multivariate analyses because there were very modestly, if at all, correlated with the outcome variables. The omitted variables included whether the infant had health problems. The infant’s birth order did not seem relevant to the duration of nighttime awakening and the mother’s history of her own sleep problems and maternal happiness were not correlated with the frequency of nighttime awakening.

The findings revealed that there was a positive relationship between the mother’s use of active physical comforting to settle her infant, at bedtime, and the frequency and duration of her premature infant’s awakenings. These mothers also reported that their infants had small to serious sleep problems.

The results of the hierarchical multiple regression analyses showed that selected variables predicted a small amount of the variance in the frequency of the infants’ nighttime awakenings and the duration of their nighttime awakenings. The extent to which the mothers had an anxious style of attachment significantly predicted the duration of nighttime awakenings in the premature infants, which was the case even after the effects of mothers’ use of active physical comforting to settle their infants, their degree of happiness, their own histories of sleep problems, family functioning were considered. If the mother had a history of sleep problems of her own, she was more likely to have an infant who was awake for relatively longer periods of time during the night. The use of active physical comforting was a stronger predictor of the frequency of the infants’ nighttime awakening than was whether the mother had an anxious style of attachment.
6 Discussion

This chapter provides the primary conclusions of this study and is divided into five main sections: (a) a general description of the study objectives and procedures, (b) a description of the study sample and premature infants’ sleep patterns, (c) a discussion of the current findings in light of other evidence, (d) the study’s strengths and limitations, (e) some implications for practice and research, and some recommendations for education and administration.

6.1 Description of the Study

Although premature infant birth rates have increased worldwide (Fox, 2002), with a corresponding increase in premature infants’ survival rates, there is a paucity of research examining premature infants’ sleep. No studies have explored the association between premature infants’ nighttime awakening and whether their mothers have an anxious style of attachment and the mother’s use of intense physical comforting at bedtime. The major contribution of this study was that it focused on premature infants, an understudied population in the field of sleep research. The purpose of this cross-sectional study was to enlarge understanding of premature infants’ sleep by examining whether having an anxious style of attachment, on the part of the mother, and mothers’ bedtime behaviour were associated with infants’ nighttime awakening and sleep problems. More specifically, the study examined the relationships between intensive use of active physical comforting strategies to settle infants to sleep and infants’ nighttime awakenings and sleep problems. The study included 105 mothers who had premature infants (born
before 37 weeks of gestation). The majority of the participants were from Canada and USA.

The study was guided by France and Blampied’s (1999) Infant Sleep Self-initiation Model, which describes the relationship between infants’ sleep and maternal characteristics, such as a mother’s style of attachment and mother-infant bedtime interactions. According to the model, infants’ signaled nighttime awakening occurs because infants lack the ability to self-initiate sleep. The failure to self-initiate sleep results from inappropriate sleep cues being provided to the infant by the mother at bedtime. Mothers’ intense involvement at bedtime, such as using excessive rocking, carrying the infant, and her very presence, is thought to create dependency. France and Blampied (1999) claimed that these features of mothers’ behaviour arise, in part, because she has an anxious style of attachment. Guided by this theory of the sources of infants’ sleep problems, the following research questions were addressed in this study:

(a) Is maternal bedtime behaviour used to settle infants to sleep associated with mothers’ reports of sleep problems in their infants born prematurely at five to six months of corrected age?

(b) Is there an association between mothers’ bedtime behaviour used to settle their infants to sleep and the frequency of the nighttime awakenings and duration of nighttime awakenings of premature infants at five to six months of corrected age?

(c) Is there an association between the extent to which mothers display an anxious style of attachment and the frequency of the nighttime awakenings and duration of nighttime awakenings of premature infants at five to six months of corrected age, when maternal bedtime behaviour (in particular the use of active physical comforting
strategies) to settle infants to sleep, family functioning, maternal happiness, maternal marital status, infant birth order, and infants’ health problems are statistically controlled?

6.2 Sample Demographics

In the following sections, the study sample (n = 105) is compared with samples described in other pediatric sleep studies and with the general population. In addition, findings pertaining to premature infants’ nighttime sleep patterns from this study are compared with findings reported by other researchers.

6.2.1 The Study Infants’ Demographics and other Characteristics

Sixty-nine percent of the premature infants studied here were born between 34\(\frac{1}{7}\) and 36\(\frac{6}{7}\) weeks of gestation. This relatively high prevalence of “late” preterm births (from 34-36 weeks gestation) is congruent with the general preterm population. According to the World Health Organization (WHO, 2009) a rise in late preterm births accounts for the majority of the observed increase in the incidence of preterm birth, worldwide. For example, the prevalence of late preterm birth in the USA represented 71.1% of all preterm births, in 2006, compared with 13.3% of infants born between 32-33 weeks and 15.6% for very premature infants (born < 32 weeks of gestation) (WHO, 2009).

In the sample studied here, only 4.8% of the premature infants were small-for-gestational-age (SGA). The Public Health Agency of Canada (2008) reported that SGA rates have dramatically declined: from 10.1% in 1995 to 7.8% in 2004. Nonetheless, the sample for this study had a lower rate of SGA than does the overall Canadian preterm
infant population. This lower rate may be the result of the mothers in the study being largely well-educated, upper middle class, and from a variety of English-speaking countries across the world.

About one half the study infants were born by Cesarean section. According to the National Vital Statistics of the USA (Martin et al., 2009), Cesarean section rates increased for premature births at all gestational ages between 1996 and 2006; they reported that 35 - 40% of premature infants (> 32 week of gestation) were born by Cesarean section in 2006 compared with less than 30% in 1996. In addition, the Cesarean rate for appropriate-for-gestational-age (AGA) infants was reported to be between 22% and 38% for 1999 and 2000, in the USA (Lee & Gould, 2006). The current sample had a higher Cesarean section rate compared with the premature infant population born after 32 weeks of gestation. Because the mean age of the mothers in the study was 31.5 years and 86.7% of the infants had appropriate weights for their gestational age, it is difficult to speculate about the reasons underlying the high Cesarean rate of the study sample. Other factors could have been operating that were not assessed, such as maternal and fetal health and position at the time of delivery or the mother’s choice.

The World Health Organization (WHO, 2010) recommends exclusive breastfeeding during the first six months of life. Approximately 19% of the infants in the study were reported to have been breastfed exclusively, which is comparable with the general Canadian population. The percentage of Canadian infants who were exclusively breastfed until six months of age was 20% in 2005 (Organisation for Economic Co-Operation and Development Family Database, 2009), whereas 12.3% of the American
The study questionnaire gathered information about the infants’ health status, including whether they had allergies, reflux, or transient health problems because they may be associated with sleep problems. Sixty percent of the mothers reported that their infant had no health problems, while 27.6% reported the presence of reflux. The prevalence rate of gastro-esophageal reflux disease in the sample is lower than that observed in the general population of premature infants. In their systematic review, Hibbs and Lorch (2006) reported that the prevalence of GERD in premature infants ranges between 40% and 85%, although the severe form occurs in about 8-10% of infants (Vandenplas, Goyvaerts, Helven, & Sacre, 1991). No association between the presence of reflux and the quality of the infants’ sleep was noted. Given that the definition of reflux varies among health care professionals (Golski et al., 2010), an explanation for this null finding may be that the infants in this study did not suffer from severe reflux or had very few regurgitations. It is the number of regurgitations that have been found to increase infants’ nighttime awakening (Ghaem et al., 1998).

Approximately 12% of the mothers reported that their infants had transient health problems or allergies, a rate that is consistent with the rates provided by other researchers. For example, Morgan et al. (2004) followed 257 premature infants, in the United Kingdom, to 12 months of age and reported a prevalence rate of 15% with health problems, including upper and lower respiratory system and gastrointestinal symptoms.

The analysis presented here showed no association between the premature infants’ current weight and their mothers’ reports of their having sleep problems. Many
researchers have examined the relationship between weight gain and children’s sleep problems, although none has been conducted with preterm populations (e.g., Jenni, Molinari, Caflisch, & Largo, 2007; Taveras, Rifas-Shiman, Oken, Gunderson, & Gillman, 2008; Tikotzky et al., 2010). The evidence in the literature regarding weight gain and the sleep problems of full-term infants is inconsistent. For example, using a cross-sectional study, Tikotzky et al. found an association between nighttime sleep duration and the weight of 96 first-born, healthy, full-term infants aged 6 months. Their findings suggested that shorter nighttime sleep duration was associated with an increase in infants’ weight. Similarly, in a study of 915 mother-infant pairs who were observed at 6 months and 1 and 2 years of age, the infants that slept less than 12 hours a day had greater adiposity (measured by skin-fold thickness and body mass indices) and were more likely to be overweight at 3 years of age (Taveras et al., 2008). In contrast, a longitudinal study conducted by Jenni et al. (2007) failed to support an association between somatic growth (e.g., weight) and nighttime sleep duration in 305 children who were followed from their first year of life to the age of 10 years.

6.2.2 The Study Mothers’ Demographics and other Characteristics

The majority of the mothers in this study had college education or higher and incomes that were greater than the yearly median family income of Canadian or American families, in general. Premature infant birth has been associated with less educated (Grjibovski, Bygren, Yngve, & Sjostrom, 2004) and economically disadvantaged families (Mortensen et al., 2010). The higher socioeconomic status of the women who participated in this study is common in research and was possibly
compounded by the use of an online survey; highly educated mothers likely have more access to the internet. This sample bias was observed in another study that used a web-based survey to study children’s sleep; the authors reported that their study respondents were highly educated and mainly White women (Sadeh, Mindell, Luedtke, & Wiegand, 2009).

In the current study, 93% of the mothers were married or cohabiting and the majority (81.9%) identified themselves as Caucasian, which reflects the percentage of Caucasians in North America. In 2008, the official estimate of White people in the US population was 79.8% (U.S. Census Bureau, 2008), whereas visible minorities (non-White and non-Caucasian) and aboriginal people represented 19.9% of the population in Canada, in 2006 (Statistics Canada, 2009b). It is possible that non-Caucasian women were under-represented because all the study materials were available in English only. An over-representation of Caucasian people is commonly reported in other pediatric studies (Dennis & Ross, 2005; Meltzer & Mindell, 2007; Sadeh et al., 2009; Touchette et al., 2005; Van-Tassel, 1985). For example, Caucasian participants formed 97% and 98% of the study samples in research conducted by Van-Tassel (1985) and Meltzer and Mindell (2007), respectively. The variables of mother’s ethnicity, education, and income had no relationship with the study infants’ nighttime awakening. As well, these demographic characteristics were not associated with the mothers’ perceptions of the quality of their infant’s sleep. This finding is somewhat inconsistent with what others have reported. Children’s sleep problems have been observed to be reported more frequently by White mothers (Lozoff, Askew, & Wolf, 1996; Milan, Snow, & Belay, 2007) and among relatively poorly educated mothers (Rona, Li, Gulliford, & Chinn,
Taveras et al. (2008) found that children of minority racial groups (i.e., African-American and Hispanic) and of lower socioeconomic status, who were followed from 6 months to 3 years of age, reportedly slept less than 12 hours a day. Their sample included 915 full-term children of mostly White, highly educated parents (i.e., college graduates) with relatively high household income. In contrast, Mindell et al. (2009) did not find any significant associations between mothers’ demographics (i.e., education, employment, and income) and children’s sleep. Morrell (1999) also did not report any significant associations between mothers’ marital status, age, or income and infants’ sleep patterns.

About 25% of the mothers in this study reported that they had a history of sleep problems. Mendelson et al. (2004) reported that one third of adult Americans and 17.9% of Canadians have sleep problems. Thus, the mothers in this study appear to be fairly typical with respect to their reports of the quality of their sleep.

### 6.3 Premature Infants’ Sleep Patterns

It is difficult to compare the findings related to this study’s premature infants’ sleep with the evidence available in the literature. First, the literature includes different conceptualizations of infants’ problematic nighttime sleep. For example, Lozoff, Wolf, and Davis (1985) defined sleep problem as struggles to settle infants to sleep (more than 1 hour of protest) or nighttime awakening that kept parents awake for more than one half hour. Other researchers have used Richman’s criteria (Benoit, Zeanah, Boucher, &

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16 Based on Richman’s criteria, sleep problems are considered to be present if a child has been: (1) waking three or more times a night, (2) waking for more than 20 minutes during a night, (3) taken into the parents’ bed, (4) refusing to go to sleep at bedtime or requiring parental presence to fall asleep. All these conditions should be present for at least 3 consecutive months and for 5 or more nights/week.
Minde, 1992) or a modified form\textsuperscript{17} of these criteria (Morrell, 1999). As well, various measures have been used to assess infants’ nighttime sleep, such as actigraphy, sleep diaries, and various questionnaires. The paucity of studies that have examined premature infants’ nighttime sleep, specifically at 5-6 months of age, makes it rather difficult to compare the current findings with other evidence.

In the current study, the operationalization of premature infants’ sleep problems was guided by the France and Blampied (1999) conceptualization. Infants’ signaled (cry) nighttime awakening and inability to return to sleep without assistance was hypothesized to result from a lack of sleep self-initiation skills. According to France and Blampied, infants’ abilities to learn these skills are influenced by many factors, including mother-infant bedtime interactions (which are affected by the quality of the mother’s style of attachment). In the current study, the infants’ sleep was assessed with three measures: (1) the frequency of their nighttime awakening, as reported by their mother (2) the duration of their nighttime awakening, per night, as reported by their mother, and (3) their mothers’ perceptions of the presence of any sleep problems. In addition, the Brief Infant Sleep Questionnaire (BISQ) was used to assess the infants’ daytime and nighttime sleep patterns and sleep context. The BISQ has been widely used as a measure, particularly in web-based settings (Sadeh, 2004; Sadeh et al., 2009).

The study infants’ mean frequency of nighttime awakenings was 2.1 (range: 0-10) and the duration of these awakenings was 45.7 minutes. Their total nighttime sleep averaged 9.2 hours. The percentages of mothers who reported that their infant’s sleep was a small problem or a serious problem were 45.7% and 9.5%, respectively. One in ten

\footnote{\textsuperscript{17} Richman’s criteria, when modified, include settling and nighttime waking problems based on mothers’ reports and perceptions of the presence of sleep problems.}
(8.6%) mothers reported that the infant shared a bed, and 35% the infants shared a room. Female infants were more involved in co-sleeping than were male infants, and 22.9% of the infants slept in the prone position.

When comparing the results obtained through the use of the BISQ with other studies that also relied on the BISQ to measure infants’ nighttime sleep, the mean frequency and duration of the study premature infants’ nighttime awakening were slightly greater than what has been documented for community samples of full-term infants (Hiscock & Wake, 2002; Sadeh, Ofir, Tirosh, & Tikotzky, 2007; Sadeh et al., 2009). For example, Sadeh and colleagues (2007; 2009) reported average number of nighttime awakenings for healthy full-term infants of 1.6 and 1.3, whereas the infants in this study were reported to arouse 2.1 times each night. These authors reported the mean duration of their study infants’ nighttime awakenings to be 23.4 and 21.6 minutes; the infants in the current study were aroused for 45.7 minutes, on average. In a study that included 7- to 18-month-old full-term infants who were identified by their mothers to have sleep problems (ranging from small to severe), Mindell et al. (2009) found the mean frequency and duration of their nighttime awakenings to be 1.5 times and 23.5 minutes, respectively. The frequency of the infants’ nighttime awakenings found in the current study is not unusual. For example, in a study using the BISQ to assess 96 6-month-old full-term infants, Tikotzky et al. (2010) reported a mean frequency of nighttime awakenings of 2.3 times with a range of 0-11 times.

The greater frequency and duration of nighttime awakening observed in this study may be due to the presence of a few outliers, especially for the duration of nighttime awakening. The effect of the outliers slightly increased the mean frequency of nighttime
awakenings. The mean duration of nighttime awakening was also increased slightly by a few outliers. It is possible that premature infants have more frequent nighttime awakenings compared with full-term infants. More research will have to be conducted to ascertain whether this is the case; this was the first North American study to investigate premature infants’ nighttime sleep patterns at this age.

The infants’ mean duration of nighttime sleep was 9.2 hours, which is very close to the observed means reported elsewhere (e.g., 9.5 hours; Mindell et al., 2009). Sadeh et al. (2009) reported a mean of 9.9 hours for healthy full-term infants. They also reported a mean of 1.3 hours for daytime sleeping (i.e., naps), for infant of 6 to 8 months of age, which was shorter than the mean duration found in the current sample of premature infants (3.5 hours). It is possible that longer daytime naps counterbalanced the relatively shorter total nighttime sleep duration of these infants.

The percentages of mothers who perceived their infants’ sleep as a small or serious problem were 45.7% and 9.5%, respectively. These results are higher than an American and Canadian internet-based survey of 5,006 children aged 0-36 months (Sadeh et al., 2009). Sadeh et al. reported that 23% of parents described their child’s sleep as being a small problem and only 2% reported it as being a serious problem. The smaller percentage of serious sleep problems reported in Sadeh et al.’s study may have been the result of a fairly wide age range; the prevalence of behavioural sleep problems has been shown to decline from 25% to 50% in 6- to 12-month-old infants to 25% to 30% in 12- month-old to 3-year-old children (Mindell & Owens, 2003a). A published review of the literature suggested that the prevalence of full-term infants’ behavioural sleep problems ranges from 25% to 46% (Morrell, 1999; Hiscock & Wake, 2002), which is
slightly lower than the findings produced by the current study. Wolke, Meyer, Ohrt, and Riegel (1995) found lower prevalence rates of sleep problems in premature and full-term infants in Europe; they used parental distress as an indicator of the infants’ sleep problems. About 14% of the parents reported that they were distressed by their 5-month-old infants’ sleep. Their operationalization may be comparable to the severe/serious form of sleep problems measured with the BISQ. If so, the current rate of serious sleep problems (9.5%) is somewhat similar to Wolke et al.’s findings.

Because some authors have concluded that there is no difference in the prevalence rates of sleep problems between full-term and premature infants (e.g., Wolke et al., 1995), the higher reported number of children with sleep problems (mothers’ reports of small or serious sleep problems (55.2%)) in this study may be an artifact of the methods employed, specifically the use of an online survey. Ninety-five percent of the responses in this study were gathered from a web-based survey: it is possible that many of the mothers had concerns about their infants’ sleep and were searching the internet for information to manage their infants when they discovered the opportunity to participate in the study. In another web-based study, Sadeh (2004) acquired a skewed sample with a relatively high prevalence of sleep problems: 34.3% with a very serious problem, 59.6% with a small problem, and 7.1% with no problem. Moreover, the majority of the mothers in the current study was “Caucasian” and well educated. “Caucasian” mothers have been shown to place a high value on independence in their infants and have high expectations regarding their infants’ sleep regulation (Milan et al., 2007). Accordingly, they are inclined to report relatively more sleep problems in their infants.
The women who participated in the current study were less likely to report that their infants shared a bed or room with another person. Although co-sleeping is a controversial issue because of various claims about its physical and psychosocial effects on infants (Middlemiss, 2004; Ferber, 1985; Jenni, Fuhrer, Iglowstein, Molinari, & Largo, 2005; Morgan, Groer, & Smith, 2006), this sleep arrangement is widely practiced. In the current study, 8.6% of the mothers reported co-sleeping (bed-sharing) their infants. This rate is lower than reported by a 7-year survey conducted in the USA between 1993 and 2000, wherein 12.4% of mothers of premature infants reported bed-sharing (Willinger et al., 2003). The difference in rates may be attributed to the participation of mostly “Caucasian” mothers in the current study.

The percentage of mothers who reported that their infant shared a room, in the current study, was 26.7%; which is lower than the rate (45%) obtained in a study of the sleeping arrangements of infants in the USA (Hauck, Signore, Fein, & Raju, 2008). No association was found between the study infants’ frequency of nighttime awakening and their sleeping arrangement (i.e., bed or room sharing), which is contrary to some previous findings (Elias, Nicolson, Bora, & Johnston, 1986). Elias et al. reported that children’s (7- to 24-months old) maximum period of unbroken sleep (bout length) and total sleep were significantly shorter for children who slept with their mothers (shared a bed).

The analysis in this study showed that female infants were required to share a bed or room more often than were boys. In their retrospective study of 161 female and 111 male “Caucasian” students, Billingham and Zentall (1996) found that parents reported more co-sleeping (bed-sharing) with their female infants during the first months of life. It is unclear why female infants were more likely to have “shared bed/room” with others in
the study here. In addition, no information was available about whether this sleep arrangement (sharing bed/room with others) was proactive or reactive. Reactive co-sleepers use co-sleeping (bed sharing) as a way to manage their infants’ sleep problems. Ramos (2003) found that only 3% of mothers who were proactive co-sleepers (shared a bed) reported sleep problems compared with 20% of mothers who were reactive co-sleepers. The analysis conducted here, however, failed to find a relationship between an infant’s sleep arrangements (i.e., bed or room sharing with others) and the mother’s perception of their being a problem with the infant’s sleep. The literature generally reports that male infants have more sleep problems (Van-Tassel, 1985) and more nighttime awakenings than do female infants (Anuntaseree et al., 2008), which may explain some sleep arrangements. However, the findings did not demonstrate a significant correlation between the sex of the infant and nighttime awakenings and sleep problems.

Despite the evidence relating a reduction in the incidence of sudden infant death syndrome to having infants sleep in a supine position (on their backs) (American Academy of Pediatrics, 1996) and the lack of association between infants’ supine sleeping and other health risks (Hunt et al., 2003), close to 23% of the mothers in this study reported that their infant slept in the prone position. This rate is relatively high compared with previous findings. Surveys conducted in the United States between 1993 and 2007 found that the prevalence of infants sleeping prone was about 10% for “Caucasian” and 20% for African-American populations (Colson et al., 2009). This finding may be explained, at least in part, by the fact that the mothers often observed their infants sleeping in the prone position in a neonatal intensive care unit, where the practice
is common. Fragile premature infants with respiratory problems may be placed in prone positions during the first few weeks of life for medical reasons, such as the need to increase their lung volume or improve their oxygen saturation (Kassim et al., 2007). These infants are closely observed and so the risk of sudden death is considered to be significantly reduced. Following discharge from the hospital, however, it is generally recommended that premature infants should be placed in the supine position similar to their full-term counterparts (Kassim et al.). Factors linked to mothers’ choice of sleep position for their infant have included concerns about the infant’s safety (e.g., choking), the infant’s comfort, and the advice received from physicians (Colson et al., 2009).

Colson et al. found that 45% of mothers reported that they were not advised to place their infant in a supine position or not to use a prone position. Aris et al. (2006) found that there was inconsistency in the discharge instructions given for mothers of premature infants about appropriate sleep positions. The mothers of the premature infants in the current sample may not have received clear information about safe sleep positions for their infants.

### 6.4 A Summary of the Major Findings

The findings suggest that there is an association between some maternal factors, including whether a mother has an anxious style of attachment and her active use of physical comforting strategies, and premature infants’ nighttime awakenings and sleep problems.
6.4.1 Premature Infants’ Frequency of Nighttime Awakening

Factors found to be associated with the frequency of the premature infants’ nighttime awakenings were the mothers’ use of active physical comforting strategies to settle their infants to sleep, whether they had an anxious style of attachment, reported family functioning and the infant’s birth order. The current study identified that active physical comforting strategies had a significant positive partial correlation with the frequency of awakening \((r = .25)\), which supports the hypothesis that mothers’ intense involvement at bedtime can be problematic. It appears that infants may signal for their mothers upon arousal because they do not have the ability to soothe themselves and return to sleep.

Of the variables examined, only the infant’s birth order (second or later born infants had more frequent awakenings) and the mother’s active physical comforting made a statistically significant contribution in explaining the frequency of infants’ nighttime awakenings.

6.4.2 Premature Infants’ Duration of Nighttime Awakening

Of all the variables examined, only the mother’s history of having sleep problems of her own and whether she had an anxious style of attachment were significantly associated with the duration of the premature infants’ nighttime awakening. The multivariate analysis provided support for the hypothesized association between mothers with an anxious style of attachment and premature infants’ sleep problems (nighttime awakenings). The current findings identified that active physical comforting strategies
had a significant positive partial correlation with the duration of awakening \((r = .22)\), which suggests that mothers’ intense involvement at bedtime can be problematic.

### 6.4.3 Mothers’ Perceptions of the Quality of their Infants’ Sleep

Slightly over one half (55%) of the infants in this study were found to have sleep problems and 17% of the mothers rated these problems as serious. Mothers who used relatively more active physical comforting strategies for their infants were more likely to report that their infants had sleep problems. In addition, these mothers were more likely to indicate that they settled their infants to sleep through the use of movement. This finding further supports the hypothesis that there is an association between infants’ sleep problems and the ways in which their mothers comfort and settle them for sleep at bedtime.

### 6.5 A Discussion of the Findings in the Context of the Reported Evidence

The study findings produced here are discussed in relation to other evidence provided in the sleep literature. There is a paucity of evidence about premature infants’ sleep patterns and problems; thus, the discussion occurs in the context of what we know about full-term infants’ sleep. The findings are also compared with the evidence that links mothers’ styles attachment with their infants’ sleep, as well as with their behaviour, development, and health, in general.

Because of the methodological challenges found in the literature about infants’ sleep that arise because of great diversity in the conceptualization and measurement of
the problem and the practice of sampling children with a wide age range, comparisons with the published evidence should be read with caution.

6.5.1 The Key Study Variables

In this section, a discussion of the findings for mothers’ anxious style of attachment and maternal bedtime behaviours to settle infants in relation to premature infant sleep is presented.

6.5.1.1 Mothers with an Anxious Style of Attachment

The effects of attachment on infants’ sleep problems have generally been examined from the infants’ perspective (i.e., infants’ attachment). Insecure attachment on the part of infants has been linked to their having sleep problems (Morrell & Steele, 2003; Scher, 2001); however, only one study has investigated the link between attachment and sleep problems from the mother’s perspective. Benoit et al. (1992) studied 41 full-term children ($M = 31.5$ months of age, $SD = 7.2$); most of the mothers in the study were of middle-class background and all were White. The researchers used Richman’s criteria for sleep problems and the Adult Attachment Interview. They concluded that all the infants with sleep problems had insecurely attached mothers, compared with 57% of group without sleep problems. This appears to be the only study that has examined maternal attachment and children’s sleep problems. To date, no study has examined the links between maternal attachment and sleep problems in a sample of premature infants at five to six months of age.
This study found a statistically significant association between mothers having an anxious style of attachment and the duration of their premature infants’ nighttime awakening, but not with the number of awakenings in a night. The style of attachment, however, explained a very small amount of the variance in the duration of awakening (3.3%). Benoit et al. (1992) reported a larger correlation between sleep problems and having a mother with an insecure style of attachment although there are important methodological differences between the two studies. Benoit et al. studied a group of toddlers with diagnosed sleep disorders and employed an adult attachment interview, whereas the current study relied on mothers’ responses to a questionnaire. France and Blampied’s theory that mothers’ style of attachment is associated with infants’ inability to self-initiate sleep appears to be supported.

An outstanding question is why the mothers’ style of attachment would be associated with the duration of nighttime awakening but not its frequency. The frequency of infants’ awakenings is widely used as an indicator of sleep problems (Armitage et al., 2009; Gelman, Jory, & Macris, 1998; Goodlin-Jones, Burnham, Gaylor, & Anders, 2001; Hiscock & Wake, 2002; Karraker & Young, 2007; Lozoff et al., 1996; Wolke et al., 1995) or part of the criteria for diagnosing sleep problems (Deleon & Karraker, 2007; Morrell, 1999; Richam, 1981; Van-Tassel, 1985). Given that mothers usually are the primary care-givers of their infants and more involved when their infants arouse at night, brief periods of arousal, even if they occur several times in a night, may not be disruptive to the mothers’ sleep and may not be worthy of mention. It may be periods of prolonged arousal, which require attention, that are the most problematic for parents and thus the most likely to be reported. Anxiously attached mothers tend to be disorganized and often
use multiple approaches to handle various issues (Bolen & Lamb, 2004; Weingardt, 2000). Using various strategies to settle their infants upon waking may prolong the period of arousal and may cause more frustration. Hence, duration rather than frequency of nighttime awakening may be a better indicator of persistent sleep problems.

An unexpected result in the current study is that there was no association found between mothers’ style of attachment and their behaviour at their infants’ bedtime (i.e., the use of active physical comforting strategies to settle their infants to sleep). This finding is not congruent with France and Blampied’s theory that linked mothers’ attachment style with their involvement in settling their infants at bedtime. Mothers having anxious styles of attachment are expected to use more active physical comforting, which is postulated to hinder their infants’ ability to develop sleep self-initiation skills.

The lack of association between mothers’ active physical comforting and having an anxious style of attachment occurred for at least two possible reasons. First, as described by Berman and Sperling (1994), anxiously attached individuals are characterized by approach and avoidance behaviour (i.e., the tendency to attend to stressors in some instances and ignoring or diverting attention away from the stressor in other instances). Thus, it is possible that the relationship between active physical comforting and mothers’ style of attachment was mitigated by an inconsistent use of active and passive comforting strategies. The mothers in this study used a variety of strategies: active physical comforting represented about 54% of all strategies, the encouragement of autonomy was employed 50% of the time, and social comforting represented 45% of all the strategies used by mothers. Furthermore, the mothers who reported that their infants had sleep problems used active physical comforting, social
comforting, and encourage autonomy strategies in equal proportions. It is possible that consistency in the use of settling strategies is more important than a particular type of strategy used. For example, in a study that examined the association between infants’ sleeping arrangements and mother-infant interaction, consistency in sleep arrangements was found to be associated with more positive mother-infant interaction (Taylor, Donovan, & Leavitt, 2008). Lack of consistency may play a significant role in the development and maintenance of premature infants’ sleep problems because the approach-avoidance style gives conflicting messages to infants that may contribute to difficulties in settling them after nighttime awakening.

A second possible explanation for the lack of association found between active physical comforting and mothers’ style of attachment may be associated with the scale used to measure the mothers’ bedtime behaviour. That is, the scale may not have functioned adequately in terms of its sensitivity. It may be that the items in the active physical comforting subscale of the instrument were insufficient to capture all the dimensions of mothers’ intrusive involvement in their infants’ settling.

6.5.1.2 Mothers’ Bedtime Behaviour to Settle their Infants to Sleep

The study revealed that mothers’ intense involvement at bedtime, as exemplified by the use of active physical comforting to settle their infants to sleep (e.g., cuddling, rocking, offering feeding, and placing the infant in the parents’ bed), independently accounted for about 6% of the variance in the frequency of the infants’ nighttime awakenings. These findings are consistent with those of previous studies (e.g., Morrell & Steele, 2003; Sadeh et al., 2009; Van-Tassel, 1985; Touchette et al., 2005). Morrell and
Steele concluded that active physical comforting used to settle 14- to 16-month-old infants to sleep is among the most relevant factor associated with infants’ sleep problems. Van-Tassel (1985) also concluded that mothers’ behaviour, such as placing the infant in the parents’ bed and nighttime feeding, interfered with infants’ continuous night-time sleep and was a strong predictor of sleeping problems in early and late infancy.

The small proportion of the variance in the frequency of nighttime awakening explained by mothers’ settling behaviour was unexpected. Van-Tassel (1985) reported that nighttime feeding and sleeping in the parents’ bed accounted for 40% and 47% of the variance in sleeping disturbances, respectively. The small proportion of variance explained by active physical comforting could be related to the properties of the scale used. It may be that the items in the scale did not capture all aspects of mothers’ intense involvement at bedtime. Another possible explanation is that variables other than those examined in this study may play a significant role in the sleep problems of premature infants.

Similarly, in this sample active physical comforting was not a predictor of the duration of infants’ nighttime awakenings. An explanation for this finding may be the inclusion of the mother’s history of sleep problems of her own, in the multivariate regression model. It may be that the mother’s history of sleep problems reduced the contribution of active physical comforting. This explanation is supported by the partial correlations\(^ {18} \) observed between active physical comforting and the frequency and duration of nighttime awakening; active physical comforting was significantly associated with both. A large longitudinal sample (n = 1,741) of Canadian full-term and preterm infants.

\(^{18}\) Correlations adjusted for infant’s health problems and birth order, and mother’s happiness, family functioning, and having an anxious style of attachment
infants (4.2%) also investigated the role of maternal bedtime behaviour in infants’ sleep regulation (Touchette et al., 2005). Parental behaviour at bedtime, and in response to infants’ nighttime waking (i.e., rocking the infant to sleep or placing the infant in the parents’ bed), were the factors most strongly associated with sleeping less than 6 consecutive hours at night for 5-month-old infants. Thus, mothers who are more physically involved in comforting their infants at bedtime appear to be at greater risk of having infants with sleep problems. Conceptually, mothers’ bedtime behaviour that promotes infants’ independence and self-initiation of sleep should be associated with fewer nighttime awakenings (France & Blampied, 1999). It was expected that mothers’ use of bedtime strategies such as social comforting and the encouragement of autonomy would be associated with fewer nighttime awakenings. A study conducted with 288 mother-infant pairs (13-month-old infants) reported that active physical comforting and strategies that encouraged autonomy differentiated infants with sleep problems from those without sleep problems (Morrell & Cortina-Borja, 2002). This finding is congruent with the current study in which the use of active physical comforting was more frequently reported by mothers with infants that had sleep problems.

Contrary to the hypothesis that less involvement in infants’ bedtime should be associated with fewer nighttime awakenings, the results of the current study demonstrated a positive partial correlation between social and infants’ nighttime awakenings. As well, those strategies that were considered to “encourage autonomy” were more frequently reported by mothers who had infants with sleep problems. In this study the discrepancy may be related to the scale that was employed to measure the mothers’ bedtime behaviour; it did not operate as expected in this sample, although it had been developed
for, and used with, infants (Morrell & Cortina-Borja, 2002). For example the “passive
physical comforting” and “encourages autonomy” subscales had very poor internal
consistency. It is also possible that there is some overlap among the subscales’ content,
which may explain the current findings. In considering the items in the social comforting
subscale, including “reading a story to child” and “playing with child”, it is possible that
the parents do these things in conjunction with other things such as cuddling, patting, or
carrying the infant. These adjunct settling behaviours are categorized under the active
physical comforting strategy. This overlap may explain the positive partial correlation
found between social comforting and infants’ frequency and duration of nighttime
awakenings. The Parental Interactive Bedtime Behaviour scale is the most readily
available and practical measurement of mothers’ bedtime behaviour. However the poor
functioning of the scale is indicative of the need for further refinement.

The mothers that reported that their infants had sleep problems used all the
strategies assessed equally: active physical comforting, social comforting, and the
encouragement of autonomy. Other strategies, such as settling through movement and
passive physical comforting were used less frequently. Finding that social comforting and
the encouragement of autonomy were used with infants who had sleep problems was
unexpected. This demonstrates a lack of consistency in mothers’ approaches to settle
their infants to sleep. It is plausible that these findings arose because mothers who are
concerned about their infants’ sleep tend to use a variety of strategies to settle their
infants. It is widely believed that consistency in parental practices promotes optimal
infant developmental outcomes (Ainsworth et al., 1978; Gardner, 1989; Sadeh & Anders,
Consistency in comforting strategies seems to be a key factor in premature infants’ development of sleep self-initiation skills.

6.6 Strengths and Limitations of the Study

This study had several conceptual and methodological strengths. This appears to be the first study to explore the relationship between mothers’ style of attachment and premature infants’ sleep problems. Examining mothers’ bedtime interactions (active physical comforting) provides preliminary information about the possible mechanisms underpinning the relationship between infants’ development of problematic (signaled) nighttime awakenings and mothers’ style of attachment.

The concept of attachment is always seen as an integral aspect of the mother-infant relationship, which ultimately affects infant development. However, this concept is uncritically incorporated into the field of infants’ sleep research. Many researchers in the field of pediatrics have focused on the infant’s side of the attachment equation, and see it as a major determinant of infants’ interactions with their surroundings, while the other partner’s attachment (i.e., the caregiver) has received little attention.

The quality of mothers’ interactions with their infants and their ways of controlling the context affects how infants react. Because mothers generally have more input into the interaction, during the early stages of infants’ lives, and mothers’ style of attachment is a major interplaying factor within this context, an advantage of the current study was its ability to highlight some maternal attributes in understanding the outcomes of mother-infant bedtime interaction.
Many researchers have investigated mother-infant attachment and its relationship with aspects of infants’ health and development, particularly with respect to children’s sleep. Some researchers have focused on the infants’ style of attachment (Anders, 1994; Morrell & Steele, 2003; Scher, 2001). Benoit et al. (1992) examined maternal insecure attachment in relation to children’s sleep and found that 100% of the mothers who had toddlers with sleep disorders exhibited an insecure style of attachment. No other studies, to date, have explored the contribution of having an anxious style of attachment to premature infants’ sleep problems.

The study had several methodological strengths. Well-established measures were used to assess the infants’ sleep and the mothers’ style of attachment. Further, the use of a web-based approach increased the recruitment of community-based mothers, a population that is difficult to enroll in research. The web-based survey provided wide coverage for the study.

The study also had its limitations. A convenience sampling method was used to recruit the participants. The use of a non-probability sample typically limits the generalizability of study findings (Polit & Hungler, 1997). Most of the study mothers had relatively high socioeconomic status and were well educated. Also, most had self selected into the study on the basis of having located a description of this study on a website devoted to helping parents to handle problems such as infant sleep problems. While useful, the online approach may have over-estimated the prevalence of sleep problems. It is recommended that future studies make use of a broad approach to recruitment (online and non-online venues (e.g., face to face, telephone)) and include samples of mothers representative of the general population of mothers and their infants.
The cross-sectional design of the study served as another limitation. A longitudinal design would have maximized the ability to make inferences (Pilot & Hungler, 1997) by examining the variables over time that affect premature infants’ nighttime awakening and signaling. In addition, a longitudinal study would have facilitated the investigation of the ways in which mothers’ perceptions about their infants’ sleep are influenced by infants’ developmental trajectories.

Combining the data obtained from both the online and paper-based surveys produced some methodological problems. According to Dillman (2007), one of the potential errors arising from mixing data from paper-based and online surveys is that there are potential measurement differences in the approaches. The disparities between the internet survey design and the paper-based questionnaire, in terms of their visual appearance, may have affected the respondents’ perceptions (Dillman). To mitigate some of the differences, the questions were presented in the same order, and no images or animations were included in the online survey. Given the large proportion of online survey responses (i.e., 100 on line versus 5 paper-based questionnaires), the potential methodological problems originating from having mixed the modes of data collection should not have had a major effect on the study findings.

Another limitation of the study was the use of a subjective measure to determine infants’ sleep problems. Using a subjective measure rather than an objective measure, such as actigraphy, could have introduced some reporting bias. For example, sleep problems would not have been identified if the mother accepted her infant’s nighttime awakening as part of a normal routine. Because the study participants represented different cultural contexts (North America, Australia, and Europe), they would likely
have held diverse values and beliefs about infants’ sleep and sleep problems. This
diversity could have affected the mothers’ perceptions of the quality of their infants’
sleep which would have caused an erroneous estimation of the prevalence of sleep
problems in this population. Another potential limitation of the study was the lack of
attention to possible interactions between the main variables entered into the regression
models. Although the assessment of potential interactions would have refined the
analysis, the relatively small sample size prohibited this analysis.

Finally, collapsing the two categories of sleeping arrangements, sleeping in
parents’ bed and sleeping in the parents’ room in a crib, may be conceptually
problematic. Further work is needed in this area.

6.7 Study Implications

The study provides some guidance for future research and its results present some
important considerations for practice, education and health care delivery.

6.7.1 Implications for Research

The evidence from this study is preliminary, therefore more investigation is
warranted to further clarify the nature of the relationships among mothers’ style of
attachment, bedtime behaviour, and premature infants’ sleep. Having a mother with an
anxious style of attachment was found to be significantly associated with longer periods
of nighttime arousal in premature infants. Prospective and longitudinal studies are needed
to clarify the mechanisms that generate this relationship.
Because there are major changes in growth and development during infancy (Betz, Hunsberger, Wright, & Foster, 1994), it would be informative to assess how the relationships between infants’ night sleep trajectories and maternal characteristics change as the child ages. Longitudinal designs would facilitate the examination of the effects of growth and developmental milestones on premature infants’ sleep patterns. From a theoretical perspective, anxiously attached mothers may have overlapping approach-avoidance tendencies as a function of their style of attachment (Berman & Sperling, 1994) leading to inconsistent bedtime behaviours and responses to infants’ nighttime awakenings. The mechanisms associated with the mother’s style of attachment may not be clear at any given time. Thus, the study of mothers’ bedtime behaviours at different times is required to identify the mediating pathway between their style of attachment and their infant’s awakening. Future studies should also use both subjective and objective measures, such as direct observation through the use of video, to provide comprehensive, unbiased assessments of mothers’ and possibly infants’ attachment.

Given the association between mothers’ mental health status and the quality of infants’ sleep, it would be informative to contrast mothers with depression and those without depression in terms of their style of attachment and their infants’ sleep. Future research should investigate whether there is a threshold of involvement at bedtime, on the part of the mother, that negatively influences premature infants’ night sleep. Similarly, it would be important to determine whether the influence of intense bedtime involvement is mediated or moderated by the presence of other factors. An investigation with a large sample size would provide sufficient statistical power to examine these complex relationships.
6.7.2 Implications for Practice

The current findings present a profile of premature infants’ nocturnal sleep patterns and problems that does not imply a causal association. Nonetheless, the findings can heighten healthcare providers’ awareness of potential relevant factors when assessing and treating sleep problems in premature infants. The significant associations between mothers’ use of various bedtime strategies and infants’ nighttime awakenings suggest that sleep onset associations are important in the development of premature infants’ sleep problems, similar to those reported for full-term infants. The analysis also revealed that maternal excessive use of cuddling, rocking, patting, carrying and offering feeding strategies to settle infants to sleep is associated with more frequent nighttime awakenings. These findings may mean that infants signal their mothers upon arousal because they cannot soothe themselves back to sleep without theirs mothers’ settling strategies. Thus, it is very important for nurses to evaluate parents’ bedtime routines for their infants, their settling behaviour, and infants’ sleep habits during routine health assessments. Knowledge of these findings may help nurses and other healthcare practitioners identify infants who may be at risk of developing sleep problems.

Brief intervention may lead to prevention or alleviation of infants’ sleep problems. Healthcare providers could provide anticipatory guidance for healthful sleeping habits to parents of premature infants. For example, infants’ self-soothing and ability to return to sleep on their own are major milestones at about 6 months of age. Placing infants in bed when they are awake, in preparation for nighttime sleeping, would aid in the achievement of these milestones. This approach could potentially help infants
to initiate sleep by themselves rather than relying on their mothers to provide cuddling, rocking or other settling activities.

Mothers are integral people for behavioural interventions designed to address infants’ sleep problems; thus, it is essential to ascertain the mother’s perceptions and settling behaviours she employs before initiating treatment. Parents’ definitions of what constitutes a sleep problem are influenced by cultural values and beliefs. Parents from different cultural backgrounds may differ in their interpretations of the same sleep behaviour in their infants. Therefore, it is essential for nurses and healthcare providers to include in their assessment what constitutes sleep problems from the family’s perspective.

Despite the recommendations of positioning infants in the supine position for sleep, for safety reasons, 22.9% of the study mothers were positioning their 5- to 6-month-old infants in the prone position. Before discharge from the hospital, healthcare providers should provide families with culturally-sensitive information regarding sleeping arrangements and inform them about the risks associated with the prone position and potential risks of co-sleeping.

During well baby visits, community health nurses should obtain thorough sleep assessments of premature infants, including their mother’s behaviour. They should observe the mother-infant behavioural attachment and assess family dynamics, the mother’s quality of sleep, and available resources (e.g., support within the extended family and community), even if the mother has no complaint about her infant’s sleep. Nurses can encourage mothers of premature infants to seek assistance if they have any concerns about their own sleep patterns. In addition, mothers with depressive symptoms
may be at high risk of having infants with sleep problems (Armitage et al., 2009). Community nurses are encouraged to screen for postpartum depression during well baby visits. Appropriate follow-up resources should be established such as referrals and communication with the mother’s primary care provider.

The findings of this study are useful for neonatal intensive care unit nurses who should incorporate this knowledge in their discharge planning. Nurses are encouraged to provide information about infants’ sleep patterns, strategies to settle infants to sleep, and when parents should seek professional support.

### 6.7.3 Recommendations for Education

Only through comprehensive understanding of infants’ sleep problems and related issues, such as mother-infant bedtime interaction and mother-infant attachment can healthcare providers provide appropriate and sensitive care. Healthcare professionals, including nurses, receive inadequate information about sleep during their professional education (Lerner, McClain, & Vance, 2002; Mindell, Moline, Zendell, Brown, & Fry, 1994; Mindell & Owens, 2003b). Lerner et al. (2002) suggested that more pathophysiology should be added to nursing curricula, whereas better coverage of the psychosocial aspects of health problems is needed in medical schools.

A study of neonatal intensive care unit nurses revealed that they had significant knowledge deficits related the safest position to place infants in for sleep, when they are settled at home (Aris et al., 2006). Inconsistencies in the nurses’ self-reported practices conflicted with national recommendations for the best sleep position. It is advisable to
reinforce knowledge about infants’ safe sleeping positions and sleeping arrangements in
nursing curricula and in continuing education programs.

6.7.4 Recommendations for Administration

Infants’ behavioural sleep problems are not only treatable but also preventable. Evidence regarding the management and prevention of sleep problems should be applied by health policy makers when they develop programs. Preventive counseling sessions and the provision of anticipatory guidance materials about sleep practices are effective methods in promoting better sleep habits and reducing nighttime awakening (Regalado & Halfon, 2001). Educational and consultation sessions have been found to be effective in reducing and preventing excessive nighttime awakening (Hiscock, Canterford, Ukoumunne, & Wake, 2007; Stremler et al., 2006). Hiscock et al. (2007) recommended the provision of consultation sessions about the nature of infants’ sleep problems, possible solutions, individualized treatment plans, and nurses’ visits and telephone support. Preventing or reducing infants’ sleep problems would reduce health costs that arise from behavioural, physical, and cognitive problems associated with chronic sleep problems.

6.8 Dissemination of Findings

The significance of the study findings for the science of nursing makes it of value to disseminate the findings to guide the conceptualization of premature infants’ sleep problems, future research and better practice. Initiatives will be undertaken to further distribute these study findings in a written format through academic journals.
Dissemination of these findings through peer-reviewed journal may encourage future researchers to conduct longitudinal studies to discover the possible mechanisms that link mothers’ styles of attachment with premature infants’ nighttime awakening. The study findings have been presented at several scientific conferences. Presenting the study findings in scientific conferences has the potential to disseminate the findings to professional nurses in different settings. In addition, as a gesture of appreciation for the study participants, the study outcomes will be shared with them. Sharing the results about the importance of mothers’ attachment styles and effective comforting strategies to settle infants to sleep could provide mothers with the knowledge needed to carefully assess their behaviours toward their infants and may encourage them to seek professional support if needed.

6.9 Conclusions

The current study focused on the extent to which mothers had an anxious style of attachment and whether it was related to premature infants’ sleep problems. Guided by France and Blampied’s description of infants’ development of sleep self-initiation and mothers’ attachment, a new perspective was available to investigate premature infants’ sleep problems. The main purpose of this exploration was to examine the relationships between mothers’ style of attachment, maternal bedtime behaviour to settle their infants to sleep, and nighttime awakening and sleep problems in 5- to 6-month-old premature infants.

The findings identified a link between mothers having an anxious style of attachment and the duration of infants’ nighttime awakenings after controlling for the
mother’s sleep problems, happiness, family functioning and use of active physical comforting at bedtime. However, the variance explained by having an anxious style of attachment was small. No association was found between having an anxious style of attachment and the frequency of infants’ nighttime awakenings.

An association was found between the use of active physical comforting and the frequency of nighttime awakenings, after controlling for the infant’s birth order, family functioning and whether the mother had an anxious style of attachment. The variance explained by these variables was small. No association was found between the use of active physical comforting and the duration of nighttime awakening. There was a link found between the types of behavioural strategies mothers used to settle their infants to sleep and their reports of sleep problems. The use of active physical comforting differentiated the infants with sleep problems from those without sleep problems. Having a mother with a history of sleep problems and being the second or later born were also significant predictors of nighttime awakenings.
REFERENCES


Doucette, J., & Pinelli, J. (2004). The effects of family resources, coping, and strains on family adjustment 18 to 24 months after the NICU experience. *Advances in Neonatal Care, 4*, 92-104.


### Appendix A: A Summary of the Literature Concerning Children’s Sleeping Problems

<table>
<thead>
<tr>
<th>Study</th>
<th>Variable Involved</th>
<th>Definition of sleep problem (outcome measure)</th>
<th>Sample</th>
<th>Population characteristics</th>
<th>Findings</th>
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</table>
| Lozoff et al.    | Co-sleeping                         | ● Bedtime struggles: active protest >1 hour, calling parents multiple times, refusal to allow parents to leave the room [≥ 3/week] accompanied by parental conflict, distress and frustration  
● Nighttime awakening: waking parents multiple times or keeping parents awake ≥ ½ an hour/night during the last month | Random Sample from well-child care facilities.  
*N* = 126 (85% response rate)                                                                                                           | Race = 76% White  
First born = 48%  
Female = 55%  
Children age = 6-48 months.                                                                                                           | ● Co-sleeping was practiced in 35% of White and 70% of Black families.  
● Co-sleeping associated with lower education level, family stress, and more ambivalent maternal attitude toward the child  
● Co-sleeping associated with infant sleep problems at bedtime in White families.                                                    |
| Paret (1984)     | Maternal-infant interactions (i.e., maternal responsiveness, physical distance, frequency of holding and touching the infants) | Maternal report on infant number of nighttime awakening and the duration of longest uninterrupted sleep period for five nights.  
Videotaping for one night (12 hours).                                                                                                     | Sample recruited from home visits for mother/infant couples.  
*N* = 34                                                                                                                                   | First born  
Infant age = 9 months  
Race = 100% White  
and middle-class  
All infants were teething                                                                                                                  | ● Mothers of night wakers responded faster to their infants (holding/picking) and held and touched their babies more frequently during the day.  
● Wakers maintained physical proximity to their mothers during the day.                                                                          |
| Lozoff et al.    | Maternal depression  
Mother-infant interaction  
Sleep practices  
Negative events | Nighttime awakening that involved parents or bedtime struggles occurs ≥ 3 nights/week for the preceding month accompanied by conflict or distress for parents.  
● Nighttime awakening involves waking parents | Random Sample from well-child care facilities.  
*N* = 96                                                                                                                                   | Infant age = 6 months-4 years  
Race = 100% White                                                                                                                                       | ● 30% had sleep problem  
● Maternal depression, absenteeism of mothers during the day, family illness and accidents, lack of maternal acceptance and co-sleeping were occurred more in infants with sleep problems. These experiences differentiated |
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<tr>
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<tbody>
<tr>
<td>Van-Tassel (1985)</td>
<td>Sleep practices</td>
<td>Sleep disturbance were constructed from (1) Mother’s perception of infant sleep behaviours as a concern and (2) number of nighttime awakening/night.</td>
<td>Random Sample from published birth announcements N = 70</td>
<td>Children age = 4-15 months Race = 97% Caucasian Children with no siblings = 41% Premature infants = 17%</td>
<td>● 32% had sleeping disturbances ● Male had more sleep disturbance ● Sleep disturbance was associated with more frequent nighttime feedings, sleeping in parent’s bed and maternal employment</td>
</tr>
<tr>
<td>Guedeney &amp; Kreisler (1987)</td>
<td>Mother-infant interaction</td>
<td>Difficulties falling asleep or nighttime awakening that requires parental intervention and occurred for &gt; 3 nights/week during the preceding month.</td>
<td>A convenience sample from hospital attendants N = 28</td>
<td>Infant had severe sleep disorder Infant age = 1-18 months</td>
<td>● 50% of infants had associated health troubles such as colic and frequent ear infection. ● 68% of mothers had affective concern during pregnancy (e.g., familial conflict, fear of rubella). ● The observed mother-infant relationship; absence/or lack of positive interaction, and 68% of the mothers were found to exhibit overstimulation or phobic relationship</td>
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<tr>
<td>Study</td>
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- Infant took 1 hour or more to get back to sleep upon nighttime awakening.  
- AND awakened 3 or more times a night.  
- OR any problem that caused severe disruption to the mother’s sleep. | Random Sample from general practice clinics  
$N = 308$ | Infant age = 8 months  
Boys = 47%  
Race = Primarily White | ● 18% had sleep problem  
● Breast feeding and difficulties with teething were associated with sleep problems at 8 months. |
| Adair et al. (1991)           | Sleep practices; parental presence when infant falls asleep | 7 ≤ nighttime wakes that requires parental intervention to resettle the child in the past seven nights. | Sample recruited from well-child clinics  
$N = 122$ (response rate 74%) | Full-term infants  
Infant age = 8-12 months  
Boys = 56%  
Race = 95% White  
Infants had siblings = 54% | ● 28% had frequent nighttime awakening  
● 33% of mothers were physically present when their infants fell asleep  
● Parental presence when infants fall asleep was independently associated with the infants’ frequency of nighttime awakening |
| Johnson (1991)                | Sleeping practices | Based on parental perception of their children as either night sleepers or wakers by asking them “would you say your child has a problem awakening during night?” | Subjects were recruited from city directory  
$N = 97$ (response rate 81%) | Children age = 12-23 months | ● 38% of parents perceived their infants night waking to be a problem.  
● Infants who were categorized as night wakers had more difficulty settling at night and were rocked and nursed to sleep.  
● Night wakers were more likely to co-sleep in parents’ bed. |
| Anders et al. (1992)          | Sleep practices (put infants in their cribs) | Based on maternal report poor sleepers had frequent night | Participants were recruited from  
Healthy full-term | First born  
Healthy full-term | ● Males had more sleep problems |
<table>
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| Benoit et al. (1992)   | Mother’s attachment        | ● Richman’s criteria for sleep disorder: the child has - awakening 3 or more times/night.                    | Sample recruited from pediatricians and family physicians and by advertisement in newspapers N = 41 (case/control) | Children had Severe sleep problem (case group) Mean age = 31 months Race = White | ● 100% of mothers of children with sleep problems were classified as insecurely attached  
● Insecure mothers’ attachment distinguished children with sleep problems and without sleep problems |
|                        |                            | - awaking for > 20 minutes/night.                                                                             |                                 |                                               |                                                                          |
|                        |                            | - Taken into the parents’ bed OR                                                                             |                                 |                                               |                                                                          |
|                        |                            | - Refusing to go to sleep at bedtime or requiring parental presence to fall asleep For ≥ 5 nights/week for at least 3 consecutive months |                                 |                                               |                                                                          |
|                        |                            | ● Infants who soothed themselves upon night waking were put in a crib awake and used a sleeping aid.           |                                 |                                               |                                                                          |
| Wolke et al. (1995)    | Prematurity                | ● Nighttime awakening frequency: infant wakes once/night for 5 or more nights/week                            | Sample randomly recruited from children’s hospitals or pediatric centers in Germany N = 4427/1060 (case/control) | Full and preterm infants Infants required hospitalization during the first 1-10 days of life Infant age = 5 months of corrected age for prematurity | ● 15% of parents were distressed by their infants sleep behaviours with no difference between full and preterm infants  
● There was lack of association between prematurity and the length of hospitalization, and sleep problems  
● Interestingly, premature infants (32-36 weeks gestation) at 5 months had fewer episodes of nighttime awakening and settled more quickly than full-term. |
<p>|                        |                            | ● Nighttime awakening index:                                                                                 |                                 |                                               |                                                                          |
|                        |                            | - Minor: infant wakes once/night and for less than 15 minutes                                                 |                                 |                                               |                                                                          |
|                        |                            | - Major: infant wakes ≥2 /night or for ≥ 15 minutes                                                          |                                 |                                               |                                                                          |
|                        |                            | ● Parental distress; parents report distress by their infants’ sleep behaviours                               |                                 |                                               |                                                                          |
|                        |                            | ● Prematurity                                                                                                 |                                 |                                               |                                                                          |
|                        |                            | Nighttime awakening frequency: infant wakes once/night for 5 or more nights/week                            |                                 |                                               |                                                                          |</p>
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<th>Study</th>
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<tbody>
<tr>
<td>Armstrong et al. (1998)</td>
<td>Maternal depression&lt;br&gt;Maternal history of sleep problems (i.e., during pregnancy)</td>
<td>The presence of infant sleep problem was based on maternal</td>
<td>Sample recruited from hospital and well-child clinics&lt;br&gt;$N = 97$ (case/control)</td>
<td>Infant age = 6-19 months</td>
<td>● There was an association between mothers having had excessive sleep disturbances during pregnancy and children’s excessive nighttime awakenings&lt;br&gt;● There was a link between maternal high level of depression and children’s sleep problem</td>
</tr>
<tr>
<td>Wolke et al. (1998)</td>
<td>Feeding (breast feeding) &lt;br&gt;prematurity</td>
<td>● Nighttime awakening frequency: infant wakes once/night for 5 or more nights/week&lt;br&gt;● Nighttime awakening index:&lt;br&gt; - Minor: infant wakes once/night and for less than 15 minutes&lt;br&gt; - Major: infant wakes ≥2/night or for ≥ 15 minutes&lt;br&gt;● Parental distress: parents report distress by their infants’ sleep behaviours</td>
<td>Sample randomly recruited from children’s hospitals in Germany and Finland&lt;br&gt;$N = 1057/931$ (case/control)</td>
<td>Full and preterm infants&lt;br&gt;Infants required hospitalization during the first 1-10 days of life&lt;br&gt;Infant age = 5 months of corrected age for prematurity</td>
<td>● Breastfed infants whether full-term or preterm had more frequent and longer nighttime awakening than bottle fed infants&lt;br&gt;● Infant gestational age and postnatal time spent at home were not related to infant nighttime awakening</td>
</tr>
<tr>
<td>Morrell (1999)</td>
<td>Maternal cognitions about sleep:&lt;br&gt; - setting limits;&lt;br&gt; - anger at the infants’ demand;&lt;br&gt; - doubts about parenting competence;&lt;br&gt; - infant hunger;</td>
<td>● Richman’s criteria were modified to include settling problems in addition to nighttime awakening:&lt;br&gt; - Taking longer than 30 minutes to settle.&lt;br&gt; - Waking 3 or more times/night.</td>
<td>Sample recruited from well-child clinics&lt;br&gt;$N = 22/37$ (case/control)</td>
<td>Infant age = 13-16 months&lt;br&gt;Race = Majority White&lt;br&gt;First born = 52%</td>
<td>● 17% had sleep problem based on Richman’s criteria, while 35% had sleep problem based on maternal criteria&lt;br&gt;● Night waking was the most common problem and represents 27% of the sample.&lt;br&gt;● There were positive</td>
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<td>Study</td>
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<td>- cot death</td>
<td>- Waking for &gt; 20 minutes during the night. - Sleeping in parental bed - Settling and waking problems occur ≥ 5 nights/week for ≥ 2 months ● OR Maternal report of the presence of infant sleep problem</td>
<td>associations between maternal cognitions relating setting limits, anger and doubt and infant sleep problems.</td>
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<td>Thunström</td>
<td>Infant health &amp; development Infant temperament Family situation (i.e., financial problem, maternal depression, stress, feeling of incompetence &amp; parental health problems) Co-sleeping (in parental bed) Feeding method</td>
<td>● Severe sleep problems were defined as: - Prolonged sleep latency ≥15 minutes - &gt; 3 nightly waking occurring at least 5 nights per week this sleep pattern should have existed for a period of at least 6 months, this was based ICSD (1990) criteria.</td>
<td>Sample recruited from child health centers in Sweden N = 27/27 (case/control) Response rate 83%</td>
<td>Infant age = 6-12 months Infants had severe sleep problem First born = 44%</td>
<td>● Infant with severe sleep problems had normal health and normal growth and development ● Infant sleep problems were found to be associated with co-sleeping, breastfeeding, and the use of feeding to settle infant to sleep ● Factors including: previous sleeping problems in the family, psychosocial problems in the family (i.e., maternal depression, poor perceptions of parenting, parental stress, feelings of incompetence) and parental health problems were associated with infant sleep problems ● Infant difficultness and high activity were linked to sleep problems</td>
</tr>
<tr>
<td>Scher (2001)</td>
<td>Mother-infant relationship (infant) Maternal perception of presence or absence of sleep</td>
<td>● Maternal perception of presence or absence of sleep</td>
<td>Sample recruited from maternity Full-term infants</td>
<td>Infant age = 12 months</td>
<td>Infant fussiness associated with sleep efficiency index</td>
</tr>
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<td>Study</td>
<td>Variable Involved</td>
<td>Definition of sleep problem (outcome measure)</td>
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<td></td>
<td>attachment)</td>
<td>Infant temperament (fussiness)</td>
<td>Ward of a general hospital</td>
<td>Boys = 51%</td>
<td>(going to sleep later and sleep for less hours)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>N = 94</td>
<td>First born = 35%</td>
<td>● Infants’ difficulties falling asleep were marginally related to infants’ attachment (i.e., ambivalent infant)</td>
</tr>
<tr>
<td>Kelmanson &amp; Adulas (2004)</td>
<td>Quality of infant care (developmental stimulation and organization)</td>
<td>Parental report of the frequency of nighttime awakening and struggle at bedtime</td>
<td>Sample randomly recruited from community settings</td>
<td>Infant age = 2 months</td>
<td>● More favorable sleep behaviours (i.e., less struggle at bedtime, fewer nighttime awakening) were associated with more organized environments (regular routine).</td>
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<td></td>
<td>Parental behaviours at bedtime</td>
<td>Fragmented sleep was defined as sleeping ≤ 6 consecutive hours per night based on parental report.</td>
<td>Sample randomly recruited from Quebec Master Birth Registry of the Ministry of Health and Social Services</td>
<td>Infant age = 5 months</td>
<td>● 24% of infants had fragmented sleep</td>
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<td></td>
<td>Infant prematurity and health</td>
<td></td>
<td></td>
<td>Race = 88% White</td>
<td>● Parental behaviours including putting the child in the crib asleep, feeding after nighttime awakening, rocking after nighttime awakening and co-sleeping were associated with infant sleep of &lt; 6 consecutive hours/night.</td>
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<td></td>
<td>Maternal depression</td>
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<td></td>
<td>● Infant prematurity, infant health and maternal depression did not have a strong relationship with infant fragmented sleep</td>
</tr>
<tr>
<td>Martin et al. (2007)</td>
<td>Mother &amp; father psychological distress</td>
<td>Parental report of the presence and severity of sleep problem</td>
<td>Sample was drawn from the Australian Children National survey</td>
<td>Infant mean age = 9 months</td>
<td>● 17% of infants and 14% of preschool children had moderate/severe sleep problems</td>
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<tr>
<td></td>
<td>Maternal history of depression</td>
<td></td>
<td>N = 5033 (infants)</td>
<td>Preschool mean age = 57 months</td>
<td>● Infants sleep problems were associated with maternal</td>
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<td></td>
<td>Parent general health</td>
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| Mindell et al. (2009) | Bedtime routine Maternal mood      | Maternal report of the presence and severity of children sleep problems                                       | Sample randomly recruited through an independent market research contact list of parents | Infant age = 7-18 months Todder age = 18-36 months Healthy children with no sleep disorder | ● After the implementation of a consistent bedtime routine there was a significant reduction in maternal perception of sleep as a problem for both infants and toddlers  
● Following the intervention there was a significant improvement of maternal mood state for both mothers of infants and toddlers |
| Tikotzky et al. (2010)| Infant Physical growth (Weight-to-length ratio)| Parental report & objective measure (actigraphy) for duration of night sleep                              | Sample recruited from prenatal classes, on internet advertising and in hospitals (during the first 48 hours after birth) | First born Infant age = 6 months                                                          | ● Infant shorter night sleep and poor sleep quality were associated with higher weight-to-length ration particularly in boys |
Appendix B: Questionnaire

UNIVERSITY OF BRITISH COLUMBIA

Information Letter

Mothers’ Feelings about Being a Mother and Premature Infants’ Night Sleep Patterns

Dear Mother,

You are invited to participate in a study that explores relationships between mothers’ feelings about mothering, mothers’ settling behaviors, and preterm infants’ sleep patterns. Your participation is crucial to understanding why some preterm infants signal (cry for their parents) when waking and others do not, when they have the potential to resume sleep upon night waking on their own at six months of life. You are eligible to participate in the study if:

- You are the mother of a preterm infant (Singletons or multiples) who is 5-6 months corrected age, born between 28-36 weeks of gestation (± 6 days), and had a birth weight of more than 1000 grams.
- Your preterm infant has NO medical diagnoses of congenital or neurologic problems or serious developmental delays.
- Your preterm infant is NOT currently receiving therapy for sleep problems from health care providers.
- You are NOT currently diagnosed with depression.

The recruitment for this research study is extending from July 2008 to June 2009. If you are eligible to be in the study and your baby is younger than 5 months we can put you on a wait list and contact you closer to the time when your infant is 5-6 months corrected age.

The online survey is a brief questionnaire that asks questions related to your maternal feelings, settling behaviors with your infant, family dynamics, infant health, and infant sleep. I am requesting that you complete the questionnaire and submit it. If you have twins or multiple infants please select only one infant for the purpose of completing the survey.

Your participation is voluntary. You have the right to withdraw at any time. You can refuse to answer particular questions. There are no risks associated with this study. There are no direct benefits as a consequence of participation in the study; however, there will be a draw for four gifts each worth one hundred dollars to express our thanks for your participation. If you wish to be enrolled in the draw please check the box at the end of the survey. We hope you will

Version 2, August 5, 2008
agree to spend approximately 30 minutes of your time to complete the survey. If you wish to
participate in this research study and are comfortable with the procedures described above,
please complete the online survey. By completing the survey, you will have indicated your
consent to participate in the study. All information you provide is confidential. Only the principal
investigator and co-investigator will have access to the data. Your confidentiality will be
maintained in all written reports resulting from the study. You are advised to keep a copy of this
information letter for your records.

Please note that this online survey is hosted by Survey Monkey, which is a web survey
company located in the USA. All responses to the survey are stored and accessible in the USA.
The survey gathers mainly aggregate information, however it does ask for your e-mail address
for the purpose of entering you in a draw for gifts. If you choose to participate in the survey, you
understand that your responses to the survey questions and the e-mail address that you enter,
if you choose to participate in the gift draw portion, is stored and accessible in the USA. Further,
you understand that any personal information stored in the USA is subject to the US Patriot Act.
The security and privacy policy for Survey Monkey can be viewed at

If you have any concerns about your treatment or rights as a research subject, you may
contact the Research Subject Information Line in the UBC Office of Research Services at 604-
822-8598 or if long distance e-mail to RSIL@ors.ubc.ca.

Co-Investigator: Reem Ali, RN, PhD candidate, School of Nursing, University of British Columbia,
604-221-4393.

Principal Investigator: Wendy Hall, RN, PhD, Professor, School of Nursing, University of British
Columbia, 604-822-7447

Thank you very much for your interest in our study
Sincerely,

Reem Ali, PhD candidate
School of Nursing; University of British Columbia
Information Letter for Paper-Based Survey

UNIVERSITY OF BRITISH COLUMBIA

School of Nursing
T201-2211 Wesbrook Mall
Vancouver, B.C., Canada V6T 2B5
Tel: (604) 822-7417
Fax (604) 822-7466

Information Letter

Mothers’ Feelings about Being a Mother and Premature Infants’ Night Sleep Patterns

Dear Mother,

You are invited to participate in a study that explores relationships between mothers’ feelings about mothering, mothers’ settling behaviors, and preterm infants’ sleep patterns. Your participation is crucial to understanding why some preterm infants signal (cry for their parents) when waking and others do not, when they have the potential to resume sleep upon night waking on their own at six months of life. You are eligible to participate in the study if:

- You are the mother of a preterm infant (Singletons or multiples) who is 5-6-months corrected age, born between 28-36 weeks of gestation, and had a birth weight of more than 1000 grams.
- Your preterm infant has NO medical diagnoses of congenital or neurologic problems or serious developmental delays.
- Your preterm infant is NOT currently receiving therapy for sleep problems from health care providers.
- You are NOT currently diagnosed with depression.

Enclosed with this letter is a brief questionnaire that asks questions related to your maternal feelings, settling behaviors with your infant, family dynamics, infant health, and infant sleep. I am requesting that you complete the questionnaire and mail it back to me in the enclosed postage-paid envelope. If you have twins or multiple infants please select only one infant for the purpose of completing the survey.

Your participation is voluntary. You have the right to withdraw at any time. You can refuse to answer particular questions. There are no risks associated with this study. There are no direct benefits as a consequence of participation in the study; however, there will be a draw for four gifts each worth one hundred dollars to express our thanks.
for your participation. If you wish to be enrolled in the draw please check the box at the end of the survey. We hope you will agree to spend approximately 30 minutes of your time to complete the survey. If you wish to participate in this research study and are comfortable with the procedures described above, please complete the questionnaire and mail it back to us. By completing the survey, you will have indicated your consent to participate in the study. If you choose to do so, please DO NOT write your name on any part of the survey questionnaire. All information you provide is confidential. Only the principal investigator and co-investigator will have access to the data. Your confidentiality will be maintained in all written reports resulting from the study. You are advised to keep this information letter for your records.

If you have any concerns about your treatment or rights as a research subject, you may contact the Research Subject Information Line in the UBC Office of Research Services at 604-822-8598 or if long distance e-mail to RSIL@ors.ubc.ca.

**Co-Investigator:** Reem Ali, RN, PhD candidate, School of Nursing, University of British Columbia, 604-221-4938.

**Principal Investigator:** Wendy Hall, RN, PhD, Professor, School of Nursing, University of British Columbia, 604-822-7447

Thank you very much for your interest in our study
Sincerely,

Reem Ali, PhD candidate
School of Nursing
University of British Columbia
Section 1

This section asks you general questions about your baby. Please **FILL IN the blanks OR CIRCLE the number that corresponds to your answer.**

---

**Start Here**

1. What was your baby’s age at birth in weeks ..............................?

2. What is your baby’s date of birth..............................................?

3. What is your baby’s birth weight in pounds.............................?

4. What is your baby’s current weight in pounds...........................?

5. Is your baby...........
   1. Male     2. Female

6. What was the type of birth (Please circle one response):
   1. Vaginal
   2. Caesarean
   3. Vacuum/Forceps.

7. After birth how many weeks your baby stayed in hospital before discharge to home?

8. Is this your (Please circle one response):
   1. First
   2. Second
   3. Third
   4. Fourth
   5. More than Fourth...............baby?

9. What is the present method of feeding (Please circle one response)?
   1. Breastfeeding
   2. Bottle feeding
   3. Combined (BF and BF)
   4. Breastfeeding and solid food
   5. Bottle feeding and solid food

---

Version 2, August 5, 2008
10. During the past 3 weeks, does your baby have any complaints of.... (You may circle more than one response)
   1. Reflux
   2. Ear infection
   3. Allergy
   4. None

Please ensure that you have answered 10 questions in this section.
Section 2

This section asks you general questions about your background. Please fill in the blanks or circle the number that corresponds to your answer.

1. What is your age in years?.................?

2. What is your highest educational level
   1. Below high school
   2. High school
   3. College
   4. Bachelor’s degree
   5. Graduate degree

3. What would you define your ethnic background:
   1. Chinese
   3. Japanese
   4. Arab/West Asian (e.g., Armenian, Egyptian, Iranian, Lebanese, Moroccan).
   5. South Asian (e.g., East Indian, Pakistani, Sri Lankan, etc).
   6. South East Asian
   7. Caucasian
   8. Black
   9. Latin American
   10. Filipino
   11. Korean
   12. Other (Please specify)......................?

4. What is your marital status?
   1. Married
   2. Cohabiting
   3. Never Married
   4. Divorced/Separated
   5. Widow

5. Are you currently engaged in paid work?
   1. Yes
   2. No (If this is your response please answer question number 6).

6. Are you currently on maternity leave?
   1. Yes
   2. No
7. What is your regular household income per year in Canadian Dollars?
   1. UNDER C$ 25,040
   2. C$ 25,041 - C$ 44,196
   3. C$ 44,197 - C$ 67,211
   4. C$ 67,212 - C$ 98,000
   5. OVER C$ 98,000

8. How would you rate your general health?
   1. Poor
   2. Fair
   3. Good
   4. Excellent

9. Did you have a previous experience of infant sleeping problems with any of your other children?
   • Yes
   • No
   • Not applicable.

10. Did you have previous experiences of sleep problems yourself?
    • Yes
    • No

11. Below there are several statements referring to your general feelings. Please read each statement carefully and report how often you feel this way.

    Please CIRCLE the number that best describes how often you experience these feelings. For example if you have never experiencing Lonely, CIRCLE the “1” while if you have experiencing this feeling always CIRCLE the “4”

<table>
<thead>
<tr>
<th>HOW OFTEN you feel:</th>
<th>Never</th>
<th>Often</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Cheerful and light hearted</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2. Loved and wanted</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3. Downhearted and blue</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4. Lonely</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
**Section 3: Infant Sleep**

This section consists of ten questions about your baby’s SLEEP during the past three weeks, including such as sleep arrangements, hours of night-time sleep and number of night waking.

Please read each question carefully and answer to the best of your knowledge about your baby’s sleep during the past three weeks.

Please FILL IN the blanks OR CIRCLE the number that corresponds to your answer.

1. Sleeping arrangement:
   1. Infant crib in separate room
   2. In parent’s bed
   3. Infant crib in parent’s room
   4. Infant crib in room with sibling
   5. Other, (Please specify) ________________

2. In what **position** does your child sleep most of the time?
   1. On his/her belly
   2. On his/her side
   3. On his/her back

3. How much **time** does your child spend in sleep during the NIGHT (between 7 in the evening and 7 in the morning)?
   Hours: ______________ Minutes: ______________

4. How much **time** does your child spend in sleep during the DAY (between 7 in the morning and 7 in the evening)?
   Hours: ______________ Minutes: ______________

5. Average number of **night waking** per night: ______________

6. How much **time** during the night does your child spend in awake (from 10 in the evening to 6 in the morning)?
   Hours: ______________ Minutes: ______________
7. How long does it take to put your baby to sleep in the evening?

   Hours: _______________ Minutes: ________________

8. How does your baby fall asleep?
   1. While feeding
   2. In bed alone
   3. Being rocked
   4. Being held
   5. In bed near parent

9. When does your baby usually fall asleep for the night?

   Hours: ___________ Minutes: ____________

10. Do you consider your child's sleep as a problem?
    1. A very serious problem
    2. A small problem
    3. Not a problem at all.
**Section 4: Mother's Feeling**

This section consists of several statements about how you **feel about yourself and how you relate to and feel about others**. Please read the statements carefully and select the response that corresponds to your feeling. Please **CIRCLE ONLY ONE** response for each statement that represents your feeling. An example is shown below.

**Example**

If you "totally agree" with the statement that "Overall, I am a worthwhile person", you would CIRCLE the number "6" (six).

<table>
<thead>
<tr>
<th>Statement</th>
<th>1. Overall, I am a worthwhile person.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Totally Disagree</td>
</tr>
<tr>
<td></td>
<td>1 2 3 4 5</td>
</tr>
</tbody>
</table>

Please read each statement carefully and select the response corresponds with your feelings. **CIRCLE ONLY** one number that best represents your feelings for each statement.

<table>
<thead>
<tr>
<th>Statement</th>
<th>1. Overall, I am a worthwhile person.</th>
<th>2. I am easier to get to know than most people.</th>
<th>3. I feel confident that other people will be there for me when I need them.</th>
<th>4. I prefer to depend on myself rather than other people.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Version 2, August 5, 2008

Page 7 of 13
<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.</td>
<td>I prefer to keep to myself.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6.</td>
<td>To ask for help is to admit that you’re a failure.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7.</td>
<td>People’s worth should be judged by what they achieve.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8.</td>
<td>Achieving things is more important than building relationships.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9.</td>
<td>Doing your best is more important than getting on with others.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>10.</td>
<td>If you’ve got a job to do, you should do it no matter who gets hurt.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>11.</td>
<td>It’s important to me that others like me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>12.</td>
<td>It’s important to me to avoid doing things that others won’t like.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>13.</td>
<td>I find it hard to make a decision unless I know what other people think.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>14.</td>
<td>My relationships with others are generally superficial.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>15.</td>
<td>Sometimes I think I am no good at all.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>16.</td>
<td>I find it hard to trust other people.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>17.</td>
<td>I find it difficult to depend on others.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>18.</td>
<td>I find that others are reluctant to get as close as I would like.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>19.</td>
<td>I find it relatively easy to get close to other people.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>20.</td>
<td>I find it easy to trust others.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>21.</td>
<td>I feel comfortable depending on other people.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>22.</td>
<td>I worry that others won’t care about me as much as I care about them.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>23.</td>
<td>I worry about people getting too close.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>24.</td>
<td>I worry that I won’t measure up to other people.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>25.</td>
<td>I have mixed feelings about being close to others.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>26.</td>
<td>While I want to get close to others, I feel uneasy about it.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>27.</td>
<td>I wonder why people would want to be</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Version 2, August 5, 2008
<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>28. It's very important to me to have a close relationship.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>29. I worry a lot about my relationships.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>30. I wonder how I would cope without someone to love me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>31. I feel confident about relating to others.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>32. I often feel left out or alone.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>33. I often worry that I do not really fit in with other people.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>34. Other people have their own problems, so I don't bother them with mine.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>35. When I talk over my problems with others, I generally feel ashamed or foolish.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>36. I am too busy with other activities to put much time into relationships.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>37. If something is bothering me, others are generally aware and concerned.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>38. I am confident that other people will like and respect me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>39. I get frustrated when others are not available when I need them.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>40. Other people often disappoint me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>
Section 5: Bedtime Interaction

This section is to learn about the methods you use to settle your baby to sleep. You may feel that the questions are repetitive, try to answer all questions because they relate to different maternal behaviors at bedtime.

Please read and answer All questions carefully.
Please CIRCLE the number which you think mostly applies to you.
Remember that we want to know about recent methods that you used to help your baby to sleep.

Example

<table>
<thead>
<tr>
<th>How often do you use the following</th>
<th>Never Used</th>
<th>Rarely Used</th>
<th>Sometimes Used</th>
<th>Often Used</th>
<th>Very Often Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>12. Give a feed/drink.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

- If you NEVER used this method to help your baby to sleep, you would CIRCLE the number “0” (zero).
- If you SOMETIMES used this method to help your baby to sleep you would CIRCLE the number “2” (two).
- If you VERY OFTEN USED this method to help your baby to sleep, you would CIRCLE the number “4” (four).

Start Here

Here are some methods that have been used by mothers to help babies to sleep.
Please read each statement carefully and respond honestly.

- Please CIRCLE the number that best describes how frequently you use these methods.
- Please CIRCLE only ONE response for each statement.
- It is important that you answer ALL of the questions.

<table>
<thead>
<tr>
<th>How often do you use the following</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Stroke part of child or pat.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2. Cuddling or rocking in arms.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

Version 2, August 5, 2008
<table>
<thead>
<tr>
<th>How often do you use the following</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Carrying around house in arms.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4. Walks in pram or buggy</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5. Car rides</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>6. Music tape or musical toy.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>7. Talking softly to child.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>8. Singing a lullaby.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>9. Reading a story to child.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>10. Playing with child.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>11. Offer a special toy/cloth.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>12. Give a feed/drink.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>13. Leave to cry.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>14. Stand near cot without picking baby up.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>15. Settle on sofa with parent.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>16. Lie with child next to their cot.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>17. Settle in parent’s bed.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
Section 6: Family Functioning

This section asks questions about family and family relationships for people living in the same house. Please read ALL statements carefully and respond honestly. For each statement please CIRCLE the number that best represents your feelings, beliefs and attitudes toward your family.

Please read each statement carefully and decide how much **you disagree or agree with** statement.

CIRCLE the number that best represents your feelings, belief or attitude.

CIRCLE only ONE answer for each statement.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Planning family activities is difficult because we misunderstand each other.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2. In times of crisis we can turn to each other for support.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3. We cannot talk to each other about sadness we feel.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4. Individuals (in the family) are accepted for what they are.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5. We avoid discussing our fears and concerns.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>6. We express feelings to each other.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>7. There are lots of bad feelings in our family.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>8. We feel accepted for what we are.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>9. Making decisions is a problem in our family.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>10. We are able to make decisions about how to solve problems.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>11. We don’t get on well together.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>12. We confide in each other.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
Thank you for your interest in the study.
If you choose to be enrolled in the gift draw portion please check the box below and provide your e-mail address

☐ I would like to be entered in the gift draw

Please enter your e-mail address
Appendix C: UBC Behavioural Research Ethics Board Certificate of Approval

The University of British Columbia
Office of Research Ethics
UBC Behavioural Research Ethics Board
Suite 519, 6128 Agricultural Road, Vancouver, B.C. V6T 1Z3

CERTIFICATE OF APPROVAL - MINIMAL RISK

<table>
<thead>
<tr>
<th>INSTITUTION(S) WHERE RESEARCH WILL BE CARRIED OUT:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site</td>
</tr>
</tbody>
</table>

| NA                                                                 |

<table>
<thead>
<tr>
<th>RESEARCH INVESTIGATOR:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andrew Hall</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>INSTITUTION:</th>
</tr>
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<tbody>
<tr>
<td>UBC Applied Science Nursing</td>
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<table>
<thead>
<tr>
<th>UBC BRIEF NUMBER:</th>
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<tr>
<td>H08-0002</td>
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<table>
<thead>
<tr>
<th>CO-INVESTIGATORS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ruqia Ahmed</td>
</tr>
<tr>
<td>Nancy Hall</td>
</tr>
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<table>
<thead>
<tr>
<th>SPONSORING AGENCIES:</th>
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</thead>
<tbody>
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</table>

<table>
<thead>
<tr>
<th>PROJECT TITLE:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mothers' feelings about being a mother and premature infant among patients</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CERTIFICATE EXPIRY DATE:</th>
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</thead>
<tbody>
<tr>
<td>June 17, 2009</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>DOCUMENTS INCLUDED IN THIS APPROVAL:</th>
<th>DATE APPROVED:</th>
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<tbody>
<tr>
<td>Protocol:</td>
<td>June 17, 2009</td>
</tr>
<tr>
<td>Research Proposal</td>
<td>May 1, 2008</td>
</tr>
<tr>
<td>Amendments:</td>
<td>May 1, 2008</td>
</tr>
<tr>
<td>Information Letter</td>
<td>May 1, 2008</td>
</tr>
<tr>
<td>Flyer (for study)</td>
<td>May 1, 2008</td>
</tr>
<tr>
<td>Questionnaire, Questionnaire Cover Letter, Tests</td>
<td>May 1, 2008</td>
</tr>
<tr>
<td>Survey Instrument</td>
<td>May 1, 2008</td>
</tr>
<tr>
<td>Other Documents:</td>
<td>May 1, 2008</td>
</tr>
<tr>
<td>Authorization to use Protocol</td>
<td>May 1, 2008</td>
</tr>
<tr>
<td>Authorization to use Questionnaire</td>
<td>May 1, 2008</td>
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The application for ethical review and the documents listed above have been reviewed and the procedures were found to be acceptable by the appropriate review board.

Approval is issued on behalf of the Behavioural Research Ethics Board

Dr. N. Whynot, Chair
Dr. L. Clark, Chair
Dr. J. Rigby, Associate Chair
Dr. L. Smith, Associate Chair
Dr. A. Johnson, Associate Chair

1 of 1 11/11/2008 3:09 PM
CERTIFICATE OF APPROVAL - MINIMAL RISK AMENDMENT

<table>
<thead>
<tr>
<th>PRINCIPAL INVESTIGATOR:</th>
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<tbody>
<tr>
<td>Merv, L. I.</td>
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<td>-------------</td>
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<thead>
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<th>N/A Other Location(s) where the research will be conducted</th>
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<tbody>
<tr>
<td>Research conducted at Do not include locations for all but 32 years.</td>
</tr>
<tr>
<td>University of British Columbia and the University of British Columbia where the project takes place.</td>
</tr>
<tr>
<td>It is associated with the School for Health investigation.</td>
</tr>
<tr>
<td>All work conducted at Do not include locations for all but 32 years.</td>
</tr>
<tr>
<td>University of British Columbia and the University of British Columbia where the project takes place.</td>
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</table>

<table>
<thead>
<tr>
<th>CO-INVESTIGATOR(S):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keer Parkin</td>
</tr>
<tr>
<td>Karen H.</td>
</tr>
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<table>
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<tr>
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<table>
<thead>
<tr>
<th>PROJECT TITLE:</th>
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<tbody>
<tr>
<td>Vascular surgery using a remote and portable intra right arm patient</td>
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Ending Date - Approval of an amendment does not change the expiry date on the current UBC BREB approval of this study. An application for renewal is required on or before June 17, 2009

<table>
<thead>
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<th>AMENDMENT NUMBER:</th>
<th>AMENDMENT APPROVAL DATE:</th>
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<tbody>
<tr>
<td></td>
<td>August 15, 2008</td>
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<th>Approval/Disclaimer for Informed Consent Form:</th>
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<td>Version 1</td>
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<p>| Approval is issued on behalf of the Behavioural Research Ethics Board |</p>
<table>
<thead>
<tr>
<th>Approved electronically by the following:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Merv L. I. Parkin</td>
</tr>
<tr>
<td>Dr. Ken Craig</td>
</tr>
<tr>
<td>Dr. Adrienne A.</td>
</tr>
<tr>
<td>Dr. Laura</td>
</tr>
<tr>
<td>Dr. Debra S.</td>
</tr>
<tr>
<td>Dr.</td>
</tr>
</tbody>
</table>
Appendix D: Infant Development Program of British Columbia Certificate of Approval

INFANT DEVELOPMENT PROGRAM OF BRITISH COLUMBIA
OFFICE OF THE PROVINCIAL ADVISOR

July 22, 2008

Reem Ali (PhD candidate)
5511 Presidents Row
Vancouver, BC
V6T 1L5

Dean Ms. Ali,

The Provincial Steering Committee Infant Development Program of BC has reviewed the research proposal presented by you on preterm sleep patterns. We give permission to Dr. Wendy Hall, Professor at University of British Columbia and you (Reem Ali, PhD candidate) to recruit through "The Infant Development Program of BC" for the study titled "Mothers' feelings about being a mother and premature infants' night sleep patterns". We want to support this important study that explores factors that may contribute to sleep patterns for preterm infants.

Professor Hall and Ms. Ali will recruit prospective participants through posting the study on Infant Development Program of BC website (www.idpofbc.ca) and providing a link to the online survey or contact information for the participant to get the survey package by mail. As well we will ask coordinators of Infant Development Programs in BC to recruit for the study by distributing materials about the study to prospective participants. These materials include themes containing a brief description of the study, the researcher's contact information and a website address for the online survey. I understand that recruitment will start July 2008 and be completed by July 2009. Professor Hall has agreed to provide us a copy of the USC Behavioral Research Ethics Approval and a copy of final results of the study.

Permission granted recruiting via Infant Development Program as described above:

Signature

Organization: Infant Development Program of BC

Date: July 22, 2008

If there are any questions, please contact me at

Bryan Gysel
Provincial Advisor
Infant Development Program of BC
2705 Douglas Crescent
Vancouver, BC Canada V6T 1L7
Tel: (604) 622-4023
Fax: (604) 622-5856
Website: www.idpofbc.ca

Version 1, July 22, 2008
## Appendix E: Vancouver Coastal Health Research Institute Certificate of Approval

**Vancouver Coastal Health Research Institute (Vancouver Community)**

### Research Study

#### CERTIFICATE OF APPROVAL

**INVESTIGATOR(S):**

HALL, Wendy - Principal Investigator  
Ali, Reem - Co-investigator  
5511 Presidents Row, Vancouver, BC V6T 1L5

**TITLE of PROJECT:**

Mother’s feelings about being a mother and premature infants’ night sleep patterns

**TERM:** Approval has been granted until June 17, 2009

**APPROVAL TO CONDUCT RESEARCH AT VANCOUVER COMMUNITY SITES OF VANCOUVER COASTAL HEALTH RESEARCH INSTITUTE IS BASED ON:**

- [ ] Research Ethics Review and Approval by (name of REB): UBC - BREB  
  Application No: H08-01003  
  Approval Date (y/m/d): 2008-08-15
- [ ] VCH Confidentiality Acknowledgement for Access to Personal Information
- [ ] Funding Source: UBC
- [ ] Approval to Conduct Research at VCHRI: Approval No. VC08-061  
  Approved Sites (list):  
  - Three Bridges CHC; Evergreen CHC  
  - Pacific Spirit CHC; Raven Song CHC  
  - South CHO

---

Val Munroe, RN, MS  
Director, Vancouver Community  
Assistant Director, VCHRI - VC  
Date: 2009-01-19

Copy: Principal Investigator  
Vancouver Community  
File
Appendix F: Attachment Style Questionnaire Psychometric Properties

The reliability of the five sub-scales of ASQ has been documented. The internal consistency reliability was measured by Cronbach’s alpha where the scores for attachment style scales ranged from .76-.84, as calculated for 470 university students. Cronbach’s alpha for the five subscales of the attachment were .67-.73 for a sample of 248 with equal numbers of male and female students who were 12-13 years of age (Feeney et al., 1994). In the current study, the value of Cronbach’s alpha for the five subscales were .89-70.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Scale</th>
<th>Possible Range</th>
<th>Obtained Range</th>
<th>M</th>
<th>SD</th>
<th>Number of Items</th>
<th>Cronbach’s Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Confidence</td>
<td>1-6</td>
<td>8-48</td>
<td>19-48</td>
<td>36.4</td>
<td>6.6</td>
<td>8</td>
<td>0.85</td>
</tr>
<tr>
<td>Discomfort with Closeness</td>
<td>1-6</td>
<td>10-60</td>
<td>15-52</td>
<td>32.1</td>
<td>9.3</td>
<td>10</td>
<td>0.89</td>
</tr>
<tr>
<td>Relationship as Secondary</td>
<td>1-6</td>
<td>7-42</td>
<td>7-31</td>
<td>16.3</td>
<td>5.2</td>
<td>7</td>
<td>0.70</td>
</tr>
<tr>
<td>Need for Approval</td>
<td>1-6</td>
<td>7-42</td>
<td>7-35</td>
<td>19.8</td>
<td>5.6</td>
<td>7</td>
<td>0.75</td>
</tr>
<tr>
<td>Preoccupation with</td>
<td>1-6</td>
<td>8-48</td>
<td>12-41</td>
<td>26.0</td>
<td>6.3</td>
<td>8</td>
<td>0.76</td>
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<tr>
<td>Relationships</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. The number of cases was 105 for all measures.

According to Feeney et al. (1994), the validity of the five subscales of the ASQ was indicated by several findings. The patterns of correlations between the ASQ subscales were as expected. All pairwise correlations between the subscales representing insecure attachment ("preoccupation with relationships", "need for approval", "discomfort with closeness" and "relationships as secondary") were significantly and negatively correlated with the subscale representing secure attachment (confidence subscale). In addition, all four of the subscales representing insecure styles were positively correlated with one another, which indicates that they measure the same underlying concept, insecure attachment (Feeney et al., 1994) (see table below).

The ASQ confidence subscale was associated with higher scores on family intimacy, low levels of family conflict, and democratic parenting, which were derived from the ICPS Family Functioning Scales. All of the other insecure attachment subscales had lower scores on these family functioning measures (Feeney et al., 1994).
<table>
<thead>
<tr>
<th>Subscale</th>
<th>Current Study (n = 105)</th>
<th>Feeney et al. (1994; n = 295)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Confidence</td>
<td>-.67**</td>
<td>-.52</td>
</tr>
<tr>
<td>2. Discomfort with Closeness</td>
<td>-.60**</td>
<td>-.39</td>
</tr>
<tr>
<td>3. Need for Approval</td>
<td>-.55**</td>
<td>-.33</td>
</tr>
<tr>
<td>4. Preoccupied with Relationships</td>
<td>-.45**</td>
<td>-.18</td>
</tr>
<tr>
<td>5. Relationships as Secondary</td>
<td></td>
<td>.31</td>
</tr>
</tbody>
</table>

Note. Data adapted from Feeney, Noller, & Hanrahan, (1994). Feeney et al. reported that all correlations were significant in their study. *p < .05 (two-tailed), **p < .01 (two-tailed). N = 105.

The results of a correlation analysis between the ASQ subscales and personality scales derived from the EPQ supported the concurrent validity of the ASQ (Feeney et al., 1994). The same patterns of correlation were found between the ASQ and Hazan and Shaver’s forced-choice measure of attachment. The Likert ratings of the secure attachment style were positively correlated with the confidence subscale, while “Discomfort with Closeness” and “Relationship as Secondary” were positively correlated with Avoidant attachment. The “Preoccupied with Relationships” and “Need for Approval” subscales had positive correlation with anxious attachment assessed with Hazan and Shaver’s measure (Feeney et al., 1994).
Appendix G: Study Mini Posters

UNIVERSITY OF BRITISH COLUMBIA  
School of Nursing

MOTHERS NEEDED FOR  
RESEARCH INTO PRETERM INFANTS’ NIGHT SLEEP PATTERNS

We are looking for volunteers to take part in a study about    
Mothers’ feelings about being a mother and premature infants’ night sleep patterns

YOU ARE ELIGIBLE IF:

• You are the mother of a preterm infant (Singletons or one of multiples) who is 5-6 months corrected age and born between 28-35 weeks of gestation, with a birth weight of more than 1000 grams.
• Your preterm infant has NO medical diagnoses of congenital or neurologic problems or serious developmental delays.
• Your preterm infant is NOT currently receiving therapy for sleep problems from health care providers.
• You are NOT currently diagnosed with depression.

Mothers can be recruited based on the above criteria from the period extending from July 2008 to June 2009. If you are eligible to be in the study but your infant is still too young, we can put you on a wait list and contact you closer to the time when your infant is 5-6 months corrected of age.

IF YOU ARE INTERESTED IN PREMATURE INFANT SLEEP STUDY

You will be asked to answer an anonymous survey questionnaire which takes approximately 30 minutes of your time. You may choose to fill out the online survey which is available on www.fussybaby.ca you may choose to fill out mail surveys and for more information about premature infant sleep study please contact Co-Investigator at

604-221-4938 mail to: reemjuma@interchange.abc.ca

In appreciation for your time, you will be entered in a draw for 4 gifts each worth 100 dollars

Version 1: August 5, 2008

223
Appendix H: Study Pamphlet

Who is conducting this study?

Reem Ali, RN, PhD candidate
School of Nursing
University of British Columbia

Wendy Hall, RN, PhD, Professor
School of Nursing
University of British Columbia

The study is important because little is known about premature infants’ night sleep and sleep problems. Premature infants’ night sleep patterns, in particular night waking, are common concerns for parents for which many seek help from health care providers. Many factors affect infants’ night sleep patterns, including maternal and infant characteristics. The knowledge that would be obtained from this study may enhance our understanding of premature infants’ sleep patterns ultimately providing future support for parents.

UNIVERSITY OF BRITISH COLUMBIA

Mothers’ feelings about being a mother and premature infants’ night sleep patterns

IF YOU HAVE ANY CONCERNS ABOUT YOUR TREATMENT OR RIGHTS AS A RESEARCH SUBJECT
You may contact the Research Subject Information Line in the UBC Office of Research Services at
604-822-8598 or if long distance e-mail
RSIL@enr.ubc.ca

IF YOU HAVE ANY QUESTIONS ABOUT THIS STUDY PLEASE CONTACT:
Reem Ali
604-221-4988
reem.iumma@interchange.ubc.ca

Professor Wendy Hall
604-822-7447
Wendy.Hall@nursing.ubc.ca

Dear Mother,

If your baby was born premature, you are invited to participate in a study that explores relationships between mothers’ feelings about mothering, mothers’ settling behaviors, and preterm infants’ sleep patterns.

Your participation is crucial to understanding why some preterm infants signal (cry for their parents) when waking and others do not, when they have the potential to resume sleep upon night waking on their own around 5-6 months of life.

Version 2: August 5, 2008
WHO IS ELIGIBLE TO PARTICIPATE IN THIS STUDY

✓ Mothers of preterm infants (Singletons or one of multiples) who were born between 28-36 weeks of gestation (± 6 days), and had a birth weight of more than 1000 grams. In the case of multiples, mothers will be asked to select one twin for the purpose of completing the survey.

✓ Preterm infant has NO medical diagnoses of congenital or neurologic problems or serious developmental delays.

✓ Preterm infant is NOT currently receiving therapy for sleep problems from health care providers.

✓ Mothers who are NOT currently diagnosed with depression.

✓ Mothers will be asked to complete the survey when their preterm infants are CURRENTLY 5-6 months corrected age.

Mothers can be potentially recruited based on the above mentioned criteria from the period extending from July 2008 to June 2009. Dear mother, if you are eligible to be in the study and your baby is still too young, we can put you on a wait list and contact you closer to the time when your infant is 5-6 months corrected age.

WHAT IS INVOLVED TO PARTICIPATE IN THIS STUDY?

A brief survey questionnaire related to:

- Background Information
- Mother's Feelings
- Infant Sleep & Mother-Infant bedtime interactions
- Family Functioning

TIME COMMITMENT
Survey questionnaire takes less than 30 minutes to be completed.

RISKS & BENEFITS
There are NO risks associated with this study. There are no direct benefits as a consequence of participation in the study; however, participants will be entered in a draw for four gifts each worth one hundred dollars to express our thanks for your participation.

CONFIDENTIALITY
NO identifying information will be on the survey questionnaire. ONLY aggregate data will be presented.

YOUR PARTICIPATION IS VOLUNTARY
Completing a survey questionnaire indicates your voluntary participation in the study.

HOW TO PARTICIPATE IN THIS STUDY

FIRST complete online survey, a link to the survey is available on:
www.idpofbc.ca
www.fussybaby.ca

SECOND you may choose to complete the mail survey. To do that you may contact
Reem Ali
604-221-4938
reemjuma@interchange.ubc.ca
Dr. Wendy Hall
604-822-7447
Wendy.Hall@nursing.ubc.ca