The Prevention of Infant Sleep Disturbance: A Universal Approach

A thesis submitted in fulfilment of the requirements for the degree of

Doctor of Philosophy in Psychology

Steven A. Watts

BA (Hons)

School of Health Sciences
College of Science Engineering and Health
RMIT University

September, 2015
Declaration

I certify that except where due acknowledgement has been made, the work is that of the author alone; the work has not been submitted previously, in whole or in part, to qualify for any other academic award; the content of the thesis is the result of work which has been carried out since the official commencement date of the approved research program; any editorial work, paid or unpaid, carried out by a third party is acknowledged; and, ethics procedures and guidelines have been followed.

Steven A. Watts

15 March, 2016
DEDICATION

To Doxie, the sunshine of my life.
ACKNOWLEDGEMENTS

Remotely located from the University during much of this work, I became somewhat disconnected over time, often feeling as though I was sailing solo around the world. It was only in thinking about this section that I realised how many others had made my voyage possible. It takes a village to launch a PhD laden sailboat!

Professor Glen Bates, Swinburne University, inspired me greatly and ultimately encouraged me to pursue a scholarship opportunity at RMIT. Thanks to Vanessa White, Dr Peta White, Rowan Dempster, and Fiona Dey for your friendship during my on-campus Clinical Masters days and beyond; I will never forget your influence. My original Supervisor, Emeritus Professor Alan Hudson, provided the idea for this project and substantial early inspiration, direction, and guidance. Professor Margot Prior, University of Melbourne, offered important advice and the use of her team’s temperament measure. Professor Matthew Sanders, University of Queensland, and Associate Professor Harriet Hiscock, Royal Children’s Hospital, were kind enough to give me valuable suggestions during the early design phase.

I was extremely fortunate to be introduced to Associate Professor Karyn France, University of Canterbury, New Zealand, whose academic and professional background in infant sleep provided me with critical direction while also ensuring the program’s academic credibility. Thank you so much Karyn for flying to Australia to collaborate on the design of the research and the content of the parent tip sheet; your terrific ideas, knowledge, and attention to detail; and for introducing me to your colleague, Dr Jacki Henderson. Thanks Jacki for your valuable input, advice, and friendship, contribution to the tip sheet, and enduring interest in my research—I am forever grateful.

The Parenting Research Centre kindly allowed access to its staff and resources. Its CEO, Warren Cann, was instrumental in transforming this research from concept to reality by helping to produce the parent tip sheet and opening up doors through his network that would have otherwise been closed. Thanks also to the academics and paediatric sleep practitioners, and in particular, Karen Houghton, Tweddle Child & Family Health Service, who provided valuable comments on the initial draft of the tip sheet. I am greatly indebted to the wonderful Maternal and Child Health Co-ordinators and Nurses throughout Victoria who were kind enough to take an interest, engage the target population, and distribute the information packages on my behalf. Most importantly, thanks to the 408 busy first-time parents who took
the time to be involved in at least part of the study. Many went above and beyond in supplying extensive additional comments and information while several continued their involvement after moving interstate and even overseas between data collection points.

No remote student could survive without the assistance of key library staff and Tony Foley and Marina Zovko have been with me throughout my journey. Thanks so much for your exemplary service, the many hundreds of journal articles, chapters, and books, and your willingness to bend the rules for me on the odd occasion (don’t worry, I won’t tell anyone). My friend and former colleague Sarah Dalgleish provided me with access to countless additional resources and stuck by me like a crazy person when there was no compelling reason to do so. Dr Glenda Francis, my undergraduate statistics guru/teacher from Swinburne University, graciously sent me updated versions of her wonderful books/manuals at a critical time. Anybody who has been taught by Glenda is a lucky person indeed.

Associate Professor David Smith, my Primary Supervisor, has been an inspiration, mentor, friend, ally, and arranger of free parking. David, you redirected, rejuvenated, and reinvigorated a rudderless yacht when no other safe harbour was available. As my academic and professional supervisor, no other person has come close to having the influence that you have had on my career. A heartfelt thank you and it’s your turn to get the coffee. A very special thanks also to Dr Lisa Negri who assumed the role of Associate Supervisor at an important juncture, took the time to thoroughly read, comment, and offer suggestions on earlier drafts of this dissertation, and has supported me until the very end.

Thank you to my mother Barbara, late father Graeme (who was tragically killed during the course of this thesis), and my late grandparents Arch and Alison Skinner, and Jean Davey, for raising me to believe in the value of hard work. Dad, I think of you most days, I’m so sorry you didn’t live to see me graduate—I know how proud you would have been. Mum, I have great admiration for the way you have battled on alone, never losing your spirit; you will have to be doubly proud. My late grandfather was the best role model anyone could have hoped for, and someone who always had others laughing. I have eternal gratitude and appreciation for my ever-loving mother-in-law Katina, father-in-law Spiro, and my “sisters” Anna and Georgia and their families for supporting me and always looking after my girls. We would all be insane by now without you! A HUGE thank you to my beautiful wife Doxie, for all of your strength, kindness, and unconditional love and support. You never stopped believing in me. Also thanks to my two gorgeous daughters Jaime and Charlotte for putting up with a stay-at-home Dad who was working on a never-ending project. Well guess what? It’s finished. I’ve sailed humbly into Paynesville! #LoveEastGippsland
# TABLE OF CONTENTS

DEDICATION.........................................................................................................................................................i

ACKNOWLEDGEMENTS...........................................................................................................................................ii

LIST OF TABLES ...................................................................................................................................................xiv

LIST OF FIGURES ...........................................................................................................................................xvii

ABSTRACT............................................................................................................................................................. xviii

PROLOGUE: What is Sleep? ................................................................................................................................. xx

CHAPTER 1: Introduction and Program of Research ................................................................. 1

CHAPTER 2: Ontogeny of Sleep-Wake State Organisation ....................................................... 3

OVERVIEW ................................................................................................................................................................. 3

HUMAN SLEEP REGULATION AND ARCHITECTURE: BASIC CONCEPTS ................................................. 4

Diurnal Rhythms .............................................................................................................................................. 4

Sleep-Wake Regulation ..................................................................................................................................... 4

Models of Sleep-Wake Regulation ................................................................................................................... 4

Ultradian Rhythms/Sleep Architecture ........................................................................................................ 5

Non-Rapid Eye Movement Sleep .................................................................................................................... 5

Rapid Eye Movement Sleep............................................................................................................................ 6

Progression of Sleep through the Night .......................................................................................................... 7

ONTOGONY OF CHILDREN’S SLEEP .............................................................................................................. 8

The Neonatal Period: Birth to 1 Month ........................................................................................................ 9

Early Infant Sleep: 1 to 3 Months .................................................................................................................. 10

Infant Sleep: 3 to 12 Months .......................................................................................................................... 12

Ontogeny of Sleep States ............................................................................................................................... 13

Secondary Infant Sleep Disturbance ............................................................................................................... 15

CONCLUDING COMMENTS .......................................................................................................................... 16

CHAPTER 3: Childhood Sleep Problems .................................................................................... 17

OVERVIEW .............................................................................................................................................................. 17

INTRODUCTION .................................................................................................................................................. 17

THE EFFECTS OF INFANT SLEEP DISTURBANCE ON THE CHILD......................................................... 21
## A THEORETICAL MODEL OF THE DETERMINANTS OF INFANT SLEEP

69

## CONCLUDING COMMENTS

71

### CHAPTER 5: Treatment, Prevention Science, and Infant Sleep Disturbance

72

#### INTRODUCTION

72

#### THE TREATMENT OF INFANT SLEEP DISTURBANCE

73

**Behavioral Interventions**

73

- Empirical Support

73

- Behavioural Program Variants

74

- Positive Bedtime Routines

74

- Unmodified Extinction

74

- Graduated Extinction

74

- Extinction with Parental Presence

75

- Problems with Behavioural Interventions

75

**Pharmacology**

76

#### THE PERILS OF PROXIMAL CARE DISCOURSE

77

#### PREVENTION SCIENCE

78

**The Language of Prevention**

78

- Universal Interventions

79

- Selective Interventions

79

- Indicated Interventions

79

**The Mental Health Intervention Spectrum**

80

**Risk and Protective Factors**

81

- Risk Factors

81

- Protective Factors

83

- The Identification of Risk and Protective Factors

83

- The Interplay between Risk and Protective Factors

85

#### THE PREVENTION OF INFANT SLEEP DISTURBANCE

85

**A Review of Infant Sleep Problem Prevention Research**

89

- Prevention Research Beginning During Pregnancy or the Neonatal Period

89

- Wolfson, Lacks, and Futterman (1992)

89

- Pinilla and Birch (1993)

90

- St James-Roberts, Sleep, Morris, Owen, and Gillham (2001)

91

- Stremler et al. (2006)

92

- Symon, Marley, Martin, and Norman (2005)

93

- Hiscock et al. (2014)

94

- Prevention Research Beginning After 3 Months

94

- Adair, Zuckerman, Bauchner, Philipp, and Levenson (1992)

94
Kerr, Jowett, and Smith (1996) ................................................................................................... 95
Adachi et al. (2009) ..................................................................................................................... 96

CONCLUDING COMMENTS .............................................................................................. 101

CHAPTER 6: General Method............................................................................................... 102

Overview ............................................................................................................................... 102
Background ........................................................................................................................... 102

The Baby Sleep Parent Tip Sheet ..................................................................................... 102
The Victorian Maternal and Child Health Service ......................................................... 103

Ethics Approval ................................................................................................................... 104
Participants ........................................................................................................................... 104
Sampling Procedure ............................................................................................................ 104

Recruitment of Participants.............................................................................................. 104
Participant Response ......................................................................................................... 105
Allocation to Experimental Groups .................................................................................. 105
Completion of the Infant Sleep Diary and Parent Questionnaire ...................................... 107
Flow of Research Participants .......................................................................................... 107

Materials ............................................................................................................................... 109
Parent Tip Sheet ................................................................................................................ 109

Measures ............................................................................................................................... 109

Infant Sleep Diary ............................................................................................................. 109
Sleep Behaviour Scale ...................................................................................................... 110
Infant Sleep Questionnaire ............................................................................................... 111
Infant Temperament .......................................................................................................... 111
Maternal Cognitions about Infant Sleep ........................................................................... 113
Maternal Depression ......................................................................................................... 114
Parenting Stress ................................................................................................................. 116
Parenting Alliance ............................................................................................................. 117

Summary of the Study Variables ....................................................................................... 118

Characteristics of the Sample ........................................................................................... 118

Parent Characteristics ....................................................................................................... 118
Infant Characteristics .......................................................................................................... 120

CHAPTER 7: Study 1: The Efficacy of Written Anticipatory Guidance in the
Prevention of Infant Sleep Disturbance ........................................................................ 123

METHOD ........................................................................................................................ 126

Participants ........................................................................................................................... 126
CHAPTER 8: Study 2: Risk and Protective Factors Associated with Infant Sleep Disturbance

METHOD ........................................................................................................................ 164
Participants................................................................................................................... 164
Materials ......................................................................................................................... 164
Measures ......................................................................................................................... 164
Definitional Clarification ............................................................................................... 165
Procedure ........................................................................................................................ 165
Data Analyses ............................................................................................................... 165

RESULTS ....................................................................................................................... 166
Bivariate Correlations ................................................................................................. 166
Multiple Linear Regression Series I: All Variables of Theoretical Interest ................. 175
An Index of Sleep Quality ............................................................................................. 175
Variable Selection Process: The Less is More Principle ............................................. 176
Variable Entry Approach ............................................................................................. 177
A Six Step Hierarchical Strategy .................................................................................. 178
Hierarchical Regression 1: Pretest and 6-Month Variables in the Prediction of
6-Month Infant Sleep Quality ...................................................................................... 180
Hierarchical Regression 2: Pretest and 6-Month Variables in the Prediction of
12-Month Infant Sleep Quality ................................................................................... 185
Hierarchical Regression 3: Pretest and 12-Month Variables in the Prediction of
12-Month Infant Sleep Quality ................................................................................... 186
Multiple Linear Regression Series II: Maternal Behaviours and Cognitions .......... 188
Simultaneous Regression 1: 6-Month Parenting Behaviours and Cognitions in
the Prediction of 6-Month Infant Sleep Quality .......................................................... 191
Simultaneous Regression 2: 6-Month Parenting Behaviours and Cognitions in
the Prediction of 12-Month Infant Sleep Quality ....................................................... 194
Simultaneous Regression 3: 12-Month Parenting Behaviours and Cognitions in
the prediction of 12-Month Infant Sleep Quality ...................................................... 195

Commonality Analyses: Maternal Behaviours and Cognitions ........................................ 198
Commonality Analysis 1: 6-Month Predictors and Concurrent Infant Sleep Quality ....... 199
Commonality Analysis 2: 6-Month Predictors and 12-Month Infant Sleep Quality ........ 200
Commonality Analysis 3: 12-Month Predictors and Concurrent Infant Sleep Quality ... 201

DISCUSSION ................................................................................................................... 202

Demography, Obstetrics, and Anticipatory Guidance ......................................................... 203
Demographic, Pregnancy and Birthing ............................................................................. 203
Infant Health and Development ....................................................................................... 204
Infantile Colic ................................................................................................................... 204
Child Illness ...................................................................................................................... 204
Infant Temperament ........................................................................................................ 205

Parent Cognitions, Strategies, and Behaviours ................................................................. 206
Written Anticipatory Guidance ......................................................................................... 206
Infant Sleep Location ........................................................................................................ 207
Breastfeeding .................................................................................................................... 208
Maternal Cognitions and Parent Behaviours .................................................................. 209
Pacifier Use ....................................................................................................................... 213
Use of Transitional Objects ............................................................................................. 214

Parental Mood, Stress, and Relationship ........................................................................ 215
Postnatal Depression and Parenting Stress ..................................................................... 215
Parenting Alliance ........................................................................................................... 217

CONCLUDING COMMENTS ............................................................................................. 219

CHAPTER 9: Study 3: Factors Associated with Persistent Sleep Disturbance
and Enduring Healthy Sleep in Infants ............................................................................. 220

METHOD .......................................................................................................................... 223
Participants ....................................................................................................................... 223
Materials ........................................................................................................................... 223
Measures ........................................................................................................................... 224
Procedure ......................................................................................................................... 224
Data Analyses ................................................................................................................... 226

RESULTS .......................................................................................................................... 226
Demography, Infant Health, Temperament, and Development ...................................... 226
Demographic, Pregnancy, and Birthing .......................................................................... 226
REFERENCES ................................................................................................................ 303

APPENDICES ................................................................................................................. 396

APPENDIX A: THE TRIPLE P–POSITIVE PARENTING PROGRAM ................................. 397
APPENDIX B: THE BABY SLEEP PARENT TIP SHEET ................................................... 400
APPENDIX C: M&CH NURSE INFORMATION ................................................................. 407
APPENDIX D: INFORMATION KIT/REGISTRATION CORRESPONDENCE ................. 410
APPENDIX E: 6-MONTH PARENT CORRESPONDENCE ............................................. 419
APPENDIX F: 12-MONTH PARENT CORRESPONDENCE ............................................ 437
APPENDIX G: SUMMARY OF RESEARCH VARIABLES ............................................ 440
### LIST OF TABLES

**TABLE 1:** Examples of Childhood Risk Factors for Mental, Emotional, and Behavioural Disorders in Multiple Contexts ......................................................... 82

**TABLE 2:** Examples of Childhood Protective Factors for Mental, Emotional, and Behavioural Disorders in Multiple Contexts ......................................................... 84

**TABLE 3:** Risk and Protective Factors Associated with Infant Sleep Problems .................... 88

**TABLE 4:** Summary of Infant Sleep Problem Prevention Research ....................................... 97

**TABLE 5:** Parent Demographic Characteristics ...................................................................... 119

**TABLE 6:** Infant Demographic Characteristics ........................................................................ 120

**TABLE 7:** Group Percentages of Parents using Various Methods of Assisting their 6- and 12-Month-Old Infants to Fall Asleep at Bedtime ........................................... 130

**TABLE 8:** Group Comparison of Infant Bedtime Pacifier Use at 6 and 12 Months ............... 131

**TABLE 9:** Typical Parent Response to Infant Night-Crying at 6 and 12 Months by Group ....................................................................................................................... 132

**TABLE 10:** Group Raw Scores on Infant Sleep Measures at 6 and 12 Months ...................... 134

**TABLE 11:** Group Comparison of Sleep Behaviour Scale Scores at 6 Months ...................... 137

**TABLE 12:** Group Comparison of Sleep Behaviour Scale Scores at 12 Months .................... 138

**TABLE 13:** Group Comparison of Infant Sleep Questionnaire Scores at 6 Months ............... 140

**TABLE 14:** Group Comparison of Infant Sleep Questionnaire Scores at 12 Months ............. 141

**TABLE 15:** Group Representation among Discrete Infant Sleep Disorder Categories at 6 and 12 Months ................................................................................................ 142

**TABLE 16:** Parent Concern and Beliefs about Infant Sleep Patterns at 6 and 12 Months by Group .................................................................................................................. 144

**TABLE 17:** Bivariate Correlations between Pretest, 6-Month, and 12-Month Variables, and Infant Sleep Outcome Measures at 6 and 12 Months .............................. 167

**TABLE 18:** Bivariate Correlations of 6-Month Hierarchical Regression Analyses Variables ......................................................................................................................... 181
TABLE 19: Hierarchical Regression Analyses of Pretest, Infant Development/Health, and 6-Month Parental Variables in the Prediction of Infant Sleep Quality at 6 and 12 Months

TABLE 20: Bivariate Correlations of 12-Month Hierarchical Regression Analyses Variables

TABLE 21: Hierarchical Regression Analysis of Pretest, Infant Development/Health, and 12-Month Parental Variables in the Prediction of Infant Sleep Quality at 12 Months

TABLE 22: Bivariate Correlations of 6-Month Parenting Behaviour and Cognition Variables

TABLE 23: Multiple Regression Analyses of 6-Month Parenting Behaviour and Cognition Variables in the Prediction of Infant Sleep Quality at 6 and 12 Months

TABLE 24: Bivariate Correlations of 12-Month Parenting Behaviour and Cognition Variables

TABLE 25: Multiple Regression Analysis of 12-Month Parenting Behaviour and Cognition Variables in the Prediction of Concurrent Infant Sleep Quality

TABLE 26: Commonality Analysis of 6-Month Parenting Behaviour and Cognition Variables in the Prediction of Concurrent Infant Sleep Quality

TABLE 27: Commonality Analysis of 6-Month Parenting Behaviour and Cognition Variables in the Prediction of 12-Month Infant Sleep Quality

TABLE 28: Commonality Analysis of 12-Month Parenting Behaviour and Cognition Variables in the Prediction of Concurrent Infant Sleep Quality

TABLE 29: Sleep Quality Index Quartile Group Membership at 6 and 12 Months

TABLE 30: Comparison of STSI Parent Temperament Ratings of 6- and 12-Month-Old Infants with Problematic and Optimal Sleep Patterns

TABLE 31: Comparison of Maternal Cognitions about Infant Sleep Among Mothers of Problematic and Optimal Sleepers at 6 and 12 Months

TABLE 32: Parents using Various Methods of Assisting their 6- and 12-Month-Old Problematic or Optimal Sleeper to Fall Asleep at Bedtime
TABLE 33: Typical Parent Response to the Infant Night-Crying of Problematic and Optimal Sleepers at 6 and 12 Months .......................................................... 235

TABLE 34: Parents using Various Methods of Response to Infant Night-Waking in Problematic and Optimal Sleepers at 6 and 12 Months .......................... 236

TABLE 35: Breastfeeding Practices among Mothers of Problematic and Optimal Sleepers at 6 and 12 Months ................................................................................. 237

TABLE 36: Prospective and Retrospective Parent Accounts of Infant Sleep Behaviours in Problematic and Optimal Sleepers at 6 and 12 Months ............. 240

TABLE 37: Level of Concern among Parents of Problematic and Optimal Sleepers at 6 and 12 Months ................................................................. 241

TABLE 38: Sleep Problem Perception among Parents of Problematic and Optimal Sleepers at 6 and 12 Months ................................................................. 241

TABLE 39: Postnatal Depression and Anxiety among Mothers of Problematic and Optimal Sleepers at Pretest, 6 Months, and 12 Months .................. 242

TABLE 40: Possible and Probable Depression among Mothers of Problematic and Optimal Sleepers at Pretest, 6 Months, and 12 Months ...................... 243

TABLE 41: The Triple P–Positive Parenting Program Model of Parenting and Family Support ........................................................................................................... 399

TABLE 42: Summary of Research Variables ........................................................................... 441
LIST OF FIGURES

FIGURE 1.  *Hypnogram for a normal adult* .................................................................................. 8

FIGURE 2.  *Average hours of night-time, daytime, and total sleep during the first year of life* ............................................................................................................. 13

FIGURE 3.  *A transactional model of parenting and infant sleep* ...................................... 33

FIGURE 4.  *The establishment of sleep initiation problems during the first 3 months of life* .................................................................................................................. 39

FIGURE 5.  *The development of primary infant sleep disturbance* .................................. 41

FIGURE 6.  *A theoretical model of the relationship between maternal cognitions and infant sleep* ........................................................................................................... 57

FIGURE 7.  *A theoretical model of the major influences on infant sleep (maternal perspective)* .................................................................................................................. 70

FIGURE 8.  *The mental health intervention spectrum: Australian context* ................. 80

FIGURE 9.  *Parent (infant) flow through the four phases of the research program* ...... 108

FIGURE 10.  *Comparison of Intervention and Control group Sleep Behaviour Scale (SBS) scores at 6 and 12 months* ................................................................. 136

FIGURE 11.  *Comparison of Intervention and Control group Infant Sleep Questionnaire (ISQ) scores at 6 and 12 months* .................................................. 139

FIGURE 12.  *Comparison with Adair, Zuckerman, Bauchner, Philipp, and Levenson (1992)* .............................................................................................................. 156

FIGURE 13.  *The sleep location of infants with extreme sleep patterns in comparison with the remainder of the sample at birth, 6 months and 12 months* .................................................................................................................. 230

FIGURE 14.  *Comparison of parent-estimated 24-hour total sleep hours at 6 and 12 months in the Silent Night Sleep Project (SNSP) with other published guides* .................................................................................................................. 259
ABSTRACT

Childhood sleep problems continue to pervade modern societies at alarming rates with substantial costs to individuals, families, and communities. Despite good evidence that parent preventive education may be the most acceptable, effective, time-efficient, economical, and ethical approach to behaviourally-based paediatric sleep disturbance, the availability of prevention programs remains limited. This thesis reports on a prevention strategy designed to enhance knowledge of normal sleep development, and promote adaptive sleep-related practices among parents of young children. The primary aim was to investigate the role of written anticipatory guidance in the prevention of problematic sleep. In addition, the pathways to infant sleep disturbance, including chronic sleeping difficulties within the first year of life are examined.

Three hundred and fifty-four first-time mothers of healthy, normally developing infants were recruited from infant health centres throughout Victoria, Australia. All participants completed a 4-day infant sleep diary and parent questionnaire at 6 and 12 months, post-birth. Three studies are presented. The first investigates the use of a six-page parent tip sheet designed for universal distribution to parents of newborn infants. To examine its efficacy, two groups were formed—half of the participants received the written advice and the remainder served as a control group. The second study examines many of the proximal risk and protective factors thought to be associated with infant sleep regulation and consolidation. The final report considers the factors relating to persistently problematic and enduring healthy infant sleep using two extreme subgroups of 40 participants.

Results revealed that the written anticipatory guidance was successful in influencing parent cognitions and behaviours and by extension, infant sleep outcomes. Parents privy to the parent tip sheet were significantly more likely to report adaptive cognitions about infant sleep and less likely to engage in maladaptive night-time parenting behaviours at 6 and 12 months. Importantly, the infants of intervention mothers exhibited healthier sleep patterns on both the retrospective parent questionnaire and the prospective infant sleep diary, at each time of measurement. Remarkably, the sleep patterns of intervention infants at 6 months were comparable to those of control infants at 12 months.

Additional key findings were revealed in the second and third studies. Overall, infants sleeping in their own bedroom were significantly more likely to exhibit healthy sleep patterns, while infants sleeping within the parental bedroom from birth were at increased risk
of persistent sleep problems. There was general support for widely held view that night-time parenting strategies involving active physical comforting provide the most immediate and direct path to infant sleep disturbance. This research also substantiates the influential role of maternal cognitions involving limit-setting, anger, doubt, and feeding in infant sleep regulation and consolidation. Stimulatory parenting behaviours and unhelpful maternal cognitions were additionally associated with chronic sleeping difficulties over the first 12 months of life. A multitude of other factors, including infant temperament, the co-parenting alliance, and maternal depression, anxiety, and stress were found to have weaker and/or more complex relationships with infant sleep pattern development. Methodological issues and implications for prevention theory, research, and practice are also considered.
PROLOGUE

What is Sleep?

There is no sunrise so beautiful that it is worth waking me up to see it. (Kaling, 2011, p. 5)

Sleep is one of the great mysteries of life. Like gravity or the quantum field, sleep is so fundamental that scientists still don’t know exactly what it is. (Mercola, 2010)

For thousands of years, the mysteries of sleep have captured the imagination of poets, artists, philosophers, and mythologists (Borbély, 1986; Chokroverty, 2009a). However, scientific interest in sleep for more than a century and an extensive literature on the structure, neuroanatomy, and neurophysiology of sleep over the past 60 years have not engendered a unified theory of sleep function (Eichenbaum, 2003; Fuller, Gooley, & Saper, 2006; Kushida, 2011; Mignot, 2008). This incomplete picture is extraordinary, given that people spend approximately a third of their lives sleeping (Fuller et al., 2006). At the very least, it is clear that sleep serves an essential, universal function that offsets the risk of being disengaged from the environment (Tononi & Cirelli, 2012).

At a neurobehavioural level, sleep and vigilance represent opponent processes (Dahl & El-Sheikh, 2007). However, despite the increased vulnerability associated with reduced environmental awareness and responsiveness, sleep has been highly conserved throughout evolution. This suggests that it is crucial to the survival of the human species (Jouvet, 1999; Rosenthal, 2009; Shneerson, 2005). In particular, it is difficult to imagine how dreaming can provide an adaptive advantage, since the brain disengages from the environment and activates a self-centred endogenous program while the individual is at his/her most vulnerable¹ (Jouvet, 1999). Consequently, family and social alliances have played a crucial role in the evolution of human sleep, by providing a safe context for sufficient intervals of night-time rest (Dahl & El-Sheikh, 2007; Worthman, 2008).

By way of definition, sleep has been variously described as an endogenously generated, self-regulating, and reversible behavioural state characterised by perceptual disengagement from the environment, decreased responsiveness to stimulation (i.e., increased

¹ A considerable increase in the arousal threshold and suppression of muscle tone renders the individual essentially deaf, blind, and paralysed (Jouvet, 1999).
arousal threshold), and variable yet specific brain activity (Carskadon & Dement, 2011; Fuller et al., 2006; Rosenthal, 2009; Stores, 2001). However, sleep is not merely a state of rest—most individual brain cells remain active in both sleeping and waking states, with only their pattern of firing changing (Borbély, 1986; Jouvet, 1999; Peirano & Algarín, 2007)—it is a complex amalgam of physiological, biochemical, and behavioural events (Carskadon & Dement, 2011; Roth, 2004). In other words, the brain does not sleep when we do (Borbély, 1986); it is the functions and inter-relationships between its different parts that differ from wakefulness (Shneerson, 2005). The permanently active brain has the capacity to control autonomic, metabolic, and hormonal changes occurring within the body during sleep, and simultaneously determine behavioural responses to any external stimuli (Halász, Terzano, Parrino, & Bódizs, 2004). For example, there is evidence that the significance of a stimulus is actively interpreted so that a crying child is more likely to arouse their mother than another noise of similar intensity (Shneerson, 2005; Velluti, 1997).

Although the precise function of sleep is unknown, research strongly suggests that it has a fundamental role in central nervous system (CNS) restoration, memory consolidation, and affect regulation (Lee & Douglass, 2010). The indispensable nature of sleep is reflected in the severe cognitive and physical consequences of sleep loss (Goel, Rao, Durmer, & Dinges, 2009; Sadeh, 2007) and the strong rebound of sleep on subsequent nights (Durmer & Dinges, 2005; Shneerson, 2005; Zee & Turek, 1999). In fact, most of what is understood about the function of sleep has emerged from studies examining the impact of experimentally-induced sleep restriction and deprivation in animals and human adults. These studies show that without the restorative functions of sleep, cognitive functioning, behaviours, and physical health are rapidly affected, while in the case of total sleep deprivation, death is inevitable within a few weeks (Jan et al., 2010). It is clear that sufficient sleep is a biological imperative for optimal functioning and sustaining life (Davis, Parker, & Montgomery, 2004a; Jan et al., 2010; Mindell & Owens, 2010).

Given that infants and young children spend a majority of their time asleep, it follows that it is also important for the developing brain and body. In fact, sleep is the primary activity of the brain during early development (Dahl, 1996c). Sleep is involved in the progression of the CNS, including neuronal development and brain plasticity; the regulation of somatic growth and many other neuroendocrine functions; the growth and healing of body tissues; healthy immune function; neurocognitive (attention, memory, learning), behavioural, and emotional well-being; and gene expression (Dahl & Harvey, 2007; Durmer & Dinges, 2005; Graven, 2006; Jan et al., 2010; Lampl & Johnson, 2011; Lipton, Becker & Kothare,
2008; Mindell & Owens, 2010; Rogers, Szuba, Staab, Evans, & Dinges, 2001; Walker & Stickgold, 2006; Zee & Turek, 1999). By limiting time in the awake state, it appears that sleep also protects the individual, and particularly the developing organism, from being overwhelmed by environmental stimuli that would not otherwise be adequately processed (Mindell & Owens, 2010). Indeed, there is a complex bidirectional association between sleep and brain development; not only does brain maturation lead to regularisation of sleep states and cycles, but in turn, sleep is essential for brain development (Graven, 2006). Further, all sleep events are reflective of neural processes which change dramatically over time. Thus, Kohyama (1998) and M. S. Scher (2008) argue that sleep provides a window to the developing brain which ought to be analysed and considered in the same way as other developmental milestones.

In summary, sleep is a basic necessity for an enjoyable and healthy life. It is elemental from a biological, psychological, cognitive, emotional, social, behavioural, and cultural perspective (Dahl, 2011). Sleep has a critical role in development and maintenance of neurophysiological and psychological health and well-being. Consequently, studies aimed at understanding and preventing sleep problems are of vital importance. The capacity to establish healthy sleep patterns in children from an early age is a logical focus of preventive research attention.

Throughout this thesis, the term preventive is used in preference to preventative, as recommended by Johnson (2006).
He’s finally asleep.
I’ll just give him a little
goodnight smooch.

If you wake him up,
I’ll rip your face off.
CHAPTER 1

Introduction and Program of Research

One of the mysteries of parenthood—especially for first-time parents—is what to expect of your child when it comes to sleep. (Durand, 1998, p. 196)

Few infant skills are more important to their caregivers in the early months of life than the infant’s ability to fall asleep easily and remain asleep at appropriate times…Primary care providers have a unique opportunity to assist mothers in teaching infants how to sleep. Such an important task may prove even more beneficial to mothers with depression. Even a short term gain for these women may be an invaluable contribution to infant and maternal wellbeing. (Hawkins-Walsh, 2003)

New parents are frequently asked whether their infant is sleeping through the night (Wolfson, 1998). However, perinatal parenting classes typically focus on issues such as labour and delivery, breastfeeding, car seat use, early developmental milestones, and safe baby toys. Little attention is given to matters of infant sleep. This is unfortunate, particularly when the pervasive reality of childhood sleep problems is considered.

In Australia, up to 46 percent of parents with infants under 12 months report that their child has sleeping difficulties (Armstrong, Quinn, & Dadds, 1994; Hiscock, Bayer et al., 2007; Hiscock & Wake, 2001). The high prevalence of these problems is significant because of the wide range of individual and family difficulties known to be associated with unsettled sleep patterns in children. In fact, poor sleep impacts negatively on all aspects of children’s physical, cognitive, emotional, and social development (Mindell & Owens, 2010). Moreover, infant sleep disturbance is associated with worry, frustration, despair, anger, exhaustion, lowered parenting self-efficacy, and relationship turmoil in families (Ferber, 2006).

Nevertheless, a small but growing body of research suggests that there is much that parents can do to promote healthy sleep patterns in their infants, and ultimately reduce or prevent the occurrence of childhood sleeping problems (Adair, Zuckerman, Bauchner, Philipp, & Levenson, 1992; Kerr, Jowett, & Smith, 1996; Pinilla & Birch, 1993; Wolfson, Lacks, & Futterman, 1992). Considering the prevalence and consequences of infant sleep disturbance, there is clearly a need for efficient and effective prevention programs at a community level. The program of research reported in this thesis, known as the Silent Night
Sleep Project (SNSP), was developed as one such preventive endeavour. This dissertation reports on the outcome of a universal prevention strategy designed to enhance parental knowledge of normal sleep development, and promote parenting practices thought to be associated with the establishment of healthy sleep patterns in young children. A further important aim is to contribute meaningfully to the research base by considering the pathways to infant sleep disturbance. The report begins with a series of introductory chapters that review the extant literature.

Chapter 2 considers the physical aspects of human sleep with an emphasis on the developmental aspects of sleep-wake state organisation. The third chapter discusses the exogenous influences on infant sleep regulation and consolidation. The focus is on infant sleep disturbance including its prevalence, caregiving influences, clinical features, and implications for individuals and families. Chapter 4 presents two theoretical models of infant sleep disturbance and discusses some of the additional intrinsic and extrinsic factors thought to be associated with problematic childhood sleep. The final introductory chapter provides an overview of treatment options for established sleep disorders, an introduction to prevention theory, and a review of preventive literature within the paediatric sleep disorders field.

The sixth chapter outlines the general methodology used within this research. Chapters 7, 8, and 9 report on the implementation and evaluation of the program by means of three concurrently conducted studies. The first of these investigates the efficacy of providing first-time parents of healthy newborns with written anticipatory guidance aimed at promoting healthy infant sleep patterns within the first 12 months of life. Chapter 8 examines the developmental pathways of infant sleep disturbance by investigating the relative impact of all relevant project variables. The ninth chapter investigates the factors associated with persistent infant sleep problems and enduring healthy sleep patterns during the first year using two extreme groups drawn from the original sample.

Finally, Chapter 10 is a general discussion, which aims to integrate the research outcomes into the existing body of research and clinical knowledge about the prevention and remediation of problematic infant sleep. This chapter focusses on the utility of the written anticipatory guidance and considers possible improvements in light of the second and third study findings. In addition, this final chapter discusses matters relating to dissemination of the intervention, and reports on the methodological issues, theoretical and clinical implications, and future directions.
CHAPTER 2
Ontogeny of Sleep-Wake State Organisation

The saying ‘I slept like a baby’ is reflective of the lack of understanding about patterns of sleep exhibited in the neonatal period. (Rosen, 2008, p. 711)

From the moment your first child is born, your ability to rest is intertwined with that of another creature—one who doesn’t initially know day from night, who eats at all hours and who can’t seem to doze off without being held in your arms. (Points, 2014)

OVERVIEW

In order to fully appreciate the issues relating to infant sleep disturbance, some understanding of the basic structure and regulatory mechanisms of sleep, and the normal developmental trajectory is required (Owens & Witmans, 2004). Indeed, concerns about the sleep of young children often reflect a mismatch between parent expectations and developmentally appropriate sleep patterns and behaviours (Burnham & Gaylor, 2008). Two important principles guide the consideration of normal sleep ontogeny during childhood. First, although the development of sleep structure, organisation, and regulation are primarily governed by intrinsic biological processes, they are fostered and shaped by psychosocial factors, particularly caregiving practices. Second, within and across cultures there is considerable between-individual variability in all aspects of children’s sleep (Giannotti & Cortesi, 2009; Jenni & Carskadon, 2007).

As Mindell and Owens (2010) have astutely noted, there are few clinical paradigms in paediatrics that are more in need of a biopsychosocial approach than sleep. In view of this, the current chapter will introduce the basic concepts of human sleep followed by an overview of sleep pattern development in childhood, with an emphasis on the first 12 months of life. It will primarily consider the biological aspects of children’s sleep, complementing the third chapter, which focuses more on environmental influences. Together, these chapters provide a precursory backdrop for the remainder of the dissertation.
HUMAN SLEEP REGULATION AND ARCHITECTURE: BASIC CONCEPTS

Diurnal Rhythms

Sleep-Wake Regulation

Three discrete processes are involved in the regulation of sleep and wakefulness (Achermann & Borbély, 2011). The \textit{circadian rhythm} (Process C) refers to 24-hour cyclical variations in physiological alertness and sleepiness which influence the timing and duration of daily sleep-wake cycles. Secondly, the \textit{homeostatic system} (Process S), affects sleep propensity and depth based on prior wakefulness (Chokroverty, 2010; Mindell & Owens, 2010). Although the sleep homeostatic and circadian processes are independent mechanisms, they interact in a complex way to regulate the quality and distribution of sleep and wakefulness across the 24-hour period (Achermann & Borbély, 2011; Davis, Frank, & Heller, 1999; Rosen & Mahowald, 2005) and the stability of waking neurocognitive functions (Durmer & Dinges, 2005). Accordingly, sleep may be conceptualised as reflecting the balance of these two fundamental systems (Reite, Weissberg, & Ruddy, 2009). During sleep, a third ultradian process determines the alternation, timing, and duration of two basic sleep states: \textit{non-rapid eye movement} (NREM) and \textit{rapid eye movement} (REM) sleep (Achermann & Borbély, 2011; Zee & Turek, 1999). Human existence is therefore comprised of three physiological states; one of wakefulness and two of sleep (Silber, 2011; Reite et al., 2009).

Models of Sleep-Wake Regulation

Borbély (1982) proposed a \textit{two-process model} in which interactions between Process S and Process C account for the essential elements of sleep regulation. It is the cornerstone upon which the contemporary understanding of sleep-wake timing and structure has been built (Borbély, 2009; Lockley, 2010). According to Borbély’s (1982) theory, the sleep-dependent homeostatic process interacts systematically with the sleep independent circadian timing system to influence the timing and duration of sleep and wakefulness. Edgar, Dement, and Fuller (1993) further developed and refined the two-process model to more fully articulate the role of Process C.

The resultant \textit{opponent process model} emphasised the role of the circadian pacemaker in initiating and maintaining wakefulness by actively opposing the homeostatic sleep tendency during the day. This counteracts the homeostatic pressure for sleep, thereby maintaining sleep propensity at a relatively consistent level (Borbély & Achermann, 1999;
Dijk & Lockley, 2002; Edgar et al., 1993). The sleep homeostat is impacted by the oscillations of the circadian rhythm so that, for example, enhanced alertness may be present in the early evening despite a previous restless night (Rosenthal, 2009). Conversely, the declining homeostatic sleep pressure over the course of the night is counteracted by a rising circadian sleep tendency, resulting in consolidated sleep (Fuller et al., 2006; Jenni & Carskadon, 2007; Lockley, 2010). It is commonly understood that synchronisation of these systems is vital for optimal functioning (Dijk, & Lockley, 2002; Rosen & Mahowald, 2005).

**Ultradian Rhythms/Sleep Architecture**

The ultradian rhythm refers to the alternation of NREM and REM, the two distinct states occurring during the sleep period (Achermann & Borbély, 2011; Zee & Turek, 1999). Each type of sleep is distinguished and defined by characteristic patterns of brain activity, arousal, autonomic response, and muscle tone (Adair & Bauchner, 1993). NREM and REM are also associated with unique physiology, neuroanatomy, function, developmental courses, and pathologies (Reite et al., 2009). There appears to be general support for the notion that NREM sleep is involved in the renewal of body tissue while REM sleep plays a restorative role in terms of brain tissue (Adam & Oswald, 1977; Chokroverty, 2009a; Minde, 1995).

NREM sleep is further subdivided into stages, primarily based on intensity or depth. The electroencephalogram (EEG) correlates of sleep have historically been utilised as a primary defining feature (Loomis, Harvey, & Hobart, 1937; Siegel, 1990). Correspondingly, the term sleep architecture is used to describe the distinctive brainwave patterns associated with each NREM state or stage.

**Non-Rapid Eye Movement Sleep**

NREM is characterised by progressively decreased responsiveness to the external environment involving stable physiology, including synchronised rhythmic brain activity, lower core temperature, partial relaxation of voluntary muscles, depressed cardiovascular system, and reduced cerebral blood flow (Chokroverty, 2009a; Lockley, 2010; Silber, Krahn, & Morgenthaler, 2010; Steriade, 2009). In general, it is a period of decreased neuronal activity in which the sympathovagal balance shifts toward parasympathetic dominance while body movements are preserved (Mindell & Owens, 2010; Trinder, 2007). NREM sleep makes up the largest portion of the sleep cycle, accounting for 75 to 80 percent of total adult sleep time (Chokroverty, 2009a). The NREM state, also referred to as Stage N sleep, is
subdivided into three stages (N1, N2, and N3), each with distinctly recognisable electrical brain wave patterns, and representing progressive depths of sleep (Silber et al., 2007).

The lightest stage is N1, a brief transitional phase between waking and sleeping, usually lasting less than 10 minutes. It is typified by fewer body movements, drowsiness, and reduced responsiveness, as conscious awareness of the external environment gradually disappears (Davis et al., 2004a). There will be a corresponding decrease in breathing and heart rate, relaxation of voluntary muscles, and slow, rolling eye movements (Silber et al., 2010). Recall of fragmented visual imagery (hypnagogic hallucinations) may occur as well as brief involuntary muscle contractions (hypnic myoclonia), often preceded by a falling sensation (Mindell & Owens, 2010). N1 represents approximately 3 to 8% of total adult sleep time, with the majority occurring at the beginning of the sleep period (Adair & Bauchner, 1993; Chokroverty, 2009a).

Stage N2 marks the onset of true sleep, as conscious awareness completely disappears (Fuller et al., 2006; Zee & Turek, 1999). Slow eye movements sometimes persist into this phase (Silber et al., 2010) as the cardiovascular system and muscle tone continue their deceleration (Davis et al., 2004a). It is the most common sleep stage, encompassing about half of the time spent sleeping (Adair & Bauchner, 1993; Reite et al., 2009). The defining feature of Stage N3 is the emergence of high-voltage, low-frequency delta waves on the EEG. For this reason, it is often referred to as delta or slow-wave sleep. The heart rate descends to its lowest point, accompanied by slow and rhythmical breathing. The arousal threshold is highest during N3, and if awakened, the person will initially appear confused and disoriented (Adair & Bauchner, 1993). EEG slow-wave activity increases relative to prior waking time, a classic marker of the sleep homeostatic process (Dijk & Lockley, 2002). This stage constitutes approximately 15 to 20% of total adult sleep time (Carskadon & Dement, 2011; Chokroverty, 2009a).

**Rapid Eye Movement Sleep**

REM (Aserinsky & Kleitman, 1955), paradoxical (Jouvet & Michel, 1959), or Stage R (Silber et al., 2007) sleep is present in all mammals.³ In contrast to NREM, it is associated with a high level of brain activity, vivid dreaming, and intense dysregulation of the autonomic nervous system (Aserinsky & Kleitman, 1953, 1955; Chokroverty, 2009b; Dement & Kleitman, 1957a, 1957b; McCarley, 2009). The defining characteristics of REM sleep are

---

³ Readers interested in a “behind the scenes” look at the dawn of modern sleep research are directed to a fascinating article by Lamberg (2004).
intermittent bursts of rapid binocular eye movements, suppression of muscle tone (atonia),\textsuperscript{4} and low amplitude mixed frequency EEG background (Aserinsky & Kleitman, 1953; Silber et al., 2007). Other prominent features include transient muscle activity (phasic twitches) and irregular breathing, heart rate, and blood pressure (Carskadon & Dement, 2011; Chokroverty, 2009b; Siegel, 2011a; Silber et al., 2007).

In addition, thermoregulation is temporarily suspended during Stage R, with the body drifting towards the environmental temperature (Parmeggiani, 2003). This is an issue for young children, who have higher ratios of REM sleep than adults (Kohyama, 1998). About 80% of sleepers will report dreaming activity if awoken (Dement & Kleitman, 1957b) while the accompanying loss of muscle tone is thought to prevent the individual from acting out their dream experience during this phase (Hill, Hogan, & Karmiloff-Smith, 2007; Hirshkowitz, Moore, & Minhoto, 1997; Jouvet, 1979, 1999; Reite et al., 2009). Stage R usually occurs in four to six discrete episodes which make up approximately 20 to 25% of total adult sleep time (Carskadon & Dement, 2011; Chokroverty, 2009a).

**Progression of Sleep through the Night**

Normal sleep involves an orderly progression from wakefulness to NREM sleep followed by REM sleep (Chokroverty, 2009a). NREM and REM continue to alternate throughout the night with a cycle periodicity of approximately 90 minutes (McCarley, 2009). Each sleep episode comprises four to six cycles (Chokroverty, 2009a; Silber et al., 2010) with 75 to 80% of time spent in NREM sleep overall. However, the sleep state ratios within each phase vary predictably over the course of the night. More specifically, the majority of slow-wave sleep occurs in the first third of the night, and it is generally absent from latter sleep cycles (Reite et al., 2009). Conversely, REM sleep appears only briefly in the first cycle, and becomes more prevalent and vigorous as the sleep episode progresses (Carskadon & Dement, 2011; Culebras, 1996). Similarly, the majority of Stage N2 appears during the second half of the night (Adair & Bauchner, 1993). Patterns of sleep are commonly illustrated in a hypnogram (Figure 1).

\textsuperscript{4} According to a number of authors (e.g., Luppi et al., 2006; Zee & Turek, 1999), this muscle paralysis in the presence of intense brain activity has led to use of the synonymous expression, paradoxical sleep. However, this widely held belief is not strictly accurate. Paradoxical sleep was first used by Jouvet and Michel (1959) to describe a third state of brain activity (in addition to sleeping and waking) involving very deep sleep but, paradoxically, with specific motor events such as rapid eye movements (Jouvet, 1999). Siegel (2011b) suggests that the REM state has truly has earned the name paradoxical sleep since its adaptive role remains a complete mystery.
Figure 1. Hypnogram for a normal adult. W = Wakefulness; R = Rapid Eye Movement (REM) sleep; N1–N3 = progressively deeper stages of Non-Rapid Eye Movement (NREM) sleep. Reprinted from “Fundamentals of sleep medicine,” p. 80, by R. B. Berry, Copyright 2012, with permission from Elsevier Saunders (2012).

The amount and timing of each sleep stage are also affected by extrinsic factors, such as prior sleep loss (Mindell & Owens, 2010). Following missed sleep, there is a tendency for NREM sleep to be preferentially recovered, possibly associated with its predominance early in the nocturnal sleep period (Mindell & Owens, 2010; Roth, 2004). During recovery sleep, a conspicuous increase in the duration and depth of NREM sleep occurs at the expense of REM sleep (Achermann & Borbély, 2011; Bonnet, 2011). In addition, delta power decreases exponentially with time during recovery, tracking the sleep debt dissipation (Mignot, 2008). REM sleep is also homeostatically regulated. Following slow-wave recuperation on the first night, REM sleep tends to rebound on the subsequent night, often involving more intense and longer episodes, with more vivid dreaming (Carskadon & Dement, 2011; Mindell & Owens, 2010; Shneerson, 2005; Silber, 2011). The sleep structure usually reverts to normal by the third night (Silber, 2011).

**ONTOGENY OF CHILDREN’S SLEEP**

Newborn infant sleep patterns differ dramatically from those of adults (Markov & Goldman, 2006; Moorcroft, 2013). The organisation of sleep undergoes marked transformation during early life, proceeding in an orderly manner, contingent on maturation
of the CNS (Chokroverty, 2009a; M. S. Scher, 2008). The behavioural states of wakefulness, NREM sleep, and REM sleep represent one of the most remarkable functions of this system and are important indicators of normal infant development (Curzi-Dascalova, Giganti, & Salzarulo, 2008). In addition to genetic influences, environmental factors play a significant role, particularly in terms of circadian rhythmicity (M. S. Scher, 2008) and the ability to self-regulate states of arousal (France & Blampied, 1999; Owens, 2006).

A child’s sleep experience evolves from frequent, brief, and poorly organised newborn sleep, to longer night-time sleeping with napping as a toddler, through to nocturnally-based sleeping at school-age (Adair & Bauchner, 1993). Although sleep is a major component of the lives of neonates, infants, and children, the focus of this chapter is on development during the first 12 months. A recent systematic and comprehensive evidence-based review of the paediatric sleep ontogeny literature (Grigg-Damberger et al., 2007) provides an important foundation for this discussion.

The Neonatal Period: Birth to 1 Month

The first month is a time of feeding, sleeping, and growth (Symon, 2011). At birth, infants are physiologically unable to sustain consolidated bouts of waking (Peirano & Algarín, 2007), with periods ranging from 20 to 40 minutes. Sleep times vary between 2 and 5 hours (Symon, 2011). As a result, sleep generally occupies the majority of the 24-hour day (Roth, 2004), with normal, full-term infants spending about 16 hours sleeping (Chokroverty, 2009a; de Weerd & van den Bossche, 2003; Ferber, 2006; McCarley, 2009). There is, however, remarkable individual variability in sleep behaviour. Newborns may sleep anywhere between 9 and 22 hours in each 24-hour period (Galland, Taylor, Elder, & Herbison, 2012; Sadeh, Dark, & Vohr, 1996), although the normal range5 is 14 to 18 hours (Ferber, 2006).

Evidence suggests that entrainment of the human biological clock begins in utero (M. S. Scher, 2008), presumably in response to exogenous maternal melatonin signals (Herman, 2005; R. Y. Moore, 2009; Reppert, 1995; Serón-Ferré, Valenzuela, & Torres-Farfán, 2007). Nevertheless, significant daily rhythms do not manifest in the newborn. Rather, sleep periods are polyphasic, alternating with waking states in a rest/activity cycle averaging 3 to 4 hours (Anders, Sadeh, & Appareddy, 1995; M. S. Scher, 2008; Scher & Loparo, 2009), scattered

5 Interestingly, Symon (2011) argues that estimates of the range of newborn total sleep time have been skewed by infants with sleep disturbance in large population studies. According to this author, normal, healthy babies ought to be sleeping for 18–21 hours per day for at least the first month.
throughout parents’ own sleeping and waking times. This cycle is primarily influenced by hunger and feeding times (Adair & Bauchner, 1993; Crabtree & Williams, 2009; Millpond Children’s Sleep Clinic [MCSC], 2005) while there is also an increased tendency for the neonate to fall asleep after feeding (Shneerson, 2005). Hence, the sleep of newborns is distributed about equally across the 24-hour period (Jenni & Carskadon, 2005).

Indications of a weak circadian rhythm begin to emerge early in the neonatal period, with slightly more sleep occurring during the nocturnal hours (Chokroverty, 2009a; Sadeh et al., 1996). Within the first month of life, the infant starts to acclimatise to the day-night cycle (Hoban, 2004), augmented by regularly occurring parental care activities (Recio, Míguez, Buxton, & Challet, 1997). Of particular interest is that exposure to natural light in the morning is associated with improved sleep at night (Mindell & Owens, 2010). During the neonatal period and beyond, formula-fed babies tend to sleep for longer than breastfed babies, presumably because breastmilk is more easily digested (Burness, 1979; Hiscock, 2010; Mindell & Owens, 2010) and/or since breastfeeding is a more convenient method of resettling overnight (Hiscock, 2010), leading to more frequent feeding and a closer infant temporal association between demand and response (Touchette et al., 2005).

**Early Infant Sleep: 1 to 3 Months**

Between 1 and 3 months, infant total sleep requirements decrease from approximately 15.5, to 13 hours each day (Ferber, 2006; Galland et al., 2012; So, Adamson, & Horne, 2007). The infant’s physiological ability to sustain unbroken sleep develops rapidly during the second month of life (Henderson, France, & Blampied, 2011). Throughout this period, infant sleep-wake state organisation is increasingly influenced by *zeitgebers*, such as the light/dark cycle (Coons & Guilleminault, 1982) and regularly occurring social cues (Anders et al., 1995; M. S. Scher, 2008). Gradually, the infant’s sleep consolidates into longer periods during the night, while daytime sleep and the number of naps decrease (Chokroverty, 2009a; Ferber, 2006).

In addition to the innate capacity for more continuous sleep, infants may develop the ability to independently reinitiate sleep after waking. Incidentally, all infants, children, and adults awaken briefly on between two and six occasions during a typical night’s sleep (Minde et al., 1993; Mindell & Owens, 2010), meaning that the concept of an uninterrupted night’s sleep is technically a misnomer (Burnham, Goodlin-Jones, Gaylor, & Anders, 2002b). These

---

6 Refers to any environmental signal that acts to entrain or synchronise an organism's biological rhythms.
7 This phenomenon is depicted on the hypnogram presented earlier (Figure 1).
normal brief arousals, which occur between ultradian sleep cycles, appear to have evolved as a survival mechanism and are usually not remembered (Sheldon, 2005).

Self-soothing refers to an infant’s ability to regulate states of arousal; for example, calming from crying to quiet wakefulness or from quiet wakefulness to sleep; without parental assistance (Burnham, Goodlin-Jones, Gaylor, & Anders, 2002a; Minde et al., 1993; M. S. Scher, 2008). The capacity to self-soothe develops during the first 12 weeks of life and is a manifestation of both neurodevelopmental maturation and learning (Owens, 2008). Sleep self-regulation involves the infant’s ability to negotiate the sleep-wake transition (i.e., self-soothe) at both sleep onset, and following normal awakenings during the night. There is now good evidence to suggest that increases in the ability to sustain sleep for longer than 5 or 6 hours may be attributed more to the development of self-regulation skills than changes in the substrate of sleep itself (Henderson et al., 2011).

A long period of uninterrupted sleep during the nocturnal hours is considered to be a major developmental milestone in Western cultures and is a central theme of early infant care (Jenni & Carskadon, 2007). As such, proficiency in falling asleep independently has received much attention in the paediatric sleep literature and it is a principal feature of healthy sleep concepts. Conversely, a pattern of persistent difficulty in self-soothing is associated with frequent infant night-waking (Mindell & Owens, 2010; Mindell, Sadeh, Kohyama, & How, 2010). Infants who are able to resume sleep without disturbing their parents have been referred to as self-soothers, while infants who cry and require parental intervention to resettle have been considered signallers (Anders & Keener, 1985; Keener, Zeanah, & Anders, 1988). The parents of self-soothers usually perceive their infant as “sleeping through the night” while signallers are often thought of as problem sleepers (Anders, 1994; Dahl, 1998a).

During the first month, almost all infant arousals involve signalling for parental assistance prior to sleep resumption. As infants mature they increasingly develop the capacity to return to sleep without signalling (Wolfson, 1998). More than half of all babies will be sleeping through the night by 2 or 3 months, depending on the criterion employed (Adams, Jones, Esmail, & Mitchell, 2004; Henderson, France, Owens, & Blampied, 2010).8 Further, three-quarters of infants will be sleeping for a large unbroken period during the night within the first three months (Adams et al., 2004; Beal, 1969; Henderson et al., 2010; MCSC, 2005; Sheldon, 2009). Importantly, babies who have learned to fall asleep independently by

---

8 This is, of course, inconsistent with the largely unsupported view that sleep disruptions are a normal manifestation of proximity-seeking behaviour during infancy, occurring in the majority of children, and inevitable at least until the attachment relationship matures closer to toddlerhood (e.g., Keller, 2011).
this age are also physiologically able to obtain their nutritional requirements during their usual waking periods (France, Henderson, & Hudson, 1996; MCSC, 2005). Moreover, it is a myth that night-feedings improve the quality or quantity of sleep in some way (Mindell & Owens, 2010).

By 3 months, infants are capable of sleeping in 8- or 9-hour blocks with a stable diurnal sleep pattern relatively well-established (de Weerd & van den Bossche, 2003; Kohyama, 1998; Sheldon, 2009). This rapid development, particularly between the first and second month, underscores the importance of developing adaptive night-time parenting practices early in life (Henderson et al., 2011). Note, however, that the period between 3 and 6 months (or even later) has been traditionally emphasised by leading experts (e.g., Ferber, 1987, 2009; Jenni & Carskadon, 2007; MCSC, 2005) as the principal time for the facilitation of infant settling.

**Infant Sleep: 3 to 12 Months**

Between 3 and 12 months, infants gradually sleep for longer periods of time at night, and slightly less overall. Sleep occurring during daylight hours reduces from 4.5 hours at 3 months to about 2 hours by the child’s first birthday. By 3 to 4 months, babies are not only physiologically able to sleep through the night, but are progressively more responsive to parental routines. In their seminal paper, Moore and Ucko (1957) expressed the view that a delay in the settling process past the fourth or fifth month makes adjustment to a diurnal cycle increasingly difficult, as the infant reaches a point of stabilisation on a different rhythm.

The 4- to 6-month-old child is capable of consolidating several sleep cycles into one long sleep episode per day (Adair & Bauchner, 1993) and more than half will be sleeping concurrently with their parents (Henderson et al., 2010). The developmental course of the circadian rhythm, which began in utero, reaches full adult expression by 6 months (de Weerd & van den Bossche, 2003; Herman, 2005). At this age, infants sleep for about 12.5 hours each day (Ferber, 2006) and 90% take only two naps as their night-time sleep continues to lengthen (Meltzer & Mindell, 2006). By 9 months, approximately 70 to 80% of infants have achieved sleep consolidation (Owens, 2008) while the average total sleep requirement has decreased marginally to approximately 12.25 hours (Ferber, 2006).

At 12 months, the duration of night-time sleep becomes more stable (Schwichtenberg & Goodlin-Jones, 2010) with sleep involving one major nocturnal episode averaging about 11.75 hours and one or two daytime naps totalling 2 hours (Ferber, 2006; Shneerson, 2005). Figure 2 shows the average sleep patterns of children at different ages during the first year, as
described by Ferber (2006). Although the time spent sleeping at night gradually increases, a sharper decrease in daytime sleep leads to an overall reduction in sleep across the first year (Crabtree & Williams, 2009; Ferber, 2006).

**Ontogeny of Sleep States**

In addition to changes in the duration and distribution of sleep during the first year of life, considerable transformation in sleep stages and architecture occur (Hoban, 2004). Three types of sleep are apparent during the neonatal period: quiet, active, and indeterminate sleep. **Quiet sleep**, which is analogous to NREM, is characterised by minimal muscle movements and rhythmic breathing (Carno, Hoffman, Carcillo, & Sanders, 2003; MCSC, 1999).

The first edition of his popular book (Ferber, 1985b) contained substantially different figures, and these were actually included as a guide for parents in the written intervention evaluated in this dissertation. Ferber (2006) does not provide a reference, or an explanation for the change, although his latest offering is similar the findings of an excellent recently published review by Galland et al. (2012). It is likely, however, that typical infant sleep requirements are slightly more stable between 6 and 12 months than either of Ferber’s (1985b, 2006) guidelines suggest (Galland et al., 2012; Iglowstein, Jenni, Molinari, & Largo, 2003).

In very young infants, the often ambiguous differences in EEG characteristics mean that behavioural observations are required to distinguish sleep states (Ednick et al., 2009).
Active sleep, the likely precursor to REM, features irregular breathing, vocalisations such as grunting, whimpering and crying, and body, limb and facial movements, including twitches, grimaces, smiles, frowns, and rhythmic sucking motions (Culebras, 1996; Mindell, 1997; Sheldon, 2009; Wolfson, 1996). In contrast to the muscle atonia seen in REM at later ages, gross limb movements are also exhibited. Disorganised and immature sleep that does not satisfy the polysomnographic criteria for quiet or active sleep is referred to as indeterminate sleep, technically a non-definition (de Weerd & van den Bossche, 2003; Jenni & Carskadon, 2007). As such, this indefinable state provides a quantitative measure of immature sleep (Louis, Cannard, Bastuji, & Challamel, 1997) with excessive amounts indicative of poor state integration or even underlying brain pathology (Grigg-Damberger et al., 2007). As the newborn matures, indeterminate sleep evolves into more clearly defined quiet and active, and later NREM and REM, sleep (Anders et al., 1995).

Full-term newborns spend about 50% of their total sleep time in active sleep (Carskadon & Dement, 2011). Incidentally, the active state predominates in immature infants and declines during maturation. Unborn and premature infants of 30 weeks gestational age spend 80% of the sleep period in active sleep, reflective of its crucial role in early development (Reite et al., 2009; Shneerson, 2005). Unlike older children and adults, newborns typically enter each sleep period via active sleep, a phenomenon that slowly dissipates over the first 3 months (de Weerd & van den Bossche, 2003).

The duration of sleep cycles is also shorter in infants, lasting for approximately 50 to 60 minutes (Montgomery-Downs, 2008), a periodicity which increases gradually with maturation throughout the first year and beyond (Ficca, Fagioli, & Salzarulo, 2000; M. S. Scher, 2008). Sleep cycling is essential for early neurosensory development, learning and memory, and preservation of brain plasticity for the life of the individual (Graven, 2006). The adult sleep cycle length of approximately 90 minutes is not usually observed until adolescence (Anders et al., 1995; Berry, 2012; Hoban, 2004).

From 2 months onwards, all features of REM sleep are present, allowing the active and quiet sleep descriptives to be abandoned in favour of adult terminology (Grigg-Damberger et al., 2007). The ratio of REM sleep within each sleep phase decreases as the infant develops and matures and by 3 months it will have fallen to about 40% (Shneerson, 2005). From this age, the distribution of REM sleep also begins to shift towards the later sleep cycles with NREM sleep more prevalent in the earlier part of the night (Anders et al., 1995; Heraghty, Hilliard, Henderson, & Fleming, 2008). The overall proportion of REM sleep continues to gradually decline over the first year and beyond, averaging about 30% of
total sleep time between 6 and 12 months (Ficca et al., 2000; Sheldon, Spire, & Levy, 1992; Shneerson, 2005) and reaching adult levels of 20 to 25% during early childhood (Kohyama, 1998; Reite et al., 2009; Roth, 2004; Sheldon, 2009).

The EEG markers of NREM sleep stages are not fully developed in term neonates, but develop predictably over the first two to six months (Carskadon & Dement, 2011; Hoban, 2004; Zee & Turek, 1999). Sleep spindles and K complexes, phenomena closely associated with Stage N2 sleep, typically emerge in the second and sixth months, respectively (Ednick et al., 2009; Grigg-Damberger et al., 2007). Slow-wave activity may be seen as early as 2 to 3 months (Grigg-Damberger et al., 2007; Markov & Goldman, 2006) and is usually present by 4 or 4.5 months post-term (de Weerd & van den Bossche, 2003; Ficca et al., 2000; Grigg-Damberger et al., 2007). By the fifth month, all EEG features of the three NREM sleep stages are typically discernible (Coons, & Guilleminault, 1982; Grigg-Damberger et al., 2007; Sheldon, 2009). In contrast to the physical movement seen earlier during active sleep, inhibition of muscle tone now occurs during REM sleep (Heraghty et al., 2008).

In the second half of the first year, infant sleep continues its evolution toward adult sleep architecture with most of the building blocks already in place. As the infant grows, his/her sleep cycles and rhythms increasingly resemble those of older children and adults (Scher, 1998). Nine months appears to be a turning point in the sleep maturation process with an increase in N2 sleep and a substantial decrease in REM sleep apparent (Louis et al., 1997; M. S. Scher, 2008; Scher & Loparo, 2009). These occurrences are reflective of the rapid acceleration in brain myelination, dendritic arborisation and synaptogenesis occurring at this time (van der Knaap & Valk, 1990). Twelve months marks the end of the transition from neonatal to infantile sleep, a significant milestone in cerebral development (de Weerd & van den Bossche, 2003).

Secondary Infant Sleep Disturbance

A recurring theme in the paediatric sleep literature is that 9-month-olds have a tendency to resume waking at night after having previously slept through (e.g., Adair & Bauchner, 1993; France & Blampied, 1999; Karraker, 2008; Moore & Ucko, 1957; Paret, 1983; Scher, 1991). Accordingly, Paret (1983) speculates that increases in signalled awakenings may be a consequence of separation anxiety. In addition to infant proximity-

---

11 The development of the attachment relationship at this age means that infants have begun to explore the world using their primary caregiver as a secure base, rarely venturing too far or for too long, with separations resulting in distress and dysregulation (Ainsworth, Blehar, Waters, & Wall, 1978; Waters & Cummings, 2000).
seeking behaviour, mothers who experienced attachment issues in their own infancy may have a tendency to hold on to their infants longer in an effort to reclaim some of the intimacy that they had missed out on earlier. However, DeLeon and Karraker (2007) found night-waking in 9-month-old infants to be a complex phenomenon involving many underlying factors, with separation distress unlikely to be the primary cause of resurgent awakenings. Further, a number of cross-sectional studies investigating night-waking over the first year of life have not identified an escalation in night-waking at this time (Goodlin-Jones, Burnham, Gaylor, & Anders, 2001; Sadeh, Mindell, Luedtke, & Wiegand, 2009; Scher, Epstein, & Tirosh, 2004; So et al., 2007).

**CONCLUDING COMMENTS**

The structure and distribution of sleep alter dramatically during the neonatal and infancy periods. This endogenously driven, exogenously shaped phenomenon offers important markers of biobehavioural organisation and adaptation (Curzi-Dascalova et al., 2008; Kohyama, 1998; Thoman, 1990; Van den Bergh & Mulder, 2012) as children learn to control internal states of arousal, and sleep for progressively longer periods during the nocturnal hours (Owens, 2006). However, the vulnerability of these processes is reflected in the high prevalence of sleep disturbance in early childhood and the associated maladaptive child and family outcomes (Sadeh et al., 1995). These issues, including the environmentally moulded aspects of the infant sleep-wake rhythm are discussed in the next chapter.
CHAPTER 3
Childhood Sleep Problems

There is a certain practice deeply rooted in the minds of all women as an unfailing cure for a baby’s sleeplessness, namely, rocking. Rocking is unnecessary, but the baby first likes it, then he expects it, and very soon he begins to demand it and will not go to sleep without it. When this stage has been reached, the misguided mother finds that she has forged fetters for herself which are extremely hard to break. (Sundell, 1922, p. 90)

There are few pediatric health issues that are more common or have a more significant impact on health and well-being than childhood sleep disorders. (Mindell & Owens, 2003a, p. xi)

OVERVIEW

As discussed, the sleeping and waking patterns of infants undergo rapid transformation in the first 12 months of life. While the previous chapter covered biophysical maturation, this chapter examines the influence of exogenous factors on the development of infant sleep regulation and consolidation. It will present an overview of infant sleep disturbance, incorporating: the effect on individuals and families, the interface with psychiatric disorders, cultural considerations, the impact of excessive parental involvement, current theoretical models, and a brief description of the major sleep disorder affecting infants under 12 months. The main focus will be on parenting behaviours, which have been the most studied, and the most consistently associated with the development of sleep-wake patterns during the first year of life (Hiscock, 2010).

INTRODUCTION

The transition to parenthood is typically a time of great anticipation and excitement (Medina, Lederhos, & Lillis, 2009). However, the early postpartum period can also be physically and emotionally challenging, as parents integrate new childcare responsibilities into their regular lifestyle (Anderson & Sabatelli, 2011; Maxted et al., 2005). In particular, settling and feeding a newborn baby through the night is tiring and stressful, with few opportunities for uninterrupted rest. Although night-time sleep disruption among new mothers is a predictable, normative circumstance (Thomas & Foreman, 2005), the reality
often exceeds expectations (Gair, 1994). Flustered or distressed parents may console themselves with the thought that their baby will soon develop a regular sleep pattern, and sleep for longer periods. Unfortunately, for many families the promise of consolidated sleep does not promptly materialise.

In fact, several relatively large, cross-sectional community surveys have confirmed that a substantial proportion of Australian parents experience sleeping problems in their children within the first 12 months of life (Armstrong et al., 1994; Bayer, Hiscock, Hampton, & Wake, 2007; Hiscock, Bayer et al., 2007; Hiscock & Wake, 2001). Early cry-fuss and sleep problems are frequent (Wake et al., 2006), and are one of the main factors associated with the utilisation of multiple health services within the first 4 months (McCallum et al., 2011). The vast majority of admissions to residential care units over the initial months also involve persistent unsettled infant behaviour (Fisher, Feekery, & Rowe, 2004; McMahon, Barnett, Kowalenko, Tennant, & Don, 2001).

Sleep disturbance is common among 3- to 6-month-olds, with 27 to 34% of parents reporting problematic sleep in this age group and about a third of these rating the disturbance as severe (Bayer, Hiscock, Hampton, et al., 2007; Armstrong et al., 1994). A recent prevention study by Hiscock et al. (2014) found night-time sleep problems among 4-month-old control infants at 47.2%, rising to 53.4% at 6 months. High ratios have also been found among Australian infants during the second six months of life.

In a study by Hiscock and Wake (2001), 46% of mothers reported a problem with their 6- to 12-month-old infant’s sleep. Within this sample, 59% of children woke during the night on four or more occasions each week and 37% woke every night, while just 13% consistently slept through. The relatively high ratio of sleep problems in this research was replicated in a later intervention study by Hiscock, Bayer et al. (2007) who found sleep disturbance among 47.2% of 7-month-olds. Similarly, 36% of infants aged between 6 and 12 months in Armstrong et al.’s (1994) study were reported to have disturbed sleep. Of these, 58.9% woke and required parental intervention at least once per night while 13.6% were attended by a parent on three or more occasions each night. This was despite 71.4% of the sample having slept through the night on one or more occasions by 3 months. A large cross-sectional survey also revealed moderate or severe sleep problems among 17.1% of infants (Martin, Hiscock, Hardy, Davey, & Wake, 2007).

Taken together, these studies suggest that sleep problems are prominent in Australian infants, with at least 46% of mothers reporting a sleep problem when surveyed during the
first 12 months of their child’s life. A recent large internet-based study of Australian and New Zealand children provides further corroboration within this geographical region. Parent reported sleep problems in 3- to 5-month-old infants was 28.4% while the ratio of sleeping difficulties among those aged 6 to 11 months was 36.2 (Teng, Bartle, Sadeh, & Mindell, 2012). Findings are consistent with a large body of international research indicating a high prevalence of parent-reported sleep problems during the first year (e.g., Anuntaseree et al., 2008; Byars, Yolton, Rausch, Lanphear, & Beebe, 2012; Fukumizu, Kaga, Kohyama, & Hayes, 2005; Jenni, Fuhrer, Iglowstein, Molinari, & Largo, 2005; Jiang et al., 2007; Loutzenhiser, Ahlquist, & Hoffman, 2011; National Sleep Foundation [NSF], 2004; Ottaviano, Giannotti, Cortesi, Bruni, & Ottaviano, 1996; Palmstierna, Sepa, & Ludvigsson, 2008; Touchette et al., 2005; Zuckerman, Stevenson, & Bailey, 1987), averaging between 25 and 50% among 6- to 12-month-olds (Mindell & Owens, 2003a, 2010).

Further, a number of Australian-based studies suggest that problematic sleep is prevalent throughout childhood and beyond. Armstrong et al. (1994) found parent-reported sleep problems among 28.8% of children aged 18 to 38 months. A study by Johnson and McMahon (2008) revealed disturbed sleep in 37% of children aged between 2 and 5 years. Thirty-four percent of mothers participating in a large cohort study reported sleep problems of at least a mild level in their 4- to 5-year-old children (Martin et al., 2007). Blunden et al. (2004) found clinically significant sleep disturbance in 30.4% of children aged between 4.5 and 6.5 years with similar difficulties affecting 24.6% of their entire sample ranging in age between 4.5 and 16.5 years. Using data from a longitudinal cohort study, Al Mamun et al. (2012) observed that 23.7% of children had trouble sleeping between 2 and 4 years. Of these, 49.8% were reported to have similar problems at age 14, while 57.1% had trouble sleeping as a 21-year-old. Given that all of the above figures were obtained cross-sectionally, the lifetime prevalence and lifetime risk may be much higher than these results suggest.

This Australian research is again supported by substantial international evidence investigating parent-reported sleep problems in early childhood (Byars et al., 2012; Fukumizu et al., 2005; Jenni et al., 2005; Mindell, Sadeh, Wiegand, How, & Goh, 2010; NSF, 2004; Ottaviano et al., 1996; Palmstierna et al., 2008; Petit, Touchette, Tremblay, Boivin, & Montplaisir, 2007; Sadeh et al., 2009; Touchette et al., 2005; Zuckerman et al., 1987), middle childhood (Blader, 12 Aside from Armstrong et al.’s (1994) oft cited study, most of the Australian research involving infants under 12 months has been conducted by Hiscock and colleagues. The ratio given here is conservative, drawn from the most methodologically sound assessment of infant sleep within this particular body of work. The true value may be higher.

13 This construct has shown promise as a correlate of more traditional sleep variables (Gregory et al., 2011).

14 Refers to the occurrence of a condition at any point up until the time of assessment.
Koplewicz, Abikoff, & Foley, 1997; Fricke-Oerkermann et al., 2007; Gregory & O’Connor, 2002; Jenni et al., 2005; Li et al., 2014; NSF, 2004), and adolescence (Gregory & O’Connor, 2002; Laberge et al., 2001; Morrison, McGee, & Stanton, 1992; Ohayon, Roberts, Zulley, Smirne, & Priest, 2000; Wolfson & Carskadon, 1998).15

Although many settling and night-waking issues in infants and children are transient and self-limiting, the common wisdom that all children will outgrow their sleep problems is not accurate (Meltzer, 2010; Owens & Witmans, 2004; Richman, 1985; Sadeh, 2008c). Indeed, several authors have suggested that infant sleeping patterns established within the first year of life may be predictive of stable sleep behaviours over the longer term. For example, in Zuckerman et al.’s (1987) study, 41% of sleep-disturbed 8-month-olds still had a sleep problem at 3 years of age. Touchette et al. (2005) found a strong connection between fragmented sleep at 5, 17, and 29 months.

Wake et al. (2006) followed a group of 483 Australian neonates through their first two years. The prevalence of (moderate to very large) parent-reported sleep problems at 8, 12, 18, and 24 months was 21.2, 16.2, 10.0, and 12.1%, respectively; 6.4% of children were at least moderately sleep-disturbed at three or more data collection points. Palmstierna et al. (2008) reported that children with frequent night-waking and poor quality sleep at early ages were at a greatly elevated risk of having the same problems between 5 and 6 years. Finally, Byars et al. (2012) recently found that 21% of children with sleep disturbance in infancy continued to have sleep problems into the third year of life.

While most longitudinal studies show that sleep disturbance tends to decline with age, a significant minority of children and their families endure persistent or recurring difficulties (Gregory & O’Connor, 2002; Jenkins, Owen, Bax, & Hart, 1984; Jenni et al., 2005; Kataria, Swanson, & Trevathan, 1987; Lam, Hiscock & Wake, 2003; Petit et al., 2007; Pollock, 1994; Thome & Skuladottir, 2005; Wolke, Meyer, Ohrt, & Riegel, 1995).16 In general, there is growing evidence to suggest that a consistent predictor of chronic sleep disturbance in middle

15 As a general comment, numerous measures and definitions of disordered sleep have been utilised to date, with many (especially larger scale) studies failing to thoroughly assess sleep behaviours (Gregory & Sadeh, 2012). Even when there is a consistency of approach, differences in culturally-based norms and expectations contribute to vastly varying results. For example, parent-reported sleep problems in a comprehensive international study of children under 3 years from 17 countries ranged from 10.1% in Vietnam to 75.9% in China (Mindell, Sadeh, Wiegand, et al., 2010). Parents of infants and young children are also more likely to recognise and report sleep concerns than those of older children and adolescents, making true ratios more difficult to obtain (Mindell, Kuhn, Lewin, Meltzer, & Sadeh, 2006). While there is little doubt that sleep problems are a major issue across cultures and throughout development, interpretation and synthesis of the research base is a difficult task.

16 As indicated, there is substantial inconsistency in the definitions and methodology employed within this body of research. As such, the stability of sleep problems remains unclear, with estimates of persistent difficulties varying from 5 to more than 40 percent (Johnson & Appleyard, 2010; Scher, Zukerman, & Epstein, 2005).
and later childhood is the presence of earlier sleeping problems, particularly with respect to signalled awakenings (Morrell, 1999a; Priddis, 2009; Sadeh, 2008c). The high incidence and prevalence of these problems is significant because of the wide range of individual and family difficulties known to be associated with unsettled sleep patterns in children. An awareness and understanding of the potential consequences of suboptimal sleep in childhood brings the importance of managing sleep problems effectively, squarely into perspective (Galland & Mitchell, 2010).

**THE EFFECTS OF INFANT SLEEP DISTURBANCE ON THE CHILD**

Rapidly accumulating evidence suggests that multiple domains of child development are influenced by sleep quality and quantity (El-Sheikh, 2011; Mindell & Owens, 2003a, 2003b). It is clear that disturbed sleep at any stage clearly deprives children of an optimal endogenous environment in which to develop (Jan et al., 2010). Despite advancements in the knowledge and understanding of the normal sleep development trajectory, however, no studies of the impact of sleep loss on very young infants have been conducted to date. As a result, most of what is known about the daytime sequelae of early childhood sleep problems originates from animal experiments and research with older children, adolescents, and adults (Owens & Burnham, 2009). These investigations show that sleep deficits profoundly affect daytime performance (Lipton et al., 2008), while even short-term sleep loss can adversely and permanently affect neuron generation and neurophysiological functioning (Jan et al., 2010).

Sleep processes have been found to play a vital role in neurogenesis and brain plasticity; the regulation of somatic growth and a variety of neuroendocrine functions; body tissue growth and healing; a healthy immune system; gene expression; and neurocognitive (attention, memory, learning), behavioural, and emotional well-being (Dahl & Harvey, 2007; Durmer & Dinges, 2005; Graven, 2006; Jan et al., 2010; Lampl & Johnson, 2011; Lipton et al., 2008; Mindell & Owens, 2003a, 2003b; Rogers et al., 2001; Walker & Stickgold, 2006; Zee & Turek, 1999). Any problem that results in a sleep deficiency during development, especially during critical periods, may impact negatively across any or all of these areas. As such, there is increasing recognition of the importance of sleep in relation to nearly every aspect of children’s health, functioning, and welfare (Alfano & Gamble, 2009).

Touchette, Petit, Tremblay, and Montplaisir (2009) add further clarity, suggesting that a minor but persistent disruption of sleep has potentially serious implications for children in three major developmental domains: behavioural/social competence, cognitive performance,
and physical condition. The emergence of a regular sleep pattern appears to be an important initial step in the development of a multilevel, hierarchically organised, self-regulatory system over the course of infancy and childhood (Dahl, 1996c; Dearing, McCartney, Marshall, & Warner, 2001). Poor self-regulation is associated with both internalising and externalising adjustment problems (Eisenberg et al., 2009). For example, Hall, Scher, Zaidman-Zait, Espezel, and Warnock (2012) believe that smooth, independent regulation of sleep-wake states is linked to later self-regulatory development, such as learning to manage complex social interactions with children and adults at kindergarten.

Indicators of insufficient sleep in children are often paradoxical to sleepiness, such as irritability, hyperactivity, low frustration tolerance, temper tantrums, and aggressive behaviour (Dahl, 1996b; Lam et al., 2003; Mindell & Owens, 2003b; Moore, 2010; Reid, Huntley, & Lewin, 2009; Stores, 2001). It is therefore not surprising that numerous studies have found significant associations between childhood sleep disturbance and contemporaneous behaviour problems (Bates, Viken, Alexander, Beyers, & Stockton, 2002; Hall, Scher, et al., 2012; Hiscock, Canterford, Ukoumunne, & Wake, 2007; Lam et al., 2003; Lavigne et al., 1999; Smedje, Broman, & Hetta, 2001). However, longitudinal studies have reported only modest relationships between persistent sleep problems in the first year of life and behavioural difficulties at 2 years (Wake et al., 2006) and 3.5 years (Scher, Zukerman, & Epstein, 2005). In Scher et al.’s (2005) study, night-waking in infancy predicted just 3% of the variance in behavioural scores at 42 months. Burnham and Gaylor (2008) point out that other stable factors potentially contribute to the emergence of later behaviour problems, but these are rarely considered.

Disturbed sleep in preschoolers and children in the first year of school has also been moderately associated with conduct issues in middle childhood (Gregory, Eley, O’Connor, & Plomin, 2004; Quach, Hiscock, Canterford, & Wake, 2009) and behavioural and emotional problems in adolescence (Gregory & O’Connor, 2002). The consensus appears to be that persistent rather than transient childhood sleep disturbance is a better predictor of later behaviour problems (Owens & Burnham, 2009; Wake et al., 2006). Increased internalising (withdrawn and anxious) and externalizing (aggressive and overactive) behaviour and somatic problems have been found in 3- to 4-year-old children with chronic sleep problems originating in the first year (Lam et al., 2003).

Paediatric sleep disturbance may additionally be a risk factor for later anxiety concerns (Leahy & Gradisar, 2012). For example, prospective studies have found associations between persistent sleep problems in preschool children and elevated anxiety
levels in middle childhood (Gregory et al., 2004), and persistent sleep problems in middle childhood and anxiety disorders in adulthood (Gregory et al., 2005). Shorter sleep duration has also been correlated with emotional lability in young children (Nixon et al., 2008). Moreover, many authors have noted a potential link between sleep loss in childhood and concomitant difficulties with focussed attention that mimic or exacerbate symptoms of Attention Deficit/Hyperactivity Disorder (Ball, Tiernan, Janusz, & Furr, 1997; Gruber, Sadeh, & Raviv, 2000; Hiscock, Canterford, et al., 2007; Nixon et al., 2008; Owens, 2005b; Owens, Maxim, Nobile, McGuinn, & Msall, 2000; Smedje et al., 2001). Other research has reported a link between early sleep problems and later attention and hyperactivity problems (Gregory et al., 2004; O’Callaghan et al., 2010; Thunström, 2002).

Studies of older children, adolescents, and adults provide clear evidence that insufficient sleep affects neurocognitive functions involving learning, memory, and executive functioning (Durmer & Dinges, 2005; Fallone, Owens, & Dean, 2002; Hill et al., 2007). Identified performance deficits include cognitive flexibility and verbal creativity, abstract reasoning and learning, psychomotor skills, attention and vigilance, and memory (Goel et al., 2009; Kheirandish & Gozal, 2006; Randazzo, Muehlbach, Schweitzer, & Walsh, 1998). Over the longer term, a relationship between shorter sleep duration prior to age 3.5 years and lower cognitive performance on neurodevelopmental tests in school-aged children has been reported (Touchette et al., 2007). Other studies have found a modest link between sleep problems in middle childhood and some aspects of neuropsychological functioning during adolescence (Friedman, Corley, Hewitt, & Wright, 2009; Gregory, Caspi, Moffitt, & Poulton, 2009).

Given the high prevalence of sleep problems in the preschool years, there is a strong possibility that the associated difficulties outlined above negatively impact the transition to school for a large percentage of children (Hiscock, Canterford, et al., 2007). In fact, the link between sleep, learning capacity, and academic performance is well-established. An extensive literature base has related sleep loss and fragmentation to impaired cognitive functioning in students, reduced learning capacity, inefficient consolidation of memory for procedural skills and recently gained knowledge, reduced classroom performance, and poor academic achievement (Buckhalt, El-Sheikh, Keller, & Kelly, 2009; Curcio, Ferrara, & De Gennaro, 2006; Fallone, Acebo, Seifer, & Carskadon, 2005; Sadeh, 2007; Taras & Potts-Datema, 2005; Wolfson & Carskadon, 2003).

Additional postulated health outcomes of paediatric sleep loss include increased risk of medically attended injury (Hiscock, Canterford, et al., 2007; Koulouglioti, Cole,
Kitzman, 2008; Richman, 1981; Valent, Brusaferro, & Barbone, 2001) and adverse effects on the cardiovascular, immune, and various metabolic systems, including glucose metabolism and endocrine function (Chaput, 2011; Owens, 2006; Taheri, 2006). Recent research found sleep-disturbed Australian preschool and school-aged children to have inferior health-related quality of life, particularly in the psychosocial domain (Hiscock, Canterford, et al., 2007; Quach et al., 2009).

Further, numerous cross-sectional studies (e.g., Chaput et al., 2011; Nixon et al., 2008; Shi et al., 2010), prospective cohort studies (e.g., Reilly et al., 2005; Seegers et al., 2011; Touchette et al., 2008), and critical reviews (e.g., Nielsen, Danielsen, & Sørensen, 2011) have concluded that short sleep duration is associated with weight gain and obesity in childhood and adolescence. Of particular concern, is the finding that regular sleep of less than about 10 hours per night at 30 to 36 months is associated with subsequent weight gain and obesity in middle childhood (Reilly et al., 2005; Touchette et al., 2008) while even modest sleep loss in school-aged children triggers an increased risk of obesity (Taheri, 2006). These findings highlight the importance of providing children with the opportunity to sleep for at least 10 hours each night throughout early childhood (Touchette et al., 2009).

THE BROADER EFFECTS OF INFANT SLEEP DISTURBANCE

Sleep problems represent one of the most frequent parental complaints in paediatric practice (Chervin, Archbold, Panahi, & Pituch, 2001; So, Buckley, Adamson, & Horne, 2005). Unfortunately, many physicians consider these issues normative and do not provide appropriate levels of support for parents who express distress and fatigue related to their infant’s sleep (Bayer, Hiscock, Hampton, et al., 2007). In fact, coping with sleep fragmentation (interruptions to sleep architecture) and sleep deprivation (chronic partial sleep loss), the symptoms of which are linked with negative affect (Talbot, McGlinchey, Kaplan, Dahl, & Harvey, 2010) and the onset of postpartum depression (Fisher, Feeckery, & Rowe-Murray, 2002; Medina et al., 2009; Meltzer & Montgomery-Downs, 2011), is one of the most challenging aspects of caring for a young infant.

Whether caused by developmentally appropriate or inappropriate infant sleep patterns, insufficient sleep threatens caregivers’ own well-being, as well as their capacity to parent effectively throughout the 24-hour period (Paulson, Dauber, & Leiferman, 2006). Despite an extensive literature supporting the link between sleep disturbance and neurocognitive deficit (Banks & Dingess, 2011; Bonnett, 2011; Goel et al., 2009), chronic partial sleep disruption
has generally been underestimated as an explanatory factor for maternal postpartum distress (Dennis & Ross, 2005; Medina et al., 2009; Fisher et al., 2002). Moreover, maternal sleep fragmentation, which produces non-restorative sleep with sequelae similar to total sleep deprivation (Bonnett, 2011), may be an even more important consideration during the early postpartum period (Montgomery-Downs, Insana, Clegg-Kraynok, & Mancini, 2010).

Adverse outcomes for sleep-deprived caregivers reported include increased parenting stress (Gelman & King, 2001; Meltzer & Mindell, 2007; Wake et al., 2006; Wolfson et al., 1992); elevated anxiety symptoms (Fisher et al., 2004; McMahon et al., 2001; Phillips, Charles, Sharpe, Matthey, 2009), including separation anxiety (A. Scher, 2008); fatigue, severe psychological distress, and poor physical health (Bayer, Hiscock, Hampton, et al., 2007; Dennis & Ross, 2005; Martin et al., 2007; Meijer & van den Witenboer, 2007; Meltzer & Mindell, 2007; Thunström, 1999). Additional psychosocial correlates of infant sleep disturbance include lowered parenting self-efficacy (Stifter & Bono, 1998; Wolfson et al., 1992); less positive perceptions of parenting, feelings of hopelessness, incompetence, humiliation, resentment, and being restricted by the parental role (Levitzky & Cooper, 2000; Thunström, 1999); and a higher degree of psychopathology including somatic symptoms, social dysfunction, and depression (Gelman & King, 2001). Parents may eventually end up exhausted, irritable, and less effective during daytime interactions (Meltzer & Westin, 2011; Owens & Mindell, 2005).

Problems are confounded by infant crying, which experts have long believed to be an aversive and compelling stimulus (Boukydis, 1985; Murray, 1979; Ostwald, 1972; Papoušek & von Hofacker, 1995; Tyson & Sobschak, 1994), which leaves few people unaffected (Michelsson et al., 1990). It is capable of eliciting intense psychophysiological reactions involving feelings of concern and protectiveness on the one hand, and of extreme hostility on the other (Murray, 1979; Ostwald, 1963). When individuals are distressed by infant crying and sleeping problems, the order of the entire family system is adversely affected (Dahl & El-Sheikh, 2007; Maxted et al., 2005; Meltzer & Montgomery-Downs, 2011). Conversely, maladaptive family functioning also negatively impacts child sleep patterns (Dahl & El-Sheikh, 2007; Keller, Buckhalt, & El-Sheikh, 2008; Meltzer & Montgomery-Downs, 2011), culminating in a vicious circle of mutual irritability (Eckerberg, 2004; Moore, 2010).

In a survey of parents with an infant less than 12 months old, almost 29% of respondents reported marriage or partnership stress directly attributable to their child’s sleep habits (NSF, 2004). Common family outcomes of disturbed infant sleep include parental conflict (Chavin & Tinson, 1980; Papoušek & von Hofacker, 1998) and undermining of child
management strategies (Lam et al., 2003); decreased family/marital satisfaction (Germo, Chang, Keller, & Goldberg, 2007; Medina et al., 2009; Meijer, & van den Wittenboer, 2007; Pritchard & Appleton, 1988); explicit aggressive thoughts and fantasies, including infanticide (Levitzky & Cooper, 2000); and in a small percentage of cases, child abuse (Flaherty, 2006; Frodi, 1985; Reijneveld, van der Wal, Brugman, Hirasing, & Verloove-Vanhoeick, 2004; van der Wal, van den Boom, Pauw-Plomp, & de Jonge, 1998), including Shaken Baby Syndrome (Altimier, 2008; Barr, Trent, & Cross, 2006; Lee, Barr, Catherine, & Wicks, 2007; Talvik, Alexander, & Talvik, 2008).17

SLEEP DISORDERS AND MENTAL HEALTH

The interface between sleep problems and psychiatric disorders is a crucial dimension of child and adolescent mental health (Dahl & Harvey, 2008). In particular, there is a high degree of commonality in the neurobehavioural systems involved in the regulation of sleep, arousal, attention, and emotions (Dahl, 1996a, 1998b; Nofzinger & Maquet, 2011). As such, sleep and sleep disorders are closely tied to psychiatric illness at both the neurochemical and clinical-behavioural levels. The underlying neurochemistry of the sleep-wake cycle has been implicated in the pathophysiology of numerous psychiatric disorders (Harvard Medical School, 2009) while the majority of psychotropic medications target receptors involved in sleep regulation (Lee & Douglass, 2010). However, few studies have addressed the complex, reciprocal relationships involved in early regulation, including the neurobehavioural and psychiatric consequences of childhood sleep disturbance (Alfano & Gamble, 2009).

Rather, the bulk of relevant reports published in the paediatric literature have focussed on sleep problems associated with specific psychiatric problems (Chorney, Detweiler, Morris, & Kuhn, 2008; Lewin & Alfano, 2008). Insomnia is integrated into the primary diagnostic criteria of many psychiatric disorders, the clinical reality being that the gravity of the illness often mirrors the severity of sleep problems (Shahid, Khairandish, Gladanac, & Shapiro, 2012). Additionally, sleep disturbance is a common feature across a range of other diagnostic categories which do not formally include it as a symptom, including social phobia, panic disorder, autism, chronic pain, and eating disorders (Harvey, 2008). In effect, virtually all

17 The reality of potential links between infant crying and child harm is particularly confronting in the report by Reijneveld et al. (2004). These researchers studied the parents of 3259 Netherlander infants aged 1–6 months using an anonymous questionnaire. At one month, 2.2% of parents reported having smothered, slapped, or shaken their baby at least once because of crying, a disturbing result. This ratio climbed to 5.6% among parents of 6-month-olds. The potential for abuse in response to infant crying and settling difficulties has been proactively acknowledged by Australian public health initiatives such as It’s Not Okay to Shake Babies (National Association for the Prevention of Child Abuse and Neglect, 2002, 2011).
psychiatric illnesses are associated with one or more abnormalities of sleep (Hatzinger et al., 2012; Walker & Harvey, 2010).

The conceptualisation of disordered sleep as a transdiagnostic process—a phenomenon that is common across psychiatric disorders—has potentially staggering public health implications (Harvey, 2008). According to Harvey, Murray, Chandler, and Soehner (2011), sleep disturbance is aetiologically linked to various forms of psychopathology via:

- shared/interacting neurobiological substrates in (a) genes associated with the generation and regulation of circadian rhythms, and (b) dopaminergic and serotonergic function; and
- a reciprocal relationship with emotional regulation.

Additional biological processes that are potentially shared by sleep disturbance and psychiatric problems include functions of the amygdala, hypothalamic-pituitary-adrenal axis, and noradrenergic systems (Stunkard, Allison, & Lundgren, 2008). As a result, disordered sleep is increasingly being recognised as an important causal mechanism in the development and maintenance of a broad spectrum of psychopathology (Harvey, 2011; Harvey et al., 2011). Specifically, the evidence suggests that sleep disturbance is a risk factor for psychiatric illness, contributes to relapse, adversely affects mood regulation, impairs cognitive functioning, compromises physical health, and may have a role in substance use comorbidity, and suicidality (Harvey, 2009).

The relationship is clearly bidirectional, with behavioural problems, mood disturbances, anxiety, physical health, and stress also compromising sleep patterns (Gregory & Sadeh, 2012). By and large, this phenomenon is reflective of the notion that sleep and vigilance represent opponent processes (Dahl & Harvey, 2007). It follows, then, that a vicious cycle of dysfunction may emerge, with each syndrome maladaptively influencing the other (Harvey, 2008). Mounting research interest in the interface between sleep and behavioural and emotional functioning is likely to provide new insights and opportunities for prevention, early intervention, and treatment (Dahl & Harvey, 2007; Lee & Douglass, 2010). It would appear that a comprehensive understanding of psychiatric illness cannot be achieved without a thorough appreciation of the role of sleep (Lee & Douglass, 2010; Seifer, Sameroff, Dickstein, Hayden, & Schiller, 1996; Shahid et al., 2012).18

18 Ironically, sleep remains a blind spot in medical education at undergraduate and postgraduate levels (Bruni et al., 2004; Mindell, Bartle, et al., 2011; Rosen et al., 1998; Stores & Crawford, 1998) and in graduate clinical psychology programs (Meltzer, Phillips, & Mindell, 2009; Peachey & Zelman, 2012).
CULTURAL CONSIDERATIONS

It is also important to be mindful of the family and cultural context in which childhood sleep behaviours occur (Owens & Witmans, 2004). While the pattern of activities within the immediate family environment is reflective of the parents’ own upbringing and experiences, the family microsystem is also embedded in a macrosystem, representing the prevailing societal norms, beliefs, and values (Bronfenbrenner, 1979; Giannotti & Cortesi, 2009). Cultural diversity occurs because societies with various geographies, climates, economies, religions, and histories exert unique influences. As such, parental approaches to infant sleep are fundamentally reflective of their own philosophy about how children are raised to thrive in the sociocultural environment of their native land (Giannotti & Cortesi, 2009).

Consequently, there are vast differences in bedtimes, total sleep time, sleeping arrangements, and other sleep-related customs throughout the world (Mindell, Sadeh, Wiegand, et al., 2010). Many childhood sleep problems are based on culturally constructed definitions and expectations as opposed to being rooted in sleep biology (Jenni & O’Connor, 2005). For example, Western parents typically engage their children in a bedtime ritual and send them to bed, regardless of protest. In contrast, Italian children do not always have a clear bedtime or routine, and may customarily participate in the family’s late evening life before falling asleep in the company of adults (New & Richman, 1996). In fact, the frequently studied night-time parenting practices of Western nations are a narrow representation of the full gamut of human sleep ecology.

A key question in the cross-cultural understanding of childhood sleep, involves whether particular societies value family interdependence or promote child autonomy. For example, most traditional cultures utilise communal sleeping arrangements, ensuring the availability of multiple caregivers, and promoting both safety and unity (Giannotti & Cortesi, 2009; Murray, 1979; Worthman & Melby, 2002). The practice of placing infants to sleep in a separate environment is a relatively recent custom, and is for the most part, limited to Western industrialised nations (McKenna & Mosko, 1994). In fact, parent-infant co-sleeping is a common and accepted practice in the majority of cultures worldwide (Owens, 2008).

In a large international study of families with children under 3 years, Mindell, Sadeh, Wiegand, et al. (2010) found bed-sharing to be widespread in countries with predominantly Asian populations, averaging about 65%, with more than 86% of parents and children sharing a room. By contrast, just 12% of families from nations with mainly Caucasian inhabitants
report parent-child co-sleeping, with room-sharing at about 22%. In other words, the developmental goal of independent self-soothing in infants at bedtime and after night-wakings is not valued by all people or societies (Owens & Witmans, 2004). Families who do not perceive infant waking behaviour as problematic may be less adversely affected (Germo, Goldberg, & Keller, 2009). Fortunately, most health professionals are respectful of parental preferences and do not make wholesale recommendations against co-sleeping or room-sharing.

In the same way, it would be equally paternalistic to encourage bed-sharing as the most beneficial sleeping approach for children (Sadeh, Mindell, & Owens, 2011). For example, an Australian study found that parents of sleep-disturbed infants universally preferred not to co-sleep with their children; when they did so, it was usually as a last-ditch effort to increase their own sleep (Hall, Saunders, Clauson, Carty, & Janssen, 2006). While demand feeding and proximal forms of care have been related to less infant crying (St. James-Roberts et al., 2006), they are also associated with later bedtimes, more infant night-waking, more fragmented parent and infant sleep, less infant sleep overall (Mao, Burnham, Goodlin-Jones, Gaylor, & Anders, 2004; Mindell, Sadeh, Kohyama, et al., 2010; St. James-Roberts et al., 2006), sleeping through the night at a later age (Adams et al., 2004), and substantially higher rates of parent-reported infant sleep problems (Sadeh, Mindell, & Rivera, 2011). Further, resorting to reactive co-sleeping (Madansky & Edelbrock, 1990) in an attempt to manage waking behaviour (i.e., as opposed to a proactive lifestyle choice) is likely to yield only temporary respite and may set the stage for more severe infant sleep issues (Owens & Witmans, 2004). As Sadeh, Mindell, and Owens (2011) have astutely pointed out, co-sleeping may have been beneficial in traditional societies where safety and high mortality rates were of concern. However, there is little or no empirical support for co-sleeping as the most adaptive approach in a modern society.

THE IMPACT OF STIMULATING OVERATTENTIVENESS

There is now solid evidence that parents play a pivotal role in the development of children’s sleep patterns and that a parenting style which promotes infant self-regulation is advantageous (Johnson & McMahon, 2008). St James-Roberts (2007) contends that concepts of adaptive parenting have moved beyond the dichotomy of demand versus structured forms of care. Rather, more recent ideas conceptualise parenting as: (a) an external regulatory environment for infant physiological homeostasis, and (b) a “scaffold” that supports infant
autonomous learning. This is analogous to Winnicott’s (1953) notion of the good enough mother, who promotes self-regulation by actively adjusting her strategies to suit the infant’s changing needs (Sadeh, Mindell, & Owens, 2011; Sroufe, 2000). In this way, caregivers play an important role as external regulators of infant biological rhythms, states, affects and behaviours. Accordingly, the quality and sensitivity of care either facilitates or hinders the young child’s capacity for self-regulation (Benoit, Zeanah, Boucher, & Minde, 1992).

The idea that patterns of caregiving have a substantial impact on the infant’s evolving behavioural organisation is particularly relevant to our understanding of sleep consolidation and regulation. For example, entrainment of the endogenously driven circadian rhythm of sleep and wakefulness is more closely determined by the infant’s level of exposure to geophysical time cues and other exogenous factors such as food availability and regularly occurring social events, than neurological maturity (Kelmanson, 2006; McMillen, Kok, Adamson, Deayton, & Nowak, 1991; Recio et al., 1997; Rivkees, Mayes, Jacobs, & Gross, 2004; Tsai, Barnard, Lentz, & Thomas, 2011). Moreover, it has been suggested that infant settling through the night represents an important first step in the self-regulatory process (Sadeh, Mindell, & Owens, 2011; Schwichtenberg, 2008).

Indeed, a considerable body of work indicates that the ability to control internal states of arousal is profoundly influenced by caregiving strategies which, in turn, markedly affects the quality and quantity of infant sleep (Adair, Bauchner, Philipp, Levenson, & Zuckerman, 1991; Burnham et al., 2002a; France & Blampied, 1999; Mindell, Sadeh, Kohyama, et al., 2010; Morrell & Cortina-Borja, 2002; Sadeh et al., 2009; Symon, Marley, Martin, & Norman, 2005). In order for infants to develop self-regulation of sleeping rhythms, parents need to be able to sensitively manage the change from total dependence to increasing autonomy over time (Morrell, 1999b; St James-Roberts, 2007). Generally speaking, excessive parental involvement is associated with less consolidated and more fragmented infant sleep.

For example, Morrell and Cortina-Borja (2002) found that increased active physical comforting combined with reduced encouragement of infant autonomy was related to infant sleep disturbance. In addition, delayed adoption of more adaptive strategies was associated with persistent infant sleeping problems. These findings are consistent with a number of earlier reports documenting the maladaptive nature of parental intervention during the settling and resettling process (Adair et al., 1991; Anders, Halpern, & Hua, 1992; Ferber & Boyle, 1983a, 1983b; Goodlin-Jones et al., 2001; Johnson, 1991; Paret, 1983; Schmitt, 1981). By assisting with the sleep onset process, parents deny their children the opportunity to develop self-soothing skills and hence the ability to self-regulate sleep-wake states (Ferber, 2006;
France & Blampied, 1999). Interestingly, a succession of large community surveys have supported this association across a broad cultural spectrum (Anuntaseree et al., 2008; Mindell, Sadeh, Kohyama, et al., 2010; Sadeh et al., 2009; Touchette et al., 2005).

Conversely, parents have the opportunity to promote healthy sleep habits in their child through strategic scaffolding and limit-setting (Sadeh, Tikotzky, & Scher, 2010; Schwichtenberg, 2008). In particular, neonatal intensive care unit research and practice emphasises the importance of providing optimal levels of stimulation for improved early regulation and behavioural adaptation (Bertelle, Mabin, Adrien, & Sizun, 2005; Bertelle, Sevestre, Laou-Hap, Nagahapitiye, & Sizun, 2007; Brandon, Holditch-Davis, & Beylea, 1999, 2002; Reid & Freer, 2010; Rivkees et al., 2004). It would appear that just as understimulation is detrimental to neurobehavioural development (Ardiel & Rankin, 2010; Dieter & Emory, 1997), so too is overstimulation.

Within the home, overly stimulating caregiving includes vigilant monitoring of the infant, lower threshold for detecting disturbed sleep, shorter reaction times, diversity of approach, and responses of high intensity and long duration (France & Blampied, 1999; Papoušek & von Hofacker, 1998). These practices were originally referred to by Moore and Ucko (1957) as “excess of anxious, over-solicitous mothering” (p. 341) and later by Weissbluth (1987) as “overindulgent and oversolicitous...stimulating overattentiveness” (p. 137). Significantly, elements of this style of parenting may be observable throughout the 24-hour period. Paret (1983) found that mothers of night-wakers responded more rapidly to crying, and picked their babies up sooner and more often during daylight hours. In contrast, mothers of non-wakers were sensitively responsive to their child’s need for attention while encouraging self-soothing, independence, and exploration of the environment during the daytime. In general, more independent and self-reliant infants were also more likely to have healthy sleep patterns.

One fundamental, yet rarely articulated aspect is that an excessively stimulated neonate may become drowsy or enter sleep in response to overstimulation, as a means of stimulus withdrawal (France & Blampied, 1999). In this situation, the infant bypasses the usual active sleep onset and enters quiet sleep directly from wakefulness (Brackbill, 1973; Emde, Harmon, Metcalf, Koenig, & Wagonfeld, 1971) in a process referred to as stress sleep. This form of stimulus withdrawal is thought to serve an adaptive function, in that it diminishes the infant’s responsiveness at an age where it is not possible to physically escape noxious stimulus conditions (Thoman, 1990). Parents are consequently rewarded for their stimulatory rituals with a seemingly positive and adaptive outcome (i.e., a peacefully sleeping
baby) and relief from the situational stress associated with an unsettled infant (France et al., 1996). Unfortunately, more often than not, this is a recipe for disaster. The unhealthy relationship between various forms of active physical comforting and the inducement of child sleep is recognised prominently by the American Academy of Sleep Medicine (AASM) in their discussion and classification of childhood insomnia (AASM, 2005).

**CURRENT MODELS OF INFANT SLEEP DISTURBANCE**

**Transactional Models**

Caregiving practices are not related to infant sleep problems in a simple linear fashion. Rather, an extensive literature has linked a variety of underlying factors to child sleep outcomes. Integrative transactional models typically show complex bidirectional pathways interconnecting a multitude of proximal and distal determinants of infant sleep-wake behaviour (e.g., Anders, Goodlin-Jones, & Zalenko, 1998; Morrell, 1999b; Sadeh & Anders, 1993; Sadeh et al., 2010; Touchette et al., 2009). That is, various child, parent, family, and environmental factors interact over time and contribute to the development and maintenance of childhood sleep disturbance (Reid et al., 2009). Nevertheless, parental interactive behaviours generally have the most immediate and direct link with infant sleep in these models while mediating the influence of other factors (Hiscock, 2010; Sadeh et al., 2010; Touchette et al., 2009). Figure 3 shows a transactional model by Sadeh and Anders (1993), as amended by Sadeh et al. (2010).

The bidirectional nature of the pathways in this, and other similar integrative models (e.g., Touchette et al., 2009), is reflective of both considered opinion and a large body of predominantly cross-sectional research. The uncomplicated interpretation of the literature favoured by most clinicians would be that parental interactive behaviours determine infant sleep (Johnson & McMahon, 2008; Sadeh et al., 2010). An equally valid alternative is that infants with high constitutional vulnerability and/or more difficult sleep patterns elicit more parental involvement (France & Blampied, 1999; Hiscock, 2010; Morrell & Steele, 2003; Sadeh et al., 2010). Consistent with contemporary views from developmental science and behavioural genetics (e.g., Dick, Riley, & Kendler, 2010; Lerner, Lewin-Bizan, & Warren, 2011), the transactional models proposed to date indicate that while many endogenous and exogenous factors combine to influence sleep-wake behaviour, infant sleep patterns also impact the child’s environment in a reciprocal fashion (Sadeh, 2008b).
The account by Sadeh et al. (2010) has been provided as an illustration of the wide range of underlying proximal and distal factors associated with infant sleep disturbance. While it is beyond the scope of this work to encompass all aspects of this contemporary, multifaceted explanation for disordered infant sleep, a number of factors relating directly to the SNSP (e.g., infant temperament, parenting stress) will be discussed in more detail in the following chapter. This chapter will continue its focus on the most immediate vulnerabilities associated with infant sleep development and consolidation.

**Behavioural Models**

An insightful review by France and Blampied (1999) has integrated the proximal factors associated with early childhood sleep patterns in a behavioural explanation of infant
sleep disturbance. Building on earlier work (Blampied & France, 1993), their analysis incorporated three theoretical models, two of which are discussed briefly below: (a) the establishment of sleep initiation problems during the first three months of life, and (b) the development of primary sleep disturbance.¹⁹ The work of France and Blampied (1999) has provided important impetus for the preventive intervention described in Chapter 6, and therefore underpins much of the current research program.

Sleep and Learning

Using the principles of learning theory, Blampied and France (1993) conceptualise sleep as an operant behaviour that it is strengthened or weakened by its consequences. In the case of healthy sleep, the infant will be reinforced by behavioural quietude just prior to sleep, and the parents for providing appropriate discriminative stimuli (proximal cues) for sleep onset. The associated calmness and composure acts as a positive reinforcer, increasing the likelihood that the antecedent behaviours, such as a simple and non-stimulating bedtime routine, will recur. During normal arousals between sleep cycles, infants with good sleep will be rewarded for engaging in self-soothing behaviours with sleep resumption. In the same way, the behaviours of parents who engage night-time parenting practices of an appropriate nature and intensity will be reinforced by an infant with healthy sleep patterns (Sadeh, 1994; Wolfson, 1998).

Similar, but problematic processes occur in sleep-disturbed infants, aptly labelled trained night-feeders/criers by Schmitt (1981).²⁰ Parents who provide inappropriate proximal cues at bedtime, such as feeding or rocking the child to sleep, may also be rewarded by a peacefully sleeping baby. This increases the probability of future re-engagement of these methods, despite their maladaptive nature. Nocturnal infant signalling is inadvertently reinforced by rapid response, further active physical comforting, and reinitiation of sleep, which in turn, reinforces the problematic parental behaviours (France & Blampied, 1999). Of note is that parental intervention of very low intensity (e.g., checking briefly on the child or even parental presence without engaging in stimulatory behaviour such as removal from the cot, rocking, or feeding) does not appear to reinforce infant signalling (Durand & Mindell, 1990; France & Blampied, 2005; Hiscock & Wake, 2002; Pritchard & Appleton, 1988).

¹⁹ The third model involves secondary sleep disturbance and is not directly relevant to this discussion.
²⁰ Schmitt (1981) considered regular night-waking requiring caregiver intervention after 4 months to be a conditioned behaviour. He refers to infants with a prolonged need for a middle-of-the-night feeding as trained night-feeders (Ferber & Boyle, 1983a) while trained night criers are infants older than 4 months who have given up the night-feed but continue to regularly signal for parental attention during the night (Ferber & Boyle, 1983b).
The Reinforcement Trap

To further compound these issues, repeated associations between signalling, parental attention, and sleep resumption creates a coercive behaviour trap from which it is difficult for either party to escape (France et al., 1996; Karraker, 2008). During the night, the infant acts to avoid the unfamiliar situation of falling asleep alone and unassisted, while parents take action to circumvent the stress and anxiety associated with their infant’s cries of distress (France & Blampied, 1999). Patterson (1982) termed this a reinforcement trap, with each party ensnared by their individualistic efforts to avoid aversive stimuli.

In these circumstances, parents find it difficult to understand what has taken place because the short-term payoff (behavioural quietude) appears unrelated to the long-term effects (persistent night-waking). This is an ideal scenario for unsuspecting behaviour change as parents perceive night-waking as an abnormal event, and stimulatory interventions (often involving repetition of bedtime practices) as the appropriate course of action (Ferber, 2006). Since escape from the reinforcement trap results in aversive consequences for both parties, the parental response inevitably becomes established as the only condition in which the child is able to resume sleep (France et al., 1996; Karraker, 2008; Patterson, 1982).

The Extinction Burst

Without professional assistance, efforts to break any complex chain of behaviour may be futile, particularly for inexperienced parents. According to learning theory, an infant who is suddenly thrust into the novel situation of having his/her previously reinforced signalling behaviour go unattended, is likely to respond with an increase in crying and distress, known as the extinction burst (France & Blampied, 1999; Hudson, 1998; Kearney, 2008; Lin-Dyken & Dyken, 1996). Thus, parents find an increase in the aversive stimulus more difficult to ignore while their internal discomfort may be amplified by disagreement over appropriate management strategies and disparate individual resilience (Friman & Piazza, 2011; Stores, 2001). Typically, this rapid escalation in the target behaviour leads one or both parents to become so distressed that they abandon their strategy and attend to the child in the previous maladaptive fashion (Hudson, 1998; Kearney, 2008; Vollmer & Athens, 2011).

In addition, tired and self-doubting parents tend to be inconsistent in their approach, alternating between efforts to distract and calm the child, and intense physical stimulation (Papoušek & von Hofacker, 1998). The infant who desperately needs regularity and routine, is instead met by resignation and unsophisticated solutions, including habitual night-feeding
and reactive co-sleeping (Thunström, 1999). Unfortunately, the resultant intermittent schedule of reinforcement further strengthens the behaviour trap by rewarding the infant crying at higher levels of intensity and persistence, and providing greater levels of relief for the distressed parent (Lawton, France, & Blampied, 1991; Kearney, 2008; Meltzer, 2010). These circumstances often arise in the context of poor parental knowledge of development, sleep, and behaviour in young children (France et al., 1996).

**Behavioural Model I: The Development of Sleep Self-Initiation Skills**

It is normal behaviour for infants to wake and feed during the initial months, particularly when breastfed. This behaviour is advantageous, securing the nutrition required for neurophysiological growth and development, and is especially important for vulnerable infants (Murray & Ramchandani, 2007). However, the adaptive aspects of frequent night-waking and feeding diminish quickly over time, in concert with the infant’s rapidly increasing physical ability to sustain sleep (Henderson et al., 2011; Henderson et al., 2010; Pinilla & Birch, 1993). In particular, the development of proficiency in self-soothing skills over the early months largely determines the infant’s capacity to cope with normal arousals and sustain sleep for an extended period as time progresses (France & Blampied, 1999; Henderson et al., 2011). Rather than being innate characteristics of individual infants, self-settling behaviours emerge from consistent parent-infant interactions (Anders et al., 1992).

**Infant Characteristics**

According to France and Blampied (1999), organic factors (e.g., low birth weight, recurrent illness/allergy), biological predispositions (e.g., difficult temperament) and the behavioural characteristics (e.g., infantile colic) of some infants may increase their susceptibility to sleep disturbance. These factors subsequently shape parental behaviour so that proximal factors such as crying and fussing, irritability, low malleability, and poor state regulation are frequently managed using overly stimulatory practices (Kelmanson, 2004; Morrell & Steele, 2003; Sadeh et al., 2010). Highly vulnerable infants with adverse factors affecting their parents are clearly at most risk.

Nonetheless, an infant with an “easy” temperament, for example, is still susceptible to sleep disturbance if his/her parents, for reasons independent of the child’s biological make-up, interfere with the development of self-soothing skills (Atkinson, Vetere, & Grayson, 1995; France & Blampied, 1999). Consequently, some infants with low constitutional or environmental vulnerability will still face overly intrusive parenting practices while others
with challenging qualities will be managed with appropriately responsive strategies (France & Blampied, 1999).  

**Proximal Cues for Sleep Onset**

Research has consistently shown that predictable routines produce higher parenting self-efficacy and healthier, better regulated children (Fiese et al., 2002). Sleep is one of the first regulatory behaviours that infants practice with parents (Schwichtenberg, 2008) and unsurprisingly, good sleep hygiene is considered the foundation of healthy infant sleep (Mindell, Meltzer, Carskadon, & Chervin, 2009; Mindell, Telofski, Wiegand, & Kurtz, 2009; Sadeh et al., 2009; Seymour, Brock, During, & Poole, 1989). To this end, regular bedtime practices should be established early in the child’s life.

An adaptive bedtime ritual involves facilitation of an easy and non-stimulating routine (e.g., quiet play, bath, story, feed), ideally beginning at about the same time each evening, and being as consistent as possible (France & Blampied, 1999; Galland & Mitchell, 2010; Jenni & O’Connor, 2005). Each activity is followed by subdued parental praise, signalling transition to the next stage (Kuhn & Weidinger, 2000). As such, each step becomes a discriminative stimulus for the next activity (Avis & Mindell, 2008; Goetting & Reijonen, 2007). The result is a behavioural chain of events involving verbal cues, gradual diminution of environmental stimulation, progress toward the child’s sleeping environment, and association of sleep onset with the crib (France, Blampied, & Henderson, 2003; Meltzer, 2010; Meltzer & Mindell, 2009).

In contrast, inappropriate proximal cues for sleep onset are often found among families of sleep-disturbed infants (Sadeh et al., 2009). These activities include a more inconsistent bedtime routine, sleep onset away from the normal sleeping location, prolonged activities or course of events, active physical comforting during the settling process, parental presence of reinforcing quality while falling asleep, and playing music or using stimulating toys to assist with sleep onset (Adair et al., 1991; Ferber, 2006; France & Blampied, 1999; Reid et al., 2009; Sadeh, 2008c). It should be noted, however, that the relative maladaptive influences of the various parenting activities used to assist children to sleep and other

---

21 It is likely that some parents envisage their approach to infant sleep and settling during pregnancy, others develop a strategy soon after birth, and a further group improvise based on their infant’s early behaviours (Hiscock, 2010; Ramchandani, Wiggs, Webb, & Stores, 2000).

22 Evidence from the treatment literature suggests that parental presence at sleep onset is not automatically problematical. For example, France and Blampied (2005) have determined that being present in the baby’s room without engaging in overtly stimulatory activities inhibits infant distress without positively reinforcing crying (signalling) behaviour.
interlinked practices such as sleep onset away from the child’s usual sleeping location are yet to be established (Schwichtenberg & Goodlin-Jones, 2010).

**Parenting Practices and Infant Sleep Onset Associations**

As these factors converge, the resultant patterns of parent-child interaction may be broadly delineated based on whether they involve an appropriately responsive or overly intrusive parenting style (France & Blampied, 1999). Examples of parenting practices which encourage *adaptive sleep onset associations* for a child less than 3 months old include emphasising the difference between night and day, placing the child to bed drowsy but awake at bedtime, and not allowing the child to fall asleep during routine night-feeding (Johnson & Mindell, 2011; Meltzer & Mindell, 2009; Mirmiran, Maas, & Ariagno, 2003; Owens & Burnham, 2009; Wolfson, 1998; Wolfson et al., 1992). In general, parents should aim to create the same familiar conditions for the infant’s sleep resumption as existed at the time of initial sleep onset. For example, if a hall light was on at bedtime, it should be left on all night (Watts & Hudson, 2002). Infants are also prone to eliciting non-distressful sounds while asleep that needlessly awaken vigilant new parents (Lee & Gay, 2011). It is possible that locating the infant’s crib outside the parental bedroom is advantageous, as parents may be oblivious to some partial arousals and therefore less likely to gratuitously respond to the child (Mindell, Sadeh, Kohyama, et al., 2010; Watts & Hudson, 2002).

An overly intrusive approach always involves parental participation in the infant’s sleep-initiation process, including rocking, holding, walking, or feeding the child to sleep (Adair et al., 1991; Ferber, 2006; Mindell, Sadeh, Kohyama, et al., 2010; Morrell & Cortina-Borja, 2002; Sadeh et al., 2009; Touchette et al., 2005). The child learns to associate these stimulatory strategies with the act of falling asleep and during the course of normal nighttime arousals, normally requires the same conditions to be recreated in order to resume sleep (Mindell, Kuhn, Lewin, Meltzer, & Sadeh, 2006). As such, these *maladaptive sleep onset associations* (Dahl, 1995; Schwichtenberg, 2008) are associated with longer and more frequent awakenings (Sadeh et al., 2009; Schwichtenberg & Goodlin-Jones, 2010).

Although there may be considerable night-to-night and week-to-week variability in sleep-related interactions (Goodlin-Jones et al., 2001; Mindell & Owens, 2010), parents typically employ similar strategies at bedtime and during the night (Anders et al., 1992). Accordingly, parenting styles at bedtime have been shown to covary with infant sleep

---

23 Also commonly known as *negative* or *inappropriate* sleep onset associations (AASM, 2005; Mindell, 1997; Stores, 2001).
problems (Adair et al., 1991; Anders et al., 1992) while modification of bedtime practices often eliminates night-waking (Moorcroft, 2009; Schwichtenberg & Goodlin-Jones, 2010). A persistent pattern of active physical comforting, infant difficulty in self-soothing, and parental reinforcement of night-wakings is associated with childhood sleep disruption (Mindell & Owens, 2010; Sadeh et al., 2009).

**Sleep Self-Initiation Skills**

Invariably, by the second or third month of life, the various stimuli affecting the infant sleep initiation process are in place (France & Blampied, 1999; Henderson et al., 2010). These factors largely govern whether the child begins to settle into a healthy sleep pattern or displays symptoms of primary infant sleep disturbance. In other words, the interaction of maturational processes with environmental factors (particularly caregiving routines and practices) during the initial months determines whether or not the child approaches a realistic age for sleeping through the night with the requisite sleep self-initiation skills. Figure 4 presents the first model of France and Blampied (1999), the intrinsic and environmental vulnerabilities associated with the development of infant sleep self-initiation skills during the first three months of life.

*Figure 4.* The establishment of sleep initiation problems during the first three months of life. Adapted from “Infant Sleep disturbance: Description of a Problem Behaviour Process,” by K. G. France, & N. M. Blampied, 1999, *Sleep Medicine Reviews, 3,* p. 272, Copyright 1999, with permission from Elsevier.
Behavioural Model II: The Development of Primary Infant Sleep Disturbance

As the infant’s physiological need for night-time feeding diminishes, a more stable and predictable sleep-wake cycle begins to emerge. While most infants have the capacity to sleep through by 8 to 12 weeks (Adams et al., 2004; Henderson et al., 2011), just 50% of infants will have 24-hour sleep schedules resembling those of their parents by 5 months (Henderson et al., 2010). The quality and form of nocturnal arousals will be impacted by the infant’s constitutional endowment and various developmental factors, including individual progress in self-settling ability over the previous 3 months (France & Blampied, 1999).

Arousals and Night-Time Parenting: 3 to 6 months

Schmitt (1981) and Ferber and Boyle (1983b) originally pointed out that night-time awakenings are a problem of sleep initiation rather than sleep maintenance. Normal infant arousals between sleep cycles usually follow a period of REM sleep, and are generally sufficient to rouse the child to some degree. Consequently, infant sleep during this period may involve a series of brief arousals whereby resettling occurs with minimal interruption, resulting in seemingly unbroken sleep. Alternatively, it may be characterised by frequent night-waking, consisting of complete arousals with fussing and crying (Anders et al., 1992; Blampied & France, 1993; Montgomery-Downs, 2008). Anders (1979) referred to these contrasting sleep events as simple and complex awakenings, while France and Blampied (1999) and Weissbluth (2005) have distinguished between partial and full arousals.24

Infants who are habitually put to bed awake at 3 months are significantly more likely to have developed sufficient sleep-wake state organisation to sleep through the night (Anders et al., 1992). However, France and Blampied (1999) suggest that a small subset of infants will sleep through without having previously developed the obligatory sleep self-initiation skills. For example, it is conceivable for a child to be regularly fed to sleep at bedtime and yet not exhibit frequent night-wakings. Difficulties with delayed sleep onset at bedtime may still persist for many of these infants.

Parental Response

According to France and Blampied’s (1999) second behavioural model, one of two scenarios occurs in situations of complete arousal. Infants who find themselves in familiar

---

24 The term partial arousal more commonly refers to arousal from deep NREM sleep and is associated with parasomnias, such as night terrors and sleepwalking in older children (Hoban, 2004). For this reason, the terms near-arousal (Hall, Saunders, et al., 2006) or silent awakening (Keener et al., 1988) may be more appropriate.
surroundings and who have learned to self-soothe will return to sleep without parental intervention. In contrast, infants requiring parental involvement in their transition to sleep will signal for assistance (Anders et al., 1992; Ferber, 2006; Mindell et al., 2006). In these circumstances, the inability to self-initiate sleep becomes a proximal factor in the development of primary sleep disturbance (Figure 5).

*In a few cases, infants will discriminate parent-initiated settling at bedtime from the conditions prevailing when waking occurs with the parent absent during the night. This results in appropriate bed-time settling but signaling during the night during complete arousals. This provides another entry-point into the reinforcement trap.

**Figure 5.** The development of primary infant sleep disturbance. Adapted from “Infant Sleep disturbance: Description of a Problem Behaviour Process,” by K. G. France, & N. M. Blampied, 1999, Sleep Medicine Reviews, 3, p. 273, Copyright 1999, with permission from Elsevier.

Where there are complete arousals with signalling, repeated associations between infant crying, parental attention, active physical comforting, and the resumption of sleep, create a behaviour trap. As a result, any decrease in the reinforcing intensity of the parental response is likely to trigger an The Extinction Burst and intermittent reinforcement of night-waking and crying. Alternatively, parental attention of a consistently non-reinforcing intensity will result in the infant resuming sleep and crying will decline to a low frequency (France & Blampied, 1999).
BEHAVIORAL INSOMNIA OF CHILDHOOD

Regular infant night-waking after about 6 months is considered to be disordered sleep in most Western cultures (AASM, 2005). The fourth edition of the Diagnostic and Statistical Manual of Mental Disorders with text revision (DSM-IV-TR; American Psychiatric Association [APA], 2000) had limited utility for the diagnosis of sleep problems during infancy as it neglected to distinguish children from adults in the applicable section concerned with dyssomnias (Owens & Burnham, 2009). It is notable that the recently published fifth edition (DSM-5; APA, 2013) similarly fails to make this distinction.

Rather, the second edition of the International Classification of Sleep Disorders (ICSD-2; AASM, 2005) has been the most universally employed classification system in the field of paediatric sleep medicine (Burnham & Gaylor, 2008). Under this scheme, a diagnosis of Behavioral Insomnia of Childhood (BIC) is the most relevant to infant sleep disturbance in the first 12 months of life and the most common behavioural sleep disorder, representing about 85% of childhood sleep problems (Meltzer & Mindell, 2009; Minde, 1999). In general, it is a disorder of young children, but symptoms may persist into middle childhood and beyond (Owens, 2006). BIC has three sub-classifications: Sleep-onset association type (SOA), limit-setting type, or combined type. Since the latter two involve behaviours that are more applicable to toddlers and older children, they will not be considered further.

According to the ICSD-2, BIC-SOA is the diagnostic label applied to night-waking children after 6 months of age, unless the problematic sleep is very marked at an earlier age (AASM, 2005). This disorder is established by parents providing a bedtime environment that cannot be reproduced by the infant following normal arousals between sleep cycles during the night. Falling asleep in the early evening is often a difficult process for the infant that requires special conditions. As such, bedtime may be drawn out, problematic, and demanding for parents (Berry, 2012), while night-time awakenings require caregiver interventions for the child to return to sleep. Upon waking, the infant finds him/herself alone and unable to resume sleep without the original conditions being re-established. The child alerts caregivers by signalling for assistance. The consequence is often frequent and prolonged night-waking, resulting in insufficient sleep (Davis, Parker, & Montgomery, 2004b; Owens, 2006).

Unfortunately, the recently published third edition of the ICSD (AASM, 2014) no longer includes BIC as a discrete diagnostic category. Rather, it has been subsumed within
the diagnosis of Chronic Insomnia Disorder while the unique aspects of its presentation in children are discussed in the accompanying text. From a clinical perspective, however, the former conceptualisation of behaviourally-based childhood insomnias as being related to maladaptive sleep onset associations and parental difficulties with limit-setting remains a useful approach (Owens, 2014). It allows for discrimination between disorders and facilitates an understanding of symptoms, aetiology, and pathophysiology to enable appropriate treatment.

**CONCLUDING COMMENTS**

The high prevalence of sleep disturbance in childhood is alarming, particularly given the wide range of individual and family difficulties known to be associated with unsettled sleep patterns in children. Rapidly accumulating evidence confirms that chronically disordered sleep denies children of quality endogenous and environmental brain stimulation (Jan et al., 2010), while potentially impacting multiple domains of development (Owens & Burnham, 2009). Further, there appears to be a complex bidirectional relationship between sleep disturbance and problems with behavioural and emotional regulation in children and adolescents (Dahl & Harvey, 2007). In addition to these critical issues, childhood sleep problems are known to have a substantial secondary impact on family health and well-being (Galland & Mitchell, 2010; Thunström, 1999).

It is not surprising that parenting strategies and behaviours have been most extensively studied and the most consistently associated influence on infant sleep patterns during the first year of life (Hiscock, 2010; Mindell, Sadeh, Kohyama, et al., 2010; Sadeh et al., 2010; Schwichtenberg & Goodlin-Jones, 2010). New parents have a challenging task in providing the necessary scaffolding to facilitate a healthy sleep-wake rhythm in their infants. Nevertheless, a number of other factors have been associated with sleep disturbance in the paediatric sleep literature. The next chapter discusses some of these concepts—all of which are directly relevant to the current research—and examines their ostensible relationship with infant sleep problems.
CHAPTER 4

Additional Factors Associated with Infant Sleep Disturbance

When my first daughter, Lily, was born, she slept through at five weeks. Yes, the entire night – at five weeks. As my new mum-chums staggered about with bloodshot eyes, bent double with the sort of crippling tiredness that seeps into the bone marrow, I secretly, smugly assumed they must doing something wrong and only had themselves to blame...Then my second daughter, Tabitha, was born and seemed intent on creating merry hell from dusk until dawn. By day she was a sweet little poppet, but every evening she howled for hours on end...The general consensus from friends, family and the staff at the baby clinic was ‘colic,’ a vague, catch-all term that simply means ‘your baby is crying all the time, and we don’t know why... but resist the temptation to put her outside in the recycling box and she’ll cheer up in a few months’. ‘Every baby’s different,’ other mothers would platitudinise, with a knowing smile, and I would have to sit on my hands in a Herculean effort not to punch them. (Woods, 2010)

It comes with the territory hon. Spies and parents never sleep. (Gerber, 2008, p. 29)

OVERVIEW

Notwithstanding the influence of parental interactive behaviours, a variety of other factors are potentially associated with infant sleep patterns, albeit via complex, bidirectional pathways (e.g., Sadeh et al., 2010). While it is beyond the scope of this research to investigate the impact of distal factors such as cultural influences, socioeconomic issues, and external family stressors, there is capacity to examine the effects of a range of proximal factors relating to child sleep outcomes. Additional sleep-related issues encapsulated by the SNSP include infant temperament, infantile colic, postnatal depression, parenting stress, maternal cognitions about infant sleep, and parenting alliance.

This chapter will provide an outline of these areas; for each factor there will be a brief explanation of the concept or construct, followed by a discussion of its known association with paediatric sleep. In addition, two theoretical models are presented. The first clarifies the hypothesised relationship between maternal sleep-related cognitions and infant sleep behaviour. The second model builds on the first by integrating most of the concepts incorporated in this research, as well as some other proximal factors with presumed links to infant sleep disturbance.
INFANT TEMPERAMENT

The conceptualisation and measurement of childhood temperament has engaged generations of researchers (Janson & Mathiesen, 2008). Temperament refers to individual constitutionally-based differences in behavioural style involving affect, activity, and attention (Rothbart & Bates, 2006). It is closely linked to biological (e.g., genetic, neurochemical, neuroanatomical) mechanisms with discernible parallels in nonhuman primates and other social mammals (Gosling, 2001; Kay, Marsiske, Suomi, & Higley, 2010; Zentner & Bates, 2008). Temperament is present in neonates and represents the biological foundation of personality development (Rothbart, 2011; Sanson, Hemphill, & Smart, 2004).

While temperamental traits are considered the whole of personality in infancy, they form but a subset of personality differences as development progresses (Shiner & Caspi, 2003). Indeed, personality is a more global domain, incorporating higher order thinking such as social cognition (e.g., self-concept, social schemata, attributions) and other uniquely human aspects of neurological functioning (Rothbart & Bates, 2006). Moreover, temperament influences the development of personality, but can be differentiated from it (Rothbart, 2011). More precisely, temperament is closely linked to individual differences in the reactivity of basic neural systems, while personality traits represent the projections of these tendencies into the outside world (Kagan & Snidman, 2004; Rutter, 1987).

The understanding of childhood temperament has progressed rapidly in recent years with early views on temperament as heritable and fixed being replaced by more dynamic concepts (Rothbart & Bates, 2006). Contemporary theories regard early individual characteristics as the beginning of a complex process of interaction with the social environment, which gradually and successively fosters dispositional change and the emergence of new qualities (Caspi & Shiner, 2008). This is consistent with recent epigenetic studies which have demonstrated how early social experiences become embedded in neurobiology and behaviour, including increasing evidence for a transgenerational impact on gene expression (Champagne, 2010b; Curley, Jensen, Mashoodh, & Champagne, 2011; Lester et al., 2011; Szyf, 2009). Although some stability among temperamental features is expected in childhood, traits are not necessarily constant for the duration of development (Janson & Mathieson, 2008).

The most influential investigation of childhood temperament has been the New York Longitudinal Study (NYLS), conducted by Thomas, Chess, and colleagues, which followed a small sample of children across their development (Rothbart & Gartstein, 2008). Based on a
content analysis of parent interviews, these researchers identified nine dimensions of temperament, and later combined several of these to produce a global easy-difficult concept (Thomas & Chess, 1977; Thomas, Chess, & Birch, 1968; Thomas, Chess, Birch, Hertzig, & Korn, 1963). The NYLS model spawned a series of questionnaires and rating forms designed for parents and teachers of preschool and school-aged children (e.g., Carey, 1970; Carey & McDevitt, 1978; Martin, 1988; Thomas & Chess, 1977).

However, concerns about dimensional overlap and low internal consistency have led to empirically- and theoretically-based conceptual refinements. Subsequent factor analytical investigations of these instruments suggest that infant temperamental variability can be accounted for by fewer than nine dimensions (Bohlin, Hageküll, & Lindhagen, 1981; Martin, Wisenbaker, & Huttenun, 1994; Rothbart & Gartstein, 2008; Sanson, Prior, Garino, Oberklaid, & Sewell, 1987). For example, researchers involved in a large prospective study of temperament in Australia found that the behavioural characteristics of their infants were best captured by a 5-factor model (Sanson et al., 1987). More recently it has been suggested that childhood temperament may be encapsulated by as few as three relatively independent, global dimensions (Rothbart & Bates, 2006; Sanson et al., 2009; Sanson et al., 2004).

Nonetheless, the temperament construct remains somewhat clouded by questions about assessment methodology, including structural definitions, the objectivity of parental report, and the likelihood of reliably identifying different aspects of temperament in infancy (Bates, Schermerhorn, & Goodnight, 2010; Goldsmith et al., 1987; Kagan & Fox, 2006; Messer & Parker, 1998; Strelau & Angleitner, 1991). For example, there has been a general belief that assessments of temperamental traits largely reflect the ease with which children can be managed by caregivers (Hayes, Parker, Sallinen, & Davare, 2001). Others have questioned whether existing measures capture the endogenous characteristics of the child, the child’s adaptation to a specific environment, or both (Sadeh et al., 1994).

**Temperament and Infant Sleep**

The characteristics of children potentially mediate or moderate the effects of parenting and parent-child relationships on children’s sleep (Staples & Bates, 2011). Temperamental style has been linked to individual variability in sleep behaviour through parallel and shared regulatory processes (Hayes, McCoy, Fukumizu, Wellman, & DiPietro, 2011). Specifically, the regulation of sleep, arousal, affect, and attention overlap in developmental, neuroanatomical, physiological, and developmental domains (Dahl, 1996c; Sadeh, Gruber, & Raviv, 2003). Intrinsically, infant sleep-wake states reflect several dimensions of
temperament including self-regulation, activity, arousal, irritability, and soothability (Keener et al., 1988).

Daytime temperamental characteristics indicating immature regulation in one domain (e.g., emotionality) may be indicative of dysregulation in related systems, including sleep and arousal (Dahl, 1996c; Fukumizu et al., 2005). Correspondingly, Halpern, Anders, Garcia Coll, and Hua (1994) have argued that infant sleep-wake state characteristics and temperament dimensions mirror similar aspects of biological maturity and organisation. This is supported by knowledge that many preterm infants exhibit disorganised behavioural patterns including erratic sleep, excessive fussiness, difficult temperament, and feeding problems (Altimier, 2008; National Health and Medical Research Council [NHMRC], 2000; Oberklaid, Prior, & Sanson, 1986).

In fact, infant difficulty is the most commonly investigated link between temperament and sleep in young children, with poor sleepers more likely to be described as having difficult temperaments by their parents. The direction of this relationship remains controversial. For example, the parents of infants with a difficult or unadaptable disposition may act to avoid child distress by engaging in higher levels of active physical comforting, leading to the perpetuation of night-wakings (Morrell & Cortina-Borja, 2002; Staples & Bates, 2011). Conversely, it is possible that sleep loss and/or fragmentation resulting from underlying regulatory issues manifest as difficult or unadaptable temperament characteristics in early childhood (Sadeh et al., 1994; Weissbluth, 1989). Thus, it remains unclear whether infants who are constitutionally more dysregulated have increased sleeping difficulties, or if disturbed sleep leads to more dysregulated daytime behaviour (DeLeon & Karraker, 2007). In short, the interface between child temperament, parental interactions, and sleep is complex and poorly understood.

Given a substantive literature investigating the relationship between temperament and sleep, this lack of understanding is surprising, although it is symptomatic of the aforementioned measurement issues. An overwhelming majority of studies have incorporated assessments of temperament emanating from the NYLS model. As indicated, researchers have often focussed on the correlates of infant difficulty, defined by Thomas and Chess (1977) as the combination of negative mood, low adaptability, high intensity of responses, frequent withdrawal from new experiences, and low rhythmicity. Difficult temperament has often been associated with variables that reflect sleep continuity such as night-waking, sleep and awake time during the night, and 24-hour sleep time (e.g., Keener et al., 1988; Loutzenhiser et al., 2011; Palmstierna et al., 2008; A. Scher, 2008; Touchette et al.,
The specific dimensions of temperament found to relate to poor sleep quality and quantity in infants include low sensory threshold (Carey, 1974), high sensory threshold (Spruyt et al., 2008), low adaptability (Weissbluth, 1981), diminished approach behaviour\textsuperscript{26} (Halpern et al., 1994; Kaley, Reid, & Flynn, 2012; Spruyt et al., 2008; Weissbluth, 1981), high intensity (Kaley et al., 2012; Kelmanson, 2004), elevated activity (Kaley et al., 2012), low sociability and increased irritability (Halpern et al., 1994), less distractibility\textsuperscript{27} (Kaley et al., 2012; Kelmanson, 2004; Spruyt et al., 2008), low rhythmicity (Keener et al., 1988; Kelmanson, 2004; Spruyt et al., 2008; Weissbluth, 1981), negative mood (Kelmanson, 2004; Weissbluth, 1981), and less persistence (Spruyt et al., 2008; Weissbluth, 1981). Although the majority of these reports have utilised measures derived from the NYLS approach, there has been an inconsistency of significant findings across dimensions. Moreover, other studies have failed to expose any meaningful relationships between temperament and infant sleep-wake behaviours (DeLeon & Karraker, 2007; Hayes et al., 2011; Scher, Tirosh, & Lavie, 1998; Weinraub et al., 2012). Research with toddlers and preschool children has uncovered similarly varied results with the only steadfast outcome being the link between difficult infant temperament and childhood sleep patterns (Atkinson et al., 1995; Germo et al., 2009; Jimmerson, 1991; Minde et al., 1993; Novosad, Freudigman, & Thoman, 1999; Sadeh et al., 1994; Schaefer, 1990; Weissbluth, Davis, & Poncher, 1984).

In addition to theoretical and measurement issues, paediatric temperament research is littered with methodological shortcomings, making interpretation even more difficult. In particular, small sample sizes (e.g., Halpern et al., 1994; Spruyt et al., 2008) are common, while retrospective (e.g., Germo et al., 2009) and/or unsatisfactory reporting of infant temperament (e.g., Loutzenhiser et al., 2011), and inadequate assessment of sleep behaviours (e.g., Palmstierna et al., 2008) feature prominently as problematic issues. With the exception of Johnson and McMahon (2008) and Morrell and Steele (2003), no studies have controlled for maternal cognitions about infant sleep and night-time parenting behaviours. Interestingly, Johnson and McMahon (2008), using a sample of 2- to 5-year-old preschoolers, reported that difficult temperament did not relate to parental sleep-related cognitions, bedtime interactions, or child sleep behaviour. In contrast, Morrell and Steele (2003) found that fussy/difficult infant temperament and problematic maternal cognitions influenced the degree to which

\textsuperscript{25} As with previous summations, this short review will focus mainly on the study of infants.

\textsuperscript{26} i.e., more withdrawn.

\textsuperscript{27} i.e., more difficult to soothe.
parents employed active physical comforting as a strategy to settle young infants to sleep.

Taken together, most of the findings on sleep and temperament suggest that they are in some way related. Inconsistencies and lack of replication are probably reflective of measurement issues, methodological problems, and widely differing research approaches. Nevertheless, the majority of associations reported have been relatively small in magnitude (Scher et al., 1998) and there are few, if any studies demonstrating a strong independent link between infant sleep outcomes and global ratings or the dimensions of temperament. This has led to questions about both the validity of maternal ratings (Morrell & Steele, 2003; Scher et al., 1998) and the possible influence of maternal fatigue or depression on perceptions of infant temperament (Gelfand, Teti, & Fox, 1992).

**INFANTILE COLIC**

During the initial months, one of the most challenging aspects of parenting is the prospect of increased crying, particularly in the early evening. *Infantile colic* is a syndrome characterised by excessive and inconsolable crying, hypertonicity, and wakefulness, which cluster in the evening in an otherwise healthy and well-fed infant (Carey, 1984; Clifford, Campbell, Speechley, & Gorodzinsky, 2002a; Wessel, Cobb, Jackson, Harris, & Detwiler, 1954). It affects approximately 15 to 25% of infants (Iacono et al., 2005; Kaley, Reid, & Flynn, 2011), although estimates vary from 3 to 40% depending on the definition, research design, and sampling methods employed (Lucassen et al., 2001). Colic is equally prevalent in male and female, and in breast- and formula-fed infants, and is independent of demographic, social, and cultural factors (Clifford et al., 2002a; Cohen & Albertini, 2012; Savino, 2007; Talachian, Bidari, & Rezaie, 2008).

Despite a long history and relatively frequent occurrence, infantile colic remains an enigmatic condition, with limited consensus over its aetiology, diagnosis, treatment, or sequelae (Clifford et al., 2002a; Cohen & Albertini, 2012; Helseth & Begnum, 2002; Kaley et al., 2011; Maxted et al., 2005; Salisbury et al., 2012; Savino, 2007). The most widely used definition is the *rule of threes*, involving a minimum of 3 hours crying per day, occurring on least 3 days per week, and lasting for more than 3 weeks (Wessel et al., 1954). However, these somewhat arbitrary thresholds are overly stringent and have limited clinical utility (Barr, 1993; D. J. Moore, 2009) amid a phenomenon that is ultimately defined by the parental threshold for infant crying and perception of the behaviour as problematic (Cook et al., 2012; Maxted et al., 2005).
According to Barr and colleagues (Barr, 1990, 2002; Barr et al., 2009), most studies on the phenomenology of infantile colic agree on five important aspects:

1. There is a progressive increase in crying behaviour from birth until its peak at about 6 weeks, at which time it begins to gradually decrease (Brazelton, 1962; Helseth & Begnum, 2002; Lucas & St James-Roberts, 1998), with spontaneous remittance by about 3 months.29

2. The presence of a diurnal rhythm in which most crying occurs in the evening, particularly during the crying peak in the second month.

3. There are considerable differences in crying behaviours between infants, especially at the crying peak.

4. Crying may be unpredictable and spontaneous, varying markedly within each child from day to day (Barr, 1990; Roberts, Ostapchuk, & O’Brien, 2004).

5. Crying behaviour cannot typically be accounted for by parenting style or modified by changes to caretaking practices (St James-Roberts et al., 2006).

A further point of professional consensus is that colic is distressing and frustrating for parents (Kaley et al., 2011). Although it is generally self-limiting in nature, the experience of persistent unsoothable crying, together with a lack of viable treatment options, may eventually be overwhelming (Clifford, Campbell, Speechley, & Gorodzinsky, 2002b). Sustained infant crying has been associated with parental stress and exhaustion; concentration difficulties; feelings of helplessness, incompetence, and anger; fear of harming the child (Barr et al., 2001; Donovan, 1981; Keefe, Karlsen, Lobo, Kotzer, & Dudley, 2006; Kurth, Kennedy, Spichiger, Hösl, & Stutz, 2011; Landgren & Hallström, 2011); and increased risk of maternal depression (Vik et al., 2009). At the extreme, its effects on the family system and parent-infant relationships (Papoušek & von Hofacker, 1998; Räihä, Lehtonen, Huhtala, Saleva, & Korvenranta, 2002) may be sufficient to disrupt the infant’s development (Donovan & Leavitt, 1992). In certain individuals, the stress of caring for an inconsolable infant may ultimately trigger physical abuse, such as that seen in Shaken Baby Syndrome (Altimier, 2008; Barr et al., 2006; Lee et al., 2007; Talvik et al., 2008).

---

28 This n-shaped pattern of crying appears to be a behavioural universal of normal infant development, although some children cry substantially more than others (Barr, 2002). Characteristically, the onset of colic is within 2–3 weeks of the expected due date and is both delayed (Barr, Chen, Hopkins, & Westra, 1996) and more common in premature infants (Milidou, Søndergaard, Jensen, Olsen, & Henriksen, 2014). There is also evidence that formula-fed infants may have a much earlier crying peak at around 2 weeks (Lucas & St James-Roberts, 1998).

29 Hence the original term three-months’ colic (e.g., Illingworth, 1954). The idea that infantile colic remits within 3 months has been supported by Clifford et al. (2002b), who found that 85% of infants who cry excessively are symptom free by the third month, without adjustment for post-conceptual age (i.e., this is most likely a conservative result).
Nonetheless, while excessive crying in early infancy may be a marker of concern for the family system (DeSantis, Coster, Bigsby, & Lester, 2004), in most cases colic does not have lasting effects on maternal mental health (Clifford et al., 2002b; Stifter & Braungart, 1992), or result in enduring patterns of dysfunctional interaction, unless the crying persists well beyond 3 months (Papoušek & von Hofacker, 1998). Similarly, in the absence of other individual, parental, or family risk factors, excessive crying in the first 3 months does not have long-term effects on the growth, development, or behaviour of children (Barr, 1998b; DeSantis et al., 2004; St James-Roberts, 2001b).

The pathogenesis of infantile colic remains unknown despite a large body of exploratory research. While some physiological points of divergence between infants with and without colic have been uncovered, just 5% of infants with unsoothable crying are thought to have organic disturbances (Freedman, Al-Harthi, & Thull-Freedman, 2009; Gormally, 2001; St James-Roberts, 2007; Zwart, Vellema-Goud, & Brand, 2007), rendering a simplistic biomedical management approach inefficient, and potentially harmful (Douglas, Hill, & Brodribb, 2011; Douglas & Hiscock, 2010). Moreover, research into organic aetiologies generally fails to account for the striking circadian pattern of irritability and the abrupt resolution of symptoms at about 3 months (D. J. Moore, 2009).

Interestingly, a number of authors have drawn attention to the apparent neurodevelopmental immaturity of infants with persistent crying, suggesting the possibility of a transient delay or disturbance in the child’s arousal-inhibitory control mechanisms, or sleep-wake state organisation (Barr, St. James-Roberts, & Keefe, 2001; Keefe, 1988; Papoušek & von Hofacker, 1998; Weissbluth, 1995; White, Gunnar, Larson, Donzella, & Barr, 2000). The idea of a neurodevelopmental foundation for colic is supported by knowledge that:

- the second and third month are a time when reflexive behaviours are progressively replaced by the cortical regulation of more complex abilities (St James-Roberts, 2007);
- it occurs during the most rapid period of consolidation in infant sleep regulation (Coons, & Guillemainault, 1982; Henderson et al., 2010; Weissbluth, 1995);
- crying behaviour follows a distinct circadian pattern (Weissbluth, 1995);

30 Some of the factors under investigation have included: gastroesophageal reflux (Berkowitz, Naveh, & Berant, 1997); milk-protein intolerance (Berseth, Johnston, Stolz, Harris, & Mitmesser, 2009; Savino et al., 2006); transient lactose intolerance (Kanabar, Randhawa, & Clayton, 2001; Miller, McVeagh, Fleet, Petocz, & Brand, 1989); gut microbiota (Savino et al., 2004); intestinal inflammation (Rhoads et al., 2009); impaired cholecystokinin secretion (Huhtala, Lehtonen, Uvnäs-Moberg, & Korvenranta, 2003); maternal trait anxiety (Canivet, Östergren, Rosén, Jakobsson, & Hagander, 2005); and allergy to milk proteins or other substances in the maternal diet (Jakobsson & Lindberg, 1983; Hill et al., 2005; Lust, Brown, & Thomas, 1996).
its onset and remission are more closely tied to the infant’s post-conceptual age than his/her actual birth date (Leung & Lemay, 2004; Meyer & Thaler, 1971; Søndergaard, Skajaa, & Henriksen, 2000); and

- almost all infants “outgrow” colic by 4 months (Barr, 1998a; Roberts et al., 2004).³¹

³¹ It is the author’s own speculation that infantile colic may have its roots at the interface of the homeostatic and circadian processes, as the suprachiasmatic nucleus begins to generate a wake signal of increasing intensity, creating enhanced alertness in the early evening (Borbély, 1982; Borbély & Achermann, 1999; Dijk & Lockley, 2002; Edgar et al., 1993). In this context, it might be more appropriate to describe colic as a disorder of excessive evening wakefulness (Weissbluth, 2005).
indicated no medium- to long-term effects with regard to sleeping behaviours and patterns (Canivet, Jakobsson, & Hagander, 2000; Lehtonen, Korhonen, & Korvenranta, 1994; St James-Roberts & Peache, 2011; von Kries, Kalies, & Papoušek, 2006).

There is some possibility that sleep problems in post-colicky infants result from parental failure to establish healthy sleep routines and practices following remission. Several authors contend that prolonged crying has the potential to permanently shape caregiving styles such that parents become hypersensitive to infant crying, respond with increased arousal, continue to engage in stimulating overattentiveness, and mismanage the infant’s sleep schedules and habits long after the colic has passed (AASM, 2001; France & Blampied, 1999; Papoušek, Wurmser, & von Hofacker, 2001; Weissbluth, 1987, 2005). Support for this notion has been reported by Wolke et al. (1995) who found that parent distress about crying during the first five months predicted night-waking problems at 20 (but not 56) months.

MATERNAL COGNITIONS

There has been incredible diversity in the concepts used to describe the mental processes parents engage in regarding their children. Theorists have variously associated attributions, beliefs, conceptions, expectations, goals, ideas, inferences, internal cognitive states, judgements, perceptions, representations, schemas, and thoughts with parenting, but there is no prevailing or universally accepted terminology (Goodnow & Collins, 1990; Miller, 1988; Sigel & McGillicuddy-De Lisi, 2002). Cognitions, however, is a useful umbrella term for all of these processes, which in theory, refers to any mental activity involved in the acquisition, storage, transformation, and use of knowledge (Matlin, 2009). The most straightforward and practical explanation of cognitions is that they are comprised of beliefs and thoughts (A. T. Beck, 1970).

Beliefs refer to relatively stable and often unconscious assumptions that the individual makes about him/herself, others, and the external world. Although we have the ability to consciously think about our beliefs, and even challenge their validity, we rarely engage in this process.32 Thoughts, on the other hand, are transient and often conscious contemplations. The individual can typically pause and examine their own thinking if desired. In a sense, beliefs facilitate the activation of situationally-based thinking.33 Beliefs and thoughts interact with each other to influence the way we behave and feel. As such, the individual’s belief

---

32 Beliefs can be further subcategorised into core and intermediate beliefs (see J. S. Beck, 2011, for an excellent summary).
33 Analogous to automatic thoughts described by A. T. Beck (1963).

Over the past two decades, there has been an emerging research focus on the role of parental cognitions in child development and family life (Golik et al., 2013; Tikotzky & Sadeh, 2009). These cognitions are thought to serve many functions, including the generation, organisation, and shaping of parental behaviours and consequently, as a mediator of parenting effectiveness (Bornstein et al., 2007; Ferrier-Lynn & Skouteris, 2008; Goodnow & Collins, 1990; Miller, 1988; Sigel & McGillicuddy-De Lisi, 2002). Cognitive-behavioural models of parenting suggest that parent cognitions are predictive variables that shape the practices undertaken by a parent for the physical, psychological, social, and emotional care of a child (e.g., Bugental & Johnston, 2000; Murphey, 1992).

**Maternal Cognitions and Infant Sleep**

Understanding the psychological mechanisms that influence parent behaviour is important in preventing paediatric sleep problems (Golik et al., 2013). Parental actions at bedtime and following night-wakings are governed by beliefs and thoughts about infant sleep; a change in sleep-related cognitions may lead to a change in night-time parenting practices (Tikotzky & Sadeh, 2010). As outlined, there is extensive research associating infant sleep disturbance with overly intrusive parenting methods. Until recently, however, few studies had considered the possible underlying factors that lead parents to be more actively involved in settling their children off to sleep. In particular, the role of sleep-related parenting cognitions has rarely been investigated (Morrell, 1999b).

In a study of sleep problems seen in paediatric practice, Lozoff, Wolf, and Davis (1985) found a maternal attitude of ambivalence toward the child to be an important factor discriminating children with sleep problems from those who were good sleepers. Benoit, Zeanah, Parker, Nicholson, and Coolbear (1997) reported that mothers of sleep-disturbed toddlers held unbalanced and more disengaged perceptions about their children in comparison with a control group. The groups also differed on a measure of openness to change, suggesting that these mothers were more rigid and inflexible in their approach. Finally, a study by Toselli, Farneti, and Salzarulo (1995) investigated women’s prenatal representations about their baby’s sleep. While the overwhelming majority of expectant mothers thought that sleep is always a spontaneous process, almost all felt that sleep could be induced by caregivers. In turn, many believed that a child needs to be helped to fall asleep, with preferences toward caressing and rocking. The wide range of contradictory beliefs found in
this study suggested that a more precise exploration of maternal cognitions as a risk factor for infant sleep problems was warranted (Morrell, 1999b).

To this end, Morrell (1999b) developed a new self-report measure, the Maternal Cognitions about Infant Sleep Questionnaire (MCISQ), designed to assess maternal beliefs and thoughts relating to infant sleeping issues. Using a relatively small validation sample of 150 mothers, Morrell found sleep problems among 13- to 16-month-olds to be associated with maternal cognitions about limit-setting, doubts about parenting competence, and anger at the infant’s demands. Consistent with previous theorists, he suggested that maladaptive sleep-related cognitions had the potential to disrupt parent-child interactions, and impede the development of infant self-regulation. Morrell proposed that problematic beliefs and thoughts come to the fore in the challenging circumstances associated with infant night-waking, providing the foundation for overly intrusive or rejecting parental interactions. Two other cognitive dimensions—concerns about infant hunger and child safety during the night—were not related to infant sleep problems in Morrell’s sample. This has led a number of subsequent researchers to abandon these subscales.

A follow-up study by Morrell and Steele (2003) confirmed a link between maternal cognitions and the continuity of infant sleep problems. Utilising path analysis, mothers’ thoughts indicating problems with limit-setting and anger at their infant’s demands, in combination with perceptions of a fussy-difficult temperament, directly influenced the use of active physical comforting to settle the child to sleep. In turn, this was predictive of ongoing sleep problems. Certain types of maternal cognitions were therefore implicated in impeding the development of infant self-regulation of the sleep-wake cycle via their association with intrusive caregiving practices.

In the past decade, there has been an emerging focus on the links between parent cognitions and infant sleep disturbance. Research by Sadeh, Flint-Ofir, Tirosh, and Tikotzky (2007) investigated sleep-related cognitions among parents of clinically referred and non-referred 5- to 29-month-old children, with parents of sleep-disturbed infants and toddlers reporting more difficulty with MCISQ limit-setting. When parents were given hypothetical examples of infants with sleep problems, however, the parents of infants with sleep problems were more likely to interpret the situation as excessive infant demandingness and endorse a limit-setting strategy as the appropriate course of action. This suggested that parents of sleep-disturbed infants were aware of their difficulties with setting limits, able to prescribe these strategies for others, but unable to put this into practice with their own child. Contrary to Morrell’s (1999b) validation report, no group differences were found with respect to the
Doubt or Anger subscales, while scores on the Feeding and Safety subscales also failed to differ significantly between the referred and non-referred children.

Johnson and McMahon (2008) examined the role of cognitions among parents of children aged 2 to 5 years with items from the MCISQ Setting Limits, Doubt, and Anger subscales used to establish an overall sleep-related cognitions score. Findings revealed significant inter-relationships between the following variables: problematic parental cognitions, more active parent-child interactions at bedtime, and poor child sleep outcomes. Using structural equation modelling, Johnson and McMahon found evidence for a direct link between maladaptive parental cognitions and infant sleep disturbance via inappropriate bedtime interactions.

Tikotzky, Sharabany, Hirsch, and Sadeh (2010) investigated maternal cognitions among a group of 141 parents who had themselves been raised under communal sleeping arrangements. Infants involved in the study were again from a large age range (4.5 to 30 months, $M = 15.2$) and the researchers did not develop an overall index of sleep behaviour, making interpretation of their results difficult. A weak correlation between Setting Limits and night-wakings (using a sleep diary but not via questionnaire) was the only significant maternal finding among the MCISQ dimensions.

Tikotzky and Sadeh (2009) explored the development of maternal cognitions about infant sleep throughout the first year of life. Data was collected during pregnancy, and at 1, 6, and 12 months post-birth. However, Morrell’s (1999b) measure of maternal cognitions was not included, a curious choice, considering the two measures of limit-setting previously revealed opposing results with respect to sleep problems (Sadeh et al., 2007). Tikotzky and Sadeh (2009) subsequently found a series of relatively weak correlations between their own measure of limit-setting cognitions and infant sleep behaviour at various data collection points. Results again suggested that parents who interpreted hypothetical scenarios as excessive infant demandingness by endorsing a limit-setting approach were more likely to have a poorly sleeping infant, relative to the sample. Maternal cognitions that emphasised infant distress and the need for assistance during the night also predicted more disturbed infant sleep, although the strength of the relationship was again, unremarkable.

34 Daws (1989) has highlighted the role of parents’ personal histories, including their early childhood experiences, in influencing their own children’s development, of which sleep is an important part. Given the likely differences in the childhood experiences of these parents compared to those raised in individual families, it is obviously difficult to extrapolate the results to a Western culture.

35 In effect, the study design included no direct measure of parental cognitions specific to each infant’s sleep patterns. However, the later study by Tikotzky and Shaashua (2012) described next suggests that MCISQ data was collected by Tikotzky and Sadeh (2009) but not included in their report.
A follow-up study by Tikotzky and Shaashua (2012) did consider Morrell’s (1999b) concept of maternal cognitions in terms of limit-setting. Interestingly, these authors found that maternal cognitions indicating difficulty in limiting night-time involvement at 12 months were predictive of active physical comforting at bedtime and fragmented child sleep measured objectively at 4 years. This suggests that problematic parent cognitions about limit-setting in the first year are relatively stable and may have enduring effects on childhood sleep quality.

Maternal Cognitions and Infant Sleep: A Theoretical Model

At this point, it is worth considering the theoretical relationship between maternal cognitions and infant sleep behaviours suggested by the above discussion. Figure 6 shows an adapted version of Johnson and McMahon’s (2008) theoretically-driven model of child sleep behaviour, incorporating the cognitions concept described earlier. According to this model, sleep-related parent behaviours have the most direct influence on infant sleep patterns. These parental night-time interactions are guided by maternal thinking based on her sleep-related beliefs and interpretation of her infant’s sleeping patterns. Sleep-related beliefs may be altered through interpretations of her experience with her child’s sleeping behaviours.

Ultimately, beliefs are compelling determinants of behaviour (Wright, 1993). Parents with problematic cognitions utilise strategies which threaten the development of infant self-soothing skills increase the likelihood of sleep disturbance. Adaptive cognitions lead to night-time parenting behaviours which encourage infant autonomy, self-regulation of sleep-
wake states, and sleep consolidation. This model is broadly consistent with the assertions of others who argue that parental cognitions drive the night-time parenting behaviours that directly influence infant sleep (Erath & Tu, 2011; Morrell & Steele, 2003; Sadeh et al., 2010).

**POSTNATAL DEPRESSION**

*Postnatal depression* is a clinical syndrome of moderate to severe depressive symptomatology occurring in approximately 7.1% of women within 3 months of childbirth (Gavin et al., 2005). Large Australian studies using a cut-off score of 13 or more on the Edinburgh Postnatal Depression Scale (EPDS; Cox, Holden, & Sagovsky, 1987) indicating probable major depression, have reported similar ratios of 7.3 to 7.5% during this period (Buist et al., 2008; Woolhouse, Brown, Krastev, Perlen, & Gunn, 2009). There is also evidence of a higher prevalence of postnatal depression (9.1 to 16.9%) between 6 and 12 months postpartum (Brown & Lumley, 1998; Hiscock & Wake, 2001; Woolhouse et al., 2009). Approximately 14.5 to 18.2% of women are affected by at least subclinical depressive symptoms (EPDS of 10 or more) over the first 6 months (Buist et al., 2008; Woolhouse et al., 2009). It is important to note that scores of between 10 and 12 on the EPDS are often referred to as ‘minor’ or ‘possible’ depression in the relevant literature.

In terms of formal diagnosis, the recently replaced DSM-IV-TR (APA, 2000) distinguished postnatal depression from a regular depressive episode only by its onset within one month of childbirth. DSM-5 replaced the term *postpartum* with *peripartum* which additionally recognises depressive symptom onset during pregnancy (APA, 2013). However, neither of these diagnostic conceptualisations regard symptom onset in excess of 4 weeks post-birth as having any meaningful relationship to the experience of childbirth. This temporal criterion has been criticised as being too restrictive (e.g., Jones & Cantwell, 2010; Miller, 2002) as well as ignoring the psychosocial factors that play a major precipitative role. Twelve months is generally considered to be a more appropriate upper limit in research and practice (NHMRC, 2000; Phillips, Sharpe, & Matthey, 2007). Consequently, the term *postnatal depression* is used in this thesis to describe symptoms of depression in mothers during the first year of their child’s life.

---

36 Limited generalisable evidence is available in terms of high-quality systematic reviews investigating the prevalence and incidence of postnatal depression (Mann, Gilbody, & Adamson, 2010). By far the most commonly cited estimation of mean prevalence is 13%, from a review by O’Hara and Swain (1996). However, this review is largely based on evidence collected at least 20–30 years ago; it has been criticised for its methodological rigour in weighting the results of smaller studies (more prone to chance) equally with those of larger studies (Mann et al., 2010); and many included predictive value estimates are inflated, because they were measured in higher prevalence populations (Eberhard-Gran, Eskild, Tambs, Opjordsmoen, & Samuelsen, 2001).
The symptoms of postnatal depression generally match those of a major depressive episode and include: sadness, loss of interest in pleasurable activities, sleep disturbances, loss of energy, weight changes, concentration problems, feelings of worthlessness or guilt, agitation, and thoughts of suicide (APA, 2000). There is also evidence that many women with a postnatal depressive illness will feel more worried, anxious, and/or overwhelmed than sad (Benvenuti, Valoriani, & Vanni, 2006; Fisher et al., 2002; Phillips et al., 2007), with these symptoms tending to be subsumed within the depression diagnosis (Miller, Pallant, & Negri, 2006). Postnatal depression is distinct from the more mild and transient baby blues, which affects up to 85% of mothers during the first postnatal week (Ross, Murray, & Steiner, 2005), and appears to be rooted in biological factors unique to the childbirth experience (Payne, 2003). Nevertheless, severe symptoms are considered a risk factor for a subsequent depressive episode (Henshaw, Foreman, & Cox, 2004).

Although the aetiology of postpartum depression remains uncertain, Ross, Sellers, Gilbert Evans, and Romach (2004) have proposed a multifactorial model in which biological (genetic and hormonal) variables influence depressive symptomatology by increasing individual vulnerability to psychosocial risk factors. The strongest predictors of postpartum depression include antenatal depression and anxiety, personal and family history of depression, life stress, low self-esteem, poor marital relationship, and lack of social support (C. T. Beck 2008; Dørheim, Bondevik, Eberhard-Gran, & Bjorvatn, 2009; Jayasekara, 2010). A further potentially fundamental predictive variable that has received little attention in the research literature is maternal sleep deprivation (Causey, Fairman, Nicholson, & Steiner, 2001; Dennis & Ross, 2005; Montgomery-Downs et al., 2010; Stremler & Wolfson, 2011; Wolfson, Crowley, Anwer, & Bassett, 2003). This is a remarkable oversight, given the dramatic changes in sleep quality and quantity experienced by women from late in pregnancy and extending well into the postpartum period (Kennedy, Gardiner, Gay, & Lee, 2007; Medina et al., 2009; Montgomery-Downs et al., 2010; Thomas & Foreman, 2005), and the established bidirectional relationship between sleep and major depression in the general population (Argyroupos & Wilson, 2005; Ford & Cooper-Patrick, 2001; Institute of Medicine of the National Academies [IOM], 2006; Lustberg & Reynolds, 2000).

The circumstances of adapting to a new baby can be extremely challenging, especially for first-time mothers (Goyal, Gay, & Lee, 2007). C. T. Beck (2002) reviewed the qualitative literature on women’s postpartum experience and identified three overarching themes:
1. incongruity between the expectations and reality of motherhood;
2. the tendency to spiral downward amid feelings of anxiety, dysphoria, anger, guilt, exhaustion, and being overwhelmed; and
3. a sense of pervasive loss involving control, identity, autonomy, and relationships.

Unfortunately, these problems are associated with functional impairment at a crucial time in the life of a family (Maxted et al., 2005). Development occurs within a social context and maternal sensitivity to infant behavioural cues is particularly important in the formation of the caregiver-infant attachment system (Champagne, 2010b). A secure attachment relationship has been shown to predict long-term resilience to physical and psychological distress, while insecure patterns are associated with increased fearfulness and negative affect, and greater risk of anxiety and depression (Hane & Fox, 2006; Sroufe, 2005).

A large body of literature has demonstrated the adverse effects of postnatal depressive illness on maternal sensitivity, responsiveness, and stimulation, and the quality of mother-child interactions, with consequent child health and developmental sequelae (Field, 2010; Mason, Briggs, & Silver, 2011; Milgrom, Ericksen, McCarthy, & Gemmill, 2006; Sohr-Preston & Scaramella, 2006). Children of depressed mothers have been shown to exhibit cognitive, social, emotional, and behavioural deficits (Mason et al., 2011; Milgrom, Westley, & Gemmill, 2004; Murray, Halligan, & Cooper, 2010) that persist throughout childhood with implications for subsequent adult psychosocial functioning and well-being (Champagne, 2010b; Nylen, Moran, Franklin, & O’Hara, 2006). Evidence that developmental trajectories may be shaped by early life experiences (Champagne, 2010a) underscores the importance of proactive treatment for postnatal depression.

Postnatal Depression and Infant Sleep

Maternal depression and disturbed infant sleep are intuitively linked via the following scenarios: (a) the frequent night-waking and feeding involved in caring for a young child potentially impacts parent well-being, (b) inconsistent and ineffective child management strategies associated with maternal depression may contribute to poor infant sleep patterns; or (c) maternal and child factors might mutually influence each other within a dynamic system (Meltzer & Montgomery-Downs, 2011; Warren, Howe, Simmens, & Dahl, 2006). While many researchers accept as true that a direct relationship between postnatal depression and infant sleep disturbance is well-established (e.g., Giallo, Rose, & Vittorino, 2011; Hiscock, Bayer, Hampton, Ukoumunne, & Wake, 2008; Teti & Crosby, 2012; Thomas & Foreman,
2005), a careful examination of the small but growing literature reveals somewhat inconsistent findings, particularly in community samples (Gress et al., 2010).

Two studies found that mothers who report a sleep problem in their child are twice as likely to report clinically significant symptoms of depression (Hiscock & Wake, 2001; Karraker & Young, 2007). In Hiscock and Wake’s (2001) research, the relationship between postnatal depression and infant sleep disturbance remained significant after controlling for established risk factors, such as a past history of depression. Although Karraker and Young (2007) found only a weak relationship between maternal depression and various indices of infant night-waking among a diverse group of 1364 mothers and their infants, clinically significant depression was about double in mothers of chronically waking infants compared to mothers of non-wakers.

Additionally, Bayer, Hiscock, Hampton, et al. (2007) found infant sleep problems to be associated with generally poorer maternal health and well-being. In a related study, two-thirds of mothers with clinically significant EPDS scores also reported sleep disturbance in their 6- to 12-month-old infants (Hiscock, Bayer, et al., 2007). Dennis and Ross (2005) found frequent infant crying and night-waking and maternal fatigue to be associated with major depressive symptomatology. After controlling for possible confounders, Pinheiro et al. (2011) established that infants of mothers with severe and/or chronic depressive symptoms were at higher risk for sleep disorder at 12 months.

However, as Gress et al. (2010) have noted, the studies yielding positive relationships have typically used retrospective maternal report of infant sleep patterns, which somewhat limits their contribution. For example, depressed mothers may have a distorted view of their child’s sleep (Hiscock & Wake, 2001); previous research has shown maternal emotional impairment to be related systematically to the magnitude of behavioural observation bias (Najman et al., 2001). Moreover, the simple or correlational relationship between night-waking and depression in these community studies has tended to be quite weak (Karraker & Young, 2007), unreported, or difficult to determine from the results presented (Bayer, Hiscock, Hampton, et al., 2007; Hiscock & Wake, 2001; Meltzer & Mindell, 2007; Pinheiro et al., 2011), or non-significant (Baird, Hill, Kendrick, & Inskip, 2009).

To further cloud this issue, the studies by Hiscock and colleagues have typically relied on a simple retrospective question to assess infant sleep (i.e., “Over the last 2 weeks, has your baby’s sleep generally been a problem for you? Yes/No.”) with the integrity of much of their work dependent on the reliability and validity of this indicator. Hawkins-Walsh (2003) and Loutzenhiser et al. (2011) argue that this question may be open to interpretation, with
mothers rating that their infants’ sleep behaviours are problematic for themselves or their family, rather than whether or not they consider the child to have a sleeping problem. In addition, the researchers appear to have made a philosophical or theoretical decision that the mother’s perception of whether or not her infant’s sleep is problematic is more relevant than her assessment of the child’s actual sleep.37

Conversely, investigations utilising prospective methods of assessing sleep behaviours, such as diaries, have generally failed to find an association between infant caretaking or maternal sleep, and postnatal depression during the first postpartum year (Bei, Milgrom, Ericksen, & Trinder, 2010; Dørheim et al., 2009; Goyal et al., 2007; Gress et al., 2010; Wolfson et al., 2003). For instance, Dørheim et al. (2009) found subjective reports of maternal sleep quality and sleep disturbances to be related to postnatal depression but this finding could not be verified among a subgroup of participants using actigraphy and sleep diaries. Similarly, findings from a study by Bei et al. (2010) suggested that the perception of poor maternal sleep, and the conscious awareness of its impact during wake-time, was more strongly associated with the occurrence of postpartum mood disturbances than actual sleep quality and quantity. Finally, Gress et al. (2010) found that while the number of times a mother’s sleep was interrupted by her infant influenced her subjective sleep quality, the amount of time she spent attending to the child was unrelated to her depressive symptoms.

While findings among community samples are somewhat equivocal, higher levels of postnatal depression symptomatology have been reported among Australian mothers referred for secondary or tertiary level assistance. For example, 21% of participants in a day-stay program for mothers of unsettled infants had clinically significant EPDS scores (Rowe, McCallum, Le, & Vittorino, 2012), while this ratio was 40% among a sample of 114 consecutive referrals to a paediatric sleep clinic for outpatients (Armstrong, O’Donnell, McCallum, & Dadds, 1998). These results are supported by several studies reporting on the mental health of attendees at postnatal residential programs. On admission, the rates of probable clinical depression among mothers of unsettled infants have varied between 33.9 and 48.5% (Don, McMahon, & Rossiter, 2002; Fisher et al., 2002; Rowe & Fisher, 2010).

In fact, in terms of severe maternal distress, chronic sleep deprivation and fatigue appear to be universal explanatory factors (Errante, 1985; Fisher et al., 2002). Moreover, the severity of unsettled behaviour symptoms in the hospitalised infants appears to be linked to

37 To be fair, a focus on maternal appraisal of her own level of coping with her infant’s sleep patterns may be a sound option for this particular body of research. However, this approach might result in an inflated relationship between postnatal depression and infant sleep disturbance.
the gravity of maternal depression (Fisher et al., 2002). In the only study to utilise diagnostic
interviews to evaluate an inpatient service for parents of poorly settled infants, Phillips et al.
(2007) found slightly lower rates of mothers suffering depressive symptomatology with
25.1% meeting the diagnostic criteria for postnatal depression (EPDS > 12 = 32.7%).
Interestingly, 30.5% of participants were diagnosed with an anxiety disorder supporting
previous findings of anxiety-related symptoms being an important component of postnatal
psychological distress (Fisher et al., 2002). While the results relating to residential programs
do suggest a strong link between postnatal depression and unsettled infant behaviour, there
are some clear problems.

Firstly, it is not that surprising that mothers who are so distressed that they are
referred for inpatient treatment would have high depression rates. As Matthey and Speyer
(2008) have noted, admission to these units is usually when severe infant care problems have
failed to be resolved by child health community clinics or specialist day centres providing
intensive care. Secondly, in the study by Phillips et al. (2007), the degree of unsettled infant
behaviour was actually less in mothers diagnosed with a psychological disorder on admission
to the residential mother-infant unit compared to those without mental illness. This suggested
that women suffering from depressive or anxiety disorders may have had a lower threshold
for coping with and/or seeking help for unsettled infant behaviour (Karraker & Young, 2007;
Phillips, Sharpe, & Nemeth, 2010). Thirdly, recent research has indicated that 46 to 57% of
mothers utilising one specialist sleep centre’s services report at least one coincidental
distressing life event (e.g., separation, child disability, alcohol or substance abuse, domestic
violence, eating disorder, estrangement from family), suggesting that mitigating factors
beyond infant sleep disturbance were in play (Rowe & Fisher, 2010; Rowe et al., 2012).
Alternatively, this may support a mother-driven hypothesis in which maternal depression
contributes to infant sleep disturbance.

Although childhood sleep disturbance and depressive symptomatology are intuitively
linked, research to date shows little in the way of a direct relationship. Clearly, many women
with sleepless children are not clinically depressed; however, others who are frequently
awake when their first choice is to be sleeping may find sleep deprivation to be a major
contributor to postnatal depression, or even the primary presenting problem (Errante, 1985).
It would appear that infant sleep disturbance and maternal sleep deprivation are psychosocial
risk factors within a complex, multi-factorial model of postnatal depression (Miller, 2002;
Ross et al., 2004). At this point though, a dearth of high quality, relevant research means that
the psychosocial pathways of influence remain clouded (Teti & Crosby, 2012).
PARENTING STRESS

Individual parents differ in their ability to manage the short-term psychophysiological impact of frustration, concern, and uncertainty associated with the parenting role (Butcher, Wind, & Bouma, 2008). Accordingly, parenting stress refers to the specific strain arising from the challenge of adjusting to, and functioning as, a parent (Leigh & Milgrom, 2008; Vaughan, Feinn, Bernard, Brereton, & Kaufman, 2013). This construct has typically been conceptualised as a perceived discrepancy between the situational demands of parenting and available personal resources (Abidin, 1992; Deater-Deckard & Scarr, 1996; Webster-Stratton, 1990). Most of the research in this area has focussed on the sequelae of particularly stressful circumstances, such as major child illness and disability (Mazur, 2006).

In general, the stress experience may be described as a feeling of being overloaded, uptight, tense, and worried (Australian Psychological Society [APS], 2012). When faced with a challenging event, the body responds by activating the nervous system, releasing hormones which in turn increase blood pressure, heart rate, respiration, metabolism, and muscle tension while simultaneously inhibiting vegetative functions such as digestion (Rifkin-Graboi, Borelli, & Enlow, 2009). Healthy stress responses are characterised by an elevation in blood cortisol followed by a return to baseline, avoiding a highly activated state over a prolonged period (National Scientific Council on the Developing Child, 2010). In circumstances of acute, episodic, or chronic stress, there is an undermining of physical and mental well-being (APS, 2012; Everly & Lating, 2013; Goldstein & Kopin, 2007), particularly with respect to individual genetic vulnerabilities (Maddi, 2006), and increased risk of antisocial behaviour (Maddi, 1999).

Across cultures, the burden of parenthood falls heaviest upon mothers, particularly those with young children (Marin, 2007; Rodd, 1993). However, whether or not stressors seriously disrupt parental functioning and parent-child interactions is dependent on factors such as individual psychological well-being (Webster-Stratton, 1990), cognitive appraisal and perception (Adams, 2006; Rodgers, 1993), maternal personality (Gelman, Jory, & Macris, 1998; Mulso, Caldera, Pursley, Reifman, & Huston, 2002), and personal resources such as family and social support (Leigh & Milgrom, 2008; Sepa, Frodi, & Ludvigsson, 2004). For the less resilient, prolonged high stress may be associated with a host of dysfunctional

---

38 This fight or flight reaction, which can be triggered by numerous and diverse psychosocial stimuli in humans, is an intrinsic mechanism which mobilises the body for muscular activity in response to threat (Everly & Lating, 2013). Embedded within is a degree of specificity, depending on factors such as the person’s perception of the stressor and their perceived ability to cope (Goldstein, 2001; Lazarus, 2006; Webster-Stratton, 1990).
parenting characteristics, threatening family well-being, and child health and development across multiple domains (Deater-Deckard, 2004; Haskett, Ahern, Ward, & Allaire, 2006).

In particular, the parent-child relationship may be compromised as stressed caregivers are less attuned and unable to provide consistent, sensitive, and supportive responses to their child’s evolving needs (Crnic, Greenberg, & Slough, 1986; Deater-Deckard, 2005). High maternal stress has been associated with fewer positive parent-child interactions (Marin, 2007), the use of undesirable parenting techniques (Rodgers, 1993), lower parental warmth and reciprocity (Vaughan et al., 2013), and a more negative perception of the child (Renk, Roddenberry, Oliveros, & Sieger, 2007). Caregiver-child relationship quality is especially important in terms of the child’s emotional and behavioural regulation, cognitive development, and physical health (Nygren, Carstensen, Ludvigsson, & Sepa Frostell, 2012).

In addition, it has been argued that stress-related disruption to parent functioning may perpetuate a cycle of aversive mother-child interactions involving critical and punitive parenting, child internalising and externalising problems, and increased family chaos and stress (Deater-Deckard, 2004; Patterson, 1982; Webster-Stratton, 1990). Research has primarily focussed on the relationship between parenting stress and later child psychopathology, with higher stress levels associated with increased child symptomatology (Abidin, Jenkins, & McGaughey, 1992; Costa Weems, Pellerin, & Dalton, 2006; Creasey & Jarvis, 1994; Nelson, Stage, Duppong-Hurley, Synhorst, & Epstein, 2007) as well as elevated child abuse potential (Dopke, Lundahl, Dunsterville, & Lovejoy, 2003; Rodriguez & Green, 1997). Conversely, studies have also shown later childhood behavioural and emotional problems to be predictive of higher parenting stress levels (Anderson, 2008; Deater-Deckard, 2004; McDonald, Gregoire, Poertner, & Early, 1997; Vaughan et al., 2013).

**Parenting Stress and Infant Sleep**

Despite recognition that the transition to parenthood is a challenging period involving considerably reduced and fragmented parental sleep, relatively few studies have examined the links between infant sleep patterns, parent sleep, and parental functioning during this critical period of development (Sinai & Tikotzky, 2012). Relevant investigations have typically involved parents of toddlers and older children, while parenting stress has often been a controlling variable rather than a focal point. This state of affairs is surprising, particularly given the disruption associated with 24-hour neonatal or young infant care. As a result, the relationship between parenting stress and paediatric sleep disturbance is poorly understood (Byars, Yeomans-Maldonado, & Noll, 2011).
A small number of studies have focussed on the parents of neonates and infants. Keefe et al. (2006) reported exceptionally high stress levels in parents of unsettled or colicky infants, with evidence that home visitations were helpful in improving parent-child interactions at 8 weeks. Loutzenhiser and Sevigny (2008) found no relationship between maternal parenting stress and infant sleep duration among first-time parents of 3-month-old infants, although sleep assessment using a simple retrospective question was inadequate. An epidemiological investigation by Sepa et al. (2004) examined the psychosocial correlates of parenting stress among an initial sample of more than 16,000 families in Sweden. They found poor child sleep and parental dissatisfaction to be the best predictors of parenting stress shortly after birth and at 12 months.

Using small extreme groups drawn from another large Swedish sample, Thunström (1999) found severe and chronic infant sleep problems in 6- to 12-month-old infants to be associated with maternal exhaustion, feelings of restriction due to the parenting role, less positive perceptions of parenting, more parental stress, and perceptions of incompetence. A small study by Sinai and Tikotzky (2012) involved 50 mothers with an infant aged between 4 and 5 months; half were on maternity leave with the others having returned to work. Parental perceptions of their infant’s sleep as problematic were indicative of higher parenting stress, while poorer infant and maternal sleep patterns were also associated with stress, but only in maternity leave mothers.

A longitudinal study by Wake et al. (2006) found stress to be higher among parents of unsettled or sleep-disturbed children at 2, 4, 8, 12, and 18 months, but not 24 months. Their data suggested that persistent, rather than transient problems contribute to maternal depression, parenting stress, and subsequent child behaviour problems. Finally, a controlled preventive intervention by Wolfson et al. (1992) provided further evidence of the possible link between parenting stress and infant sleep patterns. Not only was this program successful in teaching parents how to promote healthy, self-sufficient sleep behaviours in their infants, but parents felt more competent. In contrast, parenting stress among the comparison group members gradually increased during the early months of parenthood.

In general, theorists considering the parenting stress concept have neglected to articulate or fully appreciate the potential role of childhood sleep disturbance. When sleep is discussed, it tends to be incorporated into a broad “daily hassles” or “child stressors” category within explanatory models (e.g., Östberg & Hagekull, 2000; Webster-Stratton, 1990). Over the past decade, however, the possible links between infant sleep patterns and parenting stress have drawn increased research attention, while sleep loss and fragmentation have gained
prominence as important issues in terms of parent functioning and well-being. While parenting stress may have complex origins, child sleep problems may be one of the more fundamental risk factors (Sepa et al., 2004).

THE PARENTING ALLIANCE

Parenthood marks the transition to a three-person family system, involving the addition of a parental subsystem (Anderson & Sabatelli, 2011). Prior to birth, each partner anticipates a mutual bond with the child, and a shared experience in facilitating their parenting responsibilities (Cohen & Weissman, 1984; Van Egeren & Hawkins, 2004). The parenting alliance construct was introduced by Cohen and Weissman (1984) to describe the part of a relationship that is specifically concerned with child-rearing. It refers to the ways that couples relate to each other in the parenting role, and it is conceptually distinct from marital or parent-child relationships (Feinberg, 2003).

The parenting alliance reflects the degree of couple support and coordination in working together to meet the needs of the child (Abidin & Brunner, 1995). According to Cohen and Weissman (1984), an adaptive parenting alliance exists when each parent:

- is invested in the child;
- respects the judgements of the other parent;
- values the other parent’s involvement with the child; and
- desires to communicate with the other parent.

As such, a supportive parenting alliance is believed to contribute to parental well-being through the provision reciprocated assistance, validation and reinforcement of each partner’s parenting self-efficacy, including a sense of competence in handling difficult child-rearing situations. Conversely, a partnership involving intrusion, undermining, or active competition for the child’s love and attention has the potential to threaten parental welfare (Solmeyer & Feinberg, 2011). As such, a healthy parenting alliance has been associated with increased relationship quality, fewer depressive symptoms, and less parenting stress, increasing the likelihood of favourable child outcomes (Feinberg, 2003; McDaniel & Teti, 2012).

Interestingly, the parenting alliance concept emerged amid discrepant evidence regarding the relationship between marital satisfaction and child behaviour problems (Bearss & Eyberg, 1998). According to parenting alliance theory, however, both parents can be

39 Abidin and Brunner (1995) suggested that significant findings occurred more commonly in clinical samples because marital discord is most harmful to children when there are multiple family stressors.
involved and function well in the parenting role, yet be unsatisfied in their personal relationship with each other (Abidin, 1992; Bearss & Eyberg, 1998; Cohen & Weissman, 1984). This is supported by several studies indicating that co-parenting mediates the effect between marital quality and parenting (Bonds & Gondoli, 2007; Margolin, Gordis, & John, 2001; Morrill, Hines, Mahmood, & Córdova, 2010). The parenting alliance is therefore thought to be more proximally related to child adjustment than other aspects of the dyadic relationship (Feinberg, 2003).

The Parenting Alliance and Infant Sleep

Despite the fundamental role that parents play in the entrainment of childhood sleep patterns, little is known about the impact of the co-parenting relationship on infant sleep patterns more than 30 years after this construct was first described. This is even more surprising given a burgeoning interest in the role of fathers during this time, and a corresponding shift in societal norms which has increased the expectation that men will have a more active role in daily caregiving (Lamb, 2010; McBride & Rane, 1998). To the author’s knowledge, just one study has investigated the potential impact of the parental working relationship on the development of childhood sleeping difficulties.

McDaniel and Teti (2012) considered whether infant sleep behaviour at 1 and 3 months was associated with perceptions of the parenting alliance. Using structural equation modelling, findings indicated that the frequency of infant night-waking predicted night-waking in parents, which in turn, forecast parental sleep quality. Poor parent sleep quality was associated with elevated depressive symptoms, and depression was negatively related to perceptions of co-parenting quality. The authors concluded that the unfolding of parental dynamics within the context of infant sleep disturbance influenced parenting alliance perceptions. McDaniel and Teti did not consider whether a poor parental working relationship may have impeded infant sleep consolidation.40

In addition to this study, there is a small amount of recent research investigating the association between infant sleep problems and marital quality. Briefly, links have been found between crying during the first 12 months and marital satisfaction (Meijer & van den Witenboer, 2007), marital instability at 9 months and child sleep problems concurrently and at 18 months (Mannering et al., 2011), and marital hostility and hostile parenting at 9 months and child sleeping difficulties at 4.5 years (Rhoades et al., 2012). Since parenting alliance is

40 In effect, the model tested assumes that the ability to self-regulate states of arousal is governed entirely by genetic and maturation processes, ignoring the influence of exogenous factors on infant sleep.
a related but separate construct, it is difficult to ascertain what relevant information might be
drawn from these studies with respect to the current program of research. Parenthetically,
Rhoades et al. (2012) contend that negative thinking and emotionality associated with marital
conflict may permeate subsequent parent-child interactions, leading to child sleep problems.

Theoretically, to the extent that parents engage in adaptive night-time parenting
strategies, a mutually supportive parenting relationship ought to assist in the development of
healthy infant sleep patterns. For example, if parents support each other in facilitating the
child to fall asleep unassisted, or in resisting the urge to engage in night-feeding at an age-
inappropriate time, then the parenting alliance should be associated with healthy sleep
outcomes. However, if one or both parents regularly engage cooperatively in stimulating and
over-attentive night-time parenting practices, the infant may be denied the opportunity to
learn sleep self-initiation skills, regardless of the parenting alliance strength.

A THEORETICAL MODEL OF THE DETERMINANTS OF INFANT SLEEP

To this point, the aim has been to provide a comprehensive background to the
research project, introducing an array of additional factors thought to be associated with sleep
problems in infants and children. Integrating this information with clarity is problematic, due
to the lack of all-encompassing research on the pathways to disturbed infant sleep. The
transactional models presented to date are useful, but diffuse in their approach (see Figure 3).
To produce a more practical graphic, it may be necessary to more candidly identify night-
time parent interactive behaviours as the major pathomechanism of disordered infant sleep
and then examine the factors that impact these activities.

Hence, Figure 7 portrays the major conduits associated with the pathways to infant
sleep disturbance, incorporating the important concepts and constructs discussed. Infant
sleep is most closely influenced by parental sleep-related behaviours which result from
conscious thinking. Building on the model presented earlier (i.e., Figure 6), these thoughts
are influenced by a wide variety of factors including perceptions of infant temperament,
sleep-related beliefs, emotional experience, and interpretation of infant sleep behaviours.
Several of the relationships depicted are bidirectional. For example, maternal sleep-related
beliefs directly influence thinking, but may be modified according to experience and the
acquiring of new (apparently plausible) knowledge from trusted sources. The perception of
being overwhelmed may influence stress and depression symptomatology, which will also

41 i.e., the spillover hypothesis (Erel & Burman, 1995).
alter the interpretation of sleep-related events and other experiences, including her observations about co-parenting support. Beliefs may be adapted over time according to maternal discernment of infant sleep behaviours and the impact of other external influences, such as the acquisition of new information.

According to the model, her partner’s sleep-related behaviours will directly influence the infant’s sleep patterns but also the mother’s perceptions of the parenting alliance and other factors such as how stressed she feels. Personality factors including introversion, neuroticism, and openness to experience will influence maternal interpretation of sleep-related events and her appraisal of her own ability to cope (Benoit et al., 1997; Gelman et al., 1998). Infant temperament will affect sleep behaviours, and cognisance of temperamental traits throughout the 24-hour period will affect the mother’s beliefs about the child, and ultimately her sleep-related parenting strategies and behaviours.

Overall, intrinsic (biological/developmental, temperament) and extrinsic (social interactions, other zeitgebers) factors collaborate to influence the emergence of the infant’s
sleep-wake rhythm.\textsuperscript{42} Note, however, that Figure 7 is not intended as a comprehensive explanation of childhood sleep disturbance—rather it is an attempt to synthesise a complex literature and highlight the most important dimensions. Many variables beyond the scope of this project have been excluded, because either little is known about their effects, or they are of lesser influence.\textsuperscript{43}

A key feature of this theoretical model is its optimistic outlook. The implication is that while childhood sleep problems continue to pervade societies unabated, there is much that can be done in terms of prevention and treatment. The fundamental tenet of Cognitive Behavioural Therapy (CBT, A. T. Beck, 1970) is that behavioural change may be effected by altering maladaptive cognitions. Accordingly, an important part of CBT for early childhood sleep problems involves altering relevant parental beliefs and thoughts to remedy problematic sleep patterns (Johnson & McMahon, 2008; Sadeh, 2005). Prevention and treatment programs which engender beneficial and robust parent beliefs about infant sleep, and provide strategies and support for associated adaptive thinking processes, increase the likelihood of appropriate night-time interactions and healthy sleep patterns in infants and children.

CONCLUDING COMMENTS

This chapter has acknowledged that while parent-child interactions appear to be the most immediate and direct path to infant sleep disturbance, there are many other variables implicated in the parental cognitive processes that shape night-time parenting practices. This system may be best conceptualised as an array of dimensions that ultimately have varying direct and indirect influences on infant sleep outcomes, primarily via parental cognitive processes and subsequent sleep-related interactive behaviours. Unfortunately, once sleep problems are established they can be difficult to treat. The next chapter will briefly address treatment options and a viable alternative—the theory and practice of paediatric sleep disorder prevention.

\textsuperscript{42} Unlike the other inclusions in the model, personality factors, maturational aspects, and zeitgebers did not form part of the research design.
\textsuperscript{43} These include infant health and well-being, general life stressors, maternal sleep quality (Loutzenhiser et al., 2011), level of social support, cultural influences (Giannotti & Cortesi, 2009), maternal physical health (Bayer et al., 2007), marital quality (Meijer & van den Witenboer, 2007), mother-infant attachment security (Higley & Dozier, 2009; Scher & Asher, 2004), and adult attachment status (Benoit et al., 1992).
CHAPTER 5

Treatment, Prevention Science, and Infant Sleep Disturbance

The two most important things I have learned in half a century of psychology: (1) the ruling ideas of a society are those that support the ruling class; and (2) no disease (or any form of social pathology) has ever been treated out of existence. Only prevention reduces incidence. (Albee, 1999, p. 134)

If we keep on doing what we have been doing, we are going to keep on getting what we have been getting. (Wandersman et al., 2008, p.171)

INTRODUCTION

Sleep problems are common in childhood and potentially impact multiple dimensions of child and family well-being (Mindell & Owens, 2003a; Stores, 2009). Although a variety of efficacious treatment options are available to health professionals, they can be stressful for parents, and usually require the involvement of a specialist clinician. In addition, the continued high prevalence of infant sleep problems raises serious questions about whether reactively treating the most severe cases is an effective approach to this aspect of infant care, both ethically and economically. Regrettably, while allegiance to a biomedical or disease-containment model has brought wealth and status to health professionals, it has often been at the expense of understanding and promoting health and well-being (Holden & Black, 1999).

This chapter begins with a brief outline and review of contemporary treatments for infant sleep disturbance. It subsequently offers a brief overview of prevention science theory and terminology, highlighting the central role of risk and protective factors, and orienting the reader to the position of the prevention field within the Australian health system. It is unfortunate that despite a solid base of well-designed, successful research, opportunities for the prevention of paediatric sleep problems have not been taken, at least not on a wide scale. A detailed review of this important research is provided in the latter part of the chapter.
THE TREATMENT OF INFANT SLEEP DISTURBANCE

Behavioural Interventions

Empirical Support

Treatments based on learning theory were originally developed on the premise that infant sleep problems are established, shaped, and maintained by maladaptive parenting behaviours (Adachi et al., 2009; Tikotzky & Sadeh, 2010). These interventions have become the mainstay of response to behaviourally-based paediatric sleep disorders. In fact, a substantial body of research supports the use of behavioural treatments as a rapid and effective remedy for BIC, the most frequently observed disorder (Owens, 2006). In contrast, the combined evidence for all other available treatment modalities, including proximal care (e.g., Gethin & Macgregor, 2011), pharmacology (Owens, 2009), nutritional (e.g., Aparicio et al., 2007), and massage (Forbes, 2006), does not approach that of short-term behavioural interventions (Kuhn & Roane, 2012).

Consistent with previous reviews (France & Hudson, 1993; Kuhn & Elliott, 2003; Ramchandani, Wiggins, Webb, & Stores, 2000; Sadeh, 2005), an AASM task force concluded that behavioural treatments produce reliable and durable change (Mindell et al., 2006). Of 52 intervention studies examined, 94% were considered efficacious with 82% of children benefitting and the majority maintaining clinically significant improvements for 3 to 6 months. In addition to conclusive changes in infant sleep quality and quantity, behavioural programs have been shown to generate a variety of secondary benefits in individual and family health, functioning, and well-being (Avis & Mindell, 2008; Kuhn & Elliott, 2003; Mindell et al., 2006; Morgenthaler et al., 2006; Sadeh, 2005).

Behavioural Program Variants

Parents in need of professional assistance for infant sleep disturbance may be offered one or more of several treatment options currently available. Above all, it is important that caregivers adopt an approach that they are comfortable with, and then apply it consistently (Kuhn & Roane, 2012). The most frequently used behavioural interventions are positive bedtime routines, unmodified extinction, graduated extinction, and extinction with parental presence. The common factor underlying all of these programs is the withdrawal of intense and excessive parental involvement in the sleep initiation process to encourage infant self-settling (Sadeh, 2005).
Positive Bedtime Routines tend to be a universal recommendation within the behavioural framework, although there is recent evidence supporting the use of these practices as a stand-alone treatment (Mindell, Du Mond, et al., 2011; Mindell, Telofski, et al., 2009). Programs emphasise a consistent and enjoyable bedtime routine involving a progressive diminution of environmental stimulation and graduation towards the child’s normal sleeping location (Owens, 2008). A specific treatment variation, known as faded bedtime with response cost protocol, involves delay of the infant’s bedtime to encourage rapid sleep onset and then gradually advancing it to the elected time once the desired behaviour is well-established (Piazza & Fisher, 1991).

Unmodified Extinction is the most efficient method of teaching a child to fall asleep unassisted (Eckerberg, 2004) and is second only to parent education and prevention in terms of research support (Mindell et al., 2006). Parents are instructed to place the child in the crib awake at bedtime and ignore all signalling behaviour until a set time the next morning (Galland & Mitchell, 2010; Goetting & Reijonen, 2007). Without the reinforcing properties of parental attention, results are rapid, with lasting change usually apparent within 3 days (Didden et al., 2011; Meltzer & Mindell, 2009).

Graduated Extinction involves a schedule of response in which the caregiver briefly checks on the child during crying episodes at intervals of either fixed (e.g., every 10 min) or increasing (e.g., 5, 10, 15 min) duration (Ferber, 1985b; Meltzer & Mindell, 2011). There is no research evidence indicating the superiority of one response schedule over the other (Meltzer & Mindell, 2011). The goal is to reduce parental attention systematically, allowing the child’s signalling behaviours to extinguish gradually while promoting independent sleep onset (Kuhn & Weidinger, 2000). The child is not removed from the crib or engaged in any activity of potentially reinforcing intensity (Davis et al., 2004b; Mindell et al., 2006). Rather, visits are short and focussed, with the parent interacting minimally for a minute or so before leaving the room (Dilliway, 2000; France & Blampied, 2005). Ideally, the check-in protocol is tailored to the situation, particularly the parents’ judgment of how long they can tolerate the child’s crying (Mindell et al., 2006).

---

44 Explained theoretically as establishing stimulus control over bedtime (Didden, Sigafoos, & Lancioni, 2011).
45 Theoretically, extinction means reducing the occurrence of a given behaviour by withholding or eliminating any reinforcement (Berry, 2012).
46 The child would be attended to in situations where there is a possibility of illness, or safety is jeopardised (Črnčec, Matthey, & Nemeth, 2010).
47 This procedure is also known as the Ferber method (Benoit, 2004), controlled crying/comforting (Hiscock & Wake, 2002); sleep training (Mindell, 2005); and systematic ignoring with minimal parental check (France & Blampied, 2005).
Extinction with Parental Presence\textsuperscript{48} is similar to unmodified extinction except that the planned ignoring aspect occurs within the child’s bedroom (Galland & Mitchell, 2010; Kuhn & Roane, 2012). Parents are instructed to place the child into the crib awake, bid goodnight, and model that it is “time to sleep” by lying in a separate bed in the infant’s room and feigning sleep (Galland & Mitchell, 2010). It is based on the assumption that night-waking in infancy is at least partly due to separation anxiety (Sadeh, 1994). The parent remains nearby, and should not respond to the infant directly during the initial settling process or following awakenings (France & Blampied, 2005). This protocol relies on the child being aware of the parent being present (Kuhn & Weidinger, 2000) meaning that the parent may have to lighten the room or subtly alert the infant to their ongoing presence (e.g., by coughing, France, 2011). This system should remain in place for at least seven consecutive nights (Galland & Mitchell, 2010; Sadeh, 1994) before unmodified extinction practices are employed (France & Blampied, 2005). However, if there is an increase in crying at this point, the parent may move back for a few more nights. Once the crib has replaced the parent as the discriminative stimulus for sleep onset, the parent’s departure or absence is less likely to evoke distress (France, 2011).\textsuperscript{49} Since this program retains the effectiveness of an extinction paradigm while decreasing infant anxiety and crying compared with other approaches, it is often considered the treatment of choice (France, 2011; France & Blampied, 2005).

Problems with Behavioural Interventions

Several limitations of behavioural methods have been highlighted in the paediatric sleep literature. Despite its short-term nature, unmodified extinction may involve long periods of intense crying that can be difficult to ignore on every occasion, creating significant emotional distress for parents (Galland & Mitchell, 2010). As a result, some parents fear it may be harmful and reject this method (Owens, France, & Wiggs, 1999) while others find adherence to the program too demanding (France, 1994; Goetting & Reijonen, 2007). As a consequence, the unmodified version is now less frequently recommended.

Although the endorsement to check on their child is generally welcomed by parents (Meltzer & Mindell, 2009), compliance issues have also been identified with the graduated

\textsuperscript{48} This method has also been referred to as systematic ignoring with parental presence (France & Blampied, 2005) and the camping out method (France, 2011).

\textsuperscript{49} The exact mechanisms by which this intervention works are unclear. France and Blampied (2005) contend that infant signalling contains two components: respondent crying (pain, distress) and operant crying (reinforced by parental attention). Since the parent’s presence is constant and non-contingent, it does not act as a reinforcer (France, 2011). By staying nearby, parents are able to inhibit infant separation distress without positively reinforcing signalling behaviour.
approach (Rickert & Johnson, 1988). In fact, all extinction-based methods may lead to an initial spike in infant protest behaviour (i.e., the Extinction Burst), which parents may find intolerable (France, 1994; Meijer, 2011; Owens & Burnham, 2009). In addition, there is some concern that graduated extinction has the potential to train infants to cry for longer periods before it becomes effective (Adams & Rickert, 1989; Lawton et al., 1991).

Extinction with parental presence clearly has the most impressive social validity, having been designed to allay parental concerns about leaving the baby to cry. However, some parents may find it more challenging to successfully ignore infant crying while being in close proximity (France et al., 1996; Kuhn & Roane, 2012). Modified extinction programs do require a relatively long-term commitment from well-organised parents (Berry, 2012; France et al., 1996). All treatments involve the replacement of established routines and behaviour with the facilitated development of infant self-soothing skills. Without meticulous consistency of approach, caregivers may fall into the trap of intermittently reinforcing their infant’s cries, leading to treatment failure, and rendering the signalling behaviour more resistant to future change (France & Blampied, 2005; Kearney, 2008; Kuhn & Roane, 2012).

It is therefore crucial that parents ignore all target infant behaviours, regardless of frequency, intensity, or duration (Forbes, 2006). As such, regular clinician support is essential until parental anxiety has been replaced by self-efficacy (France et al., 1996). These potentially stressful circumstances underscore the appeal of evidence-based preventive approaches.

**Pharmacology**

Unfortunately, medications are widely used in the management of childhood insomnia by paediatricians, child psychiatrists, and parents (Gleason et al., 2007; Owens, Rosen, & Mindell, 2003; Owens, Rosen, Mindell, & Kirchner, 2010; Schnoes, Kuhn, Workman, & Ellis, 2006) despite minimal information on their efficacy, risks, benefits, and limitations (Mindell et al., 2006; Owens, 2009). They tend to have transient effects and are rarely appropriate for use in infants and young children (Owens, 2009). In virtually all cases, pharmacology should be neither the primary intervention nor the exclusive treatment strategy for childhood sleep disturbance (Beebe, 2012; Owens, 2009).

Nevertheless, there may be occasions where medication can be justified in very young children, as an adjunct to a more comprehensive treatment plan (France, Blampied, & Gradisar, 2013).
Pharmacological intervention is best reserved for circumstances where parents (have made reasonable attempts but) are unable to fully implement a behavioural program and the daytime functioning and well-being of the child and/or caregiver is compromised (Gleason et al., 2007). Medication should only be introduced for short periods to assist parents with implementation of the program before being quickly and systematically withdrawn (France et al., 1991, 1999; Gleason et al., 2007; Owens, 2009).

THE PERILS OF PROXIMAL CARE DISCOURSE

Unfortunately, the difficulties in implementing behavioural treatments, particularly in terms of the potential for child harm and risk to parent-infant attachment, have been misrepresented by a plethora of misleading and/or poorly researched popular books. Many parents report being perplexed by conflicting advice and the sheer volume of information available (Kerr & Jowett, 1994; Neyer, 2013; Semple, 2008). This includes endorsement of a co-sleeping, gentle, and immediate responding approach (e.g., Blunden & Willcocks, 2012; Gethin & Macgregor, 2011; Karp, 2002; Pantley, 2002; W. Sears, R. Sears, & M. Sears, 2005), creating parent confusion and additional challenges for clinicians (Črnčec, Matthey, & Nemeth, 2010). Some perspective is required amid a philosophy grounded in expert opinion and anecdotal evidence (Sadeh, Mindell, & Owens, 2011; St James-Roberts et al., 2006).

Advocates of an infant-demand approach to caregiving have criticised what they see as the encouragement of child independence to avoid inconvenience for adults (Blunden, Thompson, & Dawson, 2011; Buckner, 2000; Walker, 1993). In practice, however, research has shown that a proximal form of care leads to less unsettled behaviour in the early weeks but more night-waking and crying at later stages of development (St James-Roberts et al., 2006). Further, proponents of this method typically laud the benefits of altering sleep patterns more slowly than behavioural programs sanction (Gethin & Macgregor, 2011). Rarely does the supporting text acknowledge that ongoing infant sleep problems are a potent developmental risk factor in their own right (Črnčec et al., 2010).

According to Gethin and Macgregor (2011) withholding comfort to teach independent sleep habits can be emotionally risky for children and this is supported by an enormous body of literature. W. Sears et al. (2005) associate unmodified extinction with increased risk of Attention-Deficit/Hyperactivity Disorder, decreased intellectual development, increased daytime crying and clingingness, delayed social development, and harmful physiological
changes. Moreover, critics of extinction-based approaches (e.g., McKay, 2006) have pointed to findings demonstrating the impact of severe and prolonged stress on infant neurological development and attempted to extend these to the side-effects of brief behavioural sleep treatments in infancy. This is a considerable conceptual leap, particularly in the context of an otherwise healthy relationship (Crnčec et al., 2010). In reality, there is no evidence of compromised infant emotional status or attachment security as a result of behavioural interventions (Eckerberg, 2004; France, 1992; Sadeh, Mindell, & Owens, 2011). The parent-infant attachment relationship forms throughout the early years of life, and not just at night. A tired, stressed, and potentially emotionally disturbed parent probably represents a substantially greater threat to attachment security over time than does the use of a behavioural intervention (Crnčec et al., 2010). Correspondingly, advocates claim that the immediate-responding approach is consistent with infant needs and promotes secure attachment. However, this assertion has not been subjected to empirical evaluation.

It is important to address this issue because proximal care discourse is essentially the antithesis of evidence-based prevention philosophy. Parents seeking advice about common problems often rely on popular resources from their local library or bookstore and/or unreferenced websites as a means of accessing the prevailing scientific opinion on parenting (Connell-Carrick, 2006). Unfortunately, much of the rhetoric of these publications is not only unscientific, but appears to parallel the maladaptive parent cognitions which treatment programs target as part of the change process (Sadeh, 2005). Conversely, evidence-based parent resources supplemented with extensive clinical experience (e.g., MCSC, 2005; Ngala Family Resource Centre [Ngala], 2004; Owens & Mindell, 2005; Stores, 2009; Tweddle Child & Family Health Service, 2006) are clearly in the minority.

PREVENTION SCIENCE

The Language of Prevention

Given its high prevalence and the extensive individual, family and societal costs of infant sleep disturbance, prevention may be a more practical and ethical alternative to community-based treatment. Prior to a discussion of the prevention of infant sleep disorders, it is useful to clarify the basic theory and terminology of prevention science. Historically,

---

51 Unfortunately, the relevant medical science research is not listed in “Appendix C” of the book as claimed.
52 i.e., the effects of trauma, chronic exposure to stress, physical neglect, and emotional abuse during childhood.
prevention programs have been categorised according to one of two, three-tiered classification systems based on either the progression of disease (Caplan, 1964; Commission on Chronic Illness, 1957), or the costs and benefits of delivering a program to a targeted population (Gordon, 1983). While former typology (primary, secondary, and tertiary prevention) is still widely used within a public health context (Hage & Romano, 2010), the latter system (universal, selective, and indicated interventions) has been adopted for use in this thesis. Gordon’s (1983) concepts are less problematic, and have been employed more often within the mental health field, including clinical psychology.

*Universal Interventions* are offered to an entire population or a whole population group that has not been identified on the basis of risk factors or pathology. For example, the provision of anticipatory guidance to parents, and programs to prevent bullying in schools. These interventions are desirable for all members of the eligible population and the benefits outweigh the costs and risks for each person (Department of Health and Aged Care [DoHAC], 2000b; IOM, 1994; National Research Council of the National Academies and IOM [NRC-IOM], 2009).

*Selective Interventions* are directed at individuals or subgroups deemed to have a significantly higher probability of developing a mental disorder based on biological, psychological, or social factors. These programs aim to reduce the risks to the targeted population and may involve imminent and/or lifetime risk factors. Examples of selective interventions include support groups for people following adverse life events (e.g., divorce, bereavement), parent training among disadvantaged populations, programs to prevent depression among aged care residents, and assistance for the children of individuals with a mental illness (DoHAC, 2000b; IOM, 1994; NRC-IOM, 2009).

*Indicated Interventions* are provided to high-risk individuals who manifest early symptoms or behaviours that are precursors for mental disorder but are not yet diagnosable. For example, training for parents of children displaying non-compliant and aggressive behaviour, and programs responding to the early warning signs of psychosis (DoHAC, 2000b; IOM, 1994; NRC-IOM, 2009).

53 Especially by preventionists favouring a social model of health (e.g., Albee, 2006; Cowen, 2000).
54 The primary prevention concept has been described as vague, abstract, idealistic, and confusing (Cowen, 1977; Kessler & Albee, 1975; Wagenfeld, 1972; Zax & Cowen, 1976) while the second and third classifications more closely aligned with treatment than prevention (Spence, 1998). There is a general belief that this system covers every program and activity undertaken by mental health workers (Albee & Gullotta, 1986).
55 Indeed, Gordon’s (1983) framework has been adopted as the theoretical foundation for a series of major reports by the IOM (1994), the World Health Organization (2004), and the National Research Council and IOM of the National Academies (2009) while also underpinning key policy and practice documents in Australia (Commonwealth of Australia, 2003; Department of Health and Aged Care, 2000a, 2000b).
The Mental Health Intervention Spectrum

In its landmark review of prevention programs in mental health, the IOM (1994) added clarity by expounding the role of prevention within the gamut of mental health interventions. This spectrum consisted of three main inter-related sectors: prevention, treatment, and maintenance. In doing so, the IOM committee acknowledged that psychopathology exists along a continuum of severity, with early symptoms often a risk factor for later disorders (Spence, 1998). This more clearly reflected the complexities of the prevention concept and the overlap and interplay of prevention and treatment than had previous descriptives (Cowen, 1997; Rapee, 2008).

The IOM (1994) model was later adapted to fit the Australian context (Figure 8), with the third sector being renamed continuing care, a locally familiar term (Commonwealth of Australia, 2003; DoHAC, 2000a). The Australian version also includes mental health promotion.

Figure 8. The mental health intervention spectrum: Australian context. Adapted from “Promotion, Prevention and Early Intervention for Mental Health: A Monograph 2000,” by the Commonwealth Department of Health and Aged Care, 2000, Canberra, Australia, p. 28, Copyright 2000 by the Commonwealth of Australia, with permission.

* The original term “Case Identification” was replaced by “Symptom Identification” in the National Mental Health Plan 2003–2008 (Commonwealth of Australia, 2003).  

* Includes relapse prevention.
promotion across the entire spectrum, thus correcting a heavily criticised (Albee, 1996, 1998; Cowen, 1996; Holden & Black, 1999; Jané-Llopis, 2007; Rishel, 2007) flaw in the original model. The IOM (1994) committee recommended that the term prevention be reserved for interventions that occur before the initial onset of a clinically diagnosable disorder, analogous to Caplan’s (1964) definition of primary prevention. Once an individual meets the diagnostic criteria for a clinical disorder, any intervention is considered to be treatment, the standard clinical therapies provided by mental health professionals (IOM, 1994). Finally, continuing care interventions occur once the acute phase of a mental disorder has abated, and incorporates long-term treatment and support, and rehabilitation. It also includes programs aimed at reducing relapse and recurrence, which are regarded as part of high quality treatment, rather than prevention (Muñoz, Mrazek, & Haggerty, 1996).

Risk and Protective Factors

The aim of prevention science is to prevent, delay, or moderate the onset of illness, disorder, or adverse outcome. A primary focus is the scientific study of the precursors of dysfunction or well-being, known as risk and protective factors (Coie et al., 1993). Risk factors are measurable characteristics that precede and are associated with a higher likelihood of the onset, severity, and/or duration of negative outcomes (Coie, Miller-Johnson, & Bagwell, 2000; Kraemer et al., 1997; Shaffer & Yates, 2010). Protective factors are qualities or experiences that improve resistance to risk factors and promote positive development, health, and well-being (Coie et al., 1993; Shaffer & Yates, 2010; Yates & Masten, 2004). These factors are the fundamental building blocks of prevention theory, research, and intervention. Successful preventive efforts require reliable and valid methods of identifying individuals at risk, and interventions capable of impacting on identified mechanisms of risk and protection in ways which promote positive sequelae (Spence, 1998).

Risk Factors

Risk factors have been identified at multiple levels of analysis. As Table 1 shows, they encompass biological, psychological, and social factors in individual, family, and environmental contexts (IOM, 1994; NRC-IOM, 2009; Shaffer & Yates, 2010). In addition,

---

56 Rutter (1985) has argued that protective factors can only have meaning in the face of adversity (i.e., where there is an interaction with a risk variable). However, the growth of resilience research has fuelled interest in factors associated with positive developmental outcomes independent of the occurrence of adverse circumstances (e.g., Sameroff, 2006; Yates & Masten, 2004).
Table 1

*Examples of Childhood Risk Factors for Mental, Emotional, and Behavioural Disorders in Multiple Contexts*

<table>
<thead>
<tr>
<th>Developmental Phase</th>
<th>Individual</th>
<th>Family</th>
<th>Sociocultural</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pregnancy and Birth</td>
<td>Genetic predisposition; Prematurity</td>
<td>Maternal age at birth, health, drug use</td>
<td>Poor access to healthcare</td>
</tr>
<tr>
<td>Infancy</td>
<td>Sleep problems; Developmental delay</td>
<td>Postnatal depression; Insecure attachment</td>
<td>Social isolation, lack of external support</td>
</tr>
<tr>
<td>Early Childhood</td>
<td>Behavioural inhibition; Learning difficulties</td>
<td>Family discord; Poor parenting knowledge</td>
<td>Fewer learning opportunities</td>
</tr>
<tr>
<td>Middle Childhood</td>
<td>Low self-esteem; Social withdrawal</td>
<td>Harsh discipline; Abuse</td>
<td>Peer rejection, social isolation, bullying</td>
</tr>
<tr>
<td>Adolescence</td>
<td>Academic failure; Substance abuse</td>
<td>Parent conflict; Poor parental monitoring &amp; inconsistent discipline</td>
<td>Neighbourhood crime; Poor quality schooling, deviant peers</td>
</tr>
</tbody>
</table>

*Note.* Adapted from the following publications: Biglan and Taylor (2000); Compton et al. (2010); Global Consortium for the Advancement of Promotion and Prevention in Mental Health (2008); Institute of Medicine (1994); National Research Council and Institute of Medicine of the National Academies (2009); and Shaffer and Yates (2010). This table is for illustrative purposes only (i.e., it is not intended as a guide to the most important risk factors at each phase of development).

These contexts are dynamic, changing throughout the course of development (NRC-IOM, 2009). Some factors (e.g., head injury, specific trauma, poverty) are associated with risk across the life span, while others (e.g., association with deviant peers) may indicate risk only during certain developmental periods (Coie et al., 1993). Compton et al. (2010) also note that risk factors may be malleable through preventive interventions (e.g., parenting skills deficits) or non-malleable, fixed markers (e.g., prenatal complications, gender, family history of psychiatric illness).

An important implication of their multilevel nature is the capacity to identify high-risk groups on the basis of individual, family, or community indices of risk (NRC-IOM, 2009). Risk factors have complex links with illness, disorder, and adverse outcomes because their effects tend to spread through a number of adaptive functions during the course of development. They appear to have additive effects in terms of vulnerability to psychological dysfunction, with the probability of illness increasing as a function of the number, duration,
and toxicity of the risk factors encountered (Coie et al., 1993; Rutter, 1979; Sameroff, Gutman, & Peck, 2003). As such, specific forms of psychopathology are normally associated with multiple risk factors, while a particular risk is rarely specific to a single problematic condition (Coie et al., 1993). Children living in poverty have a considerably higher probability of being exposed to multiple risk factors (Council of Australian Governments [CoAG], 2009).

Protective Factors

Interestingly, many children in high-risk environments, facing the most severe stressors, achieve positive developmental outcomes despite their adverse experiences (Luthar, 2003; Rutter, 1979). The potentially harmful consequences of risk exposure may be mitigated by various individual and social characteristics that afford protection, provide the tools to avoid adverse emotions and behaviours, and enhance well-being (Coie et al., 1993; NRC-IOM, 2009). Protective factors are characteristics at the individual, family, or community levels that are associated with a lower likelihood of problem outcomes (Compton et al., 2010). They may decrease dysfunction directly, prevent the initial occurrence of risk factors, buffer the effects of risk factors, or interfere with the processes by which risk factors lead to illness (Coie et al., 1993; Rutter, 1985).

Some examples of protective factors identified in studies of child psychopathology are shown in Table 2. The contextual, developmental, and other distinctions between risk factors discussed above may also be applied to protective factors (NRC-IOM, 2009). Evidence suggests that in direct contrast to risk factors, multiple protective factors have a positive, snowballing effect on psychological functioning and adjustment (Sameroff et al., 2003). However, they are not analogous with good mental health (Rae-Grant, Thomas, Offord, & Boyle, 1989) or even the concept of resilience (Rutter, 2006).

The Identification of Risk and Protective Factors

Generally speaking, risk factors tend to be positively correlated with each other and negatively associated with protective factors (NRC-IOM, 2009). Despite this, their relationship is not always straightforward (Coie et al., 2000). In some situations, risk and protective factors may be conceptualised as lying at opposite ends of a continuum (e.g., poor vs. good parenting), defined according to the direction that the variable is scored (Kandel et

---

57 The concepts of equifinality and multifinality are also relevant here (see Coie et al., 2000).
Table 2

*Examples of Childhood Protective Factors for Mental, Emotional, and Behavioural Disorders in Multiple Contexts*

<table>
<thead>
<tr>
<th>Individual</th>
<th>Family</th>
<th>Sociocultural</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-regulation skills</td>
<td>Secure attachment</td>
<td>Economic advantage</td>
</tr>
<tr>
<td>Healthy sleep patterns</td>
<td>Positive early experiences</td>
<td>High quality education</td>
</tr>
<tr>
<td>High self-esteem</td>
<td>Good family structure</td>
<td>Positive peer relationships</td>
</tr>
<tr>
<td>Positive self-perceptions</td>
<td>Healthy family relationships</td>
<td>Good social support network</td>
</tr>
<tr>
<td>Sense of humour</td>
<td>Family cohesion</td>
<td>Arts and cultural engagement</td>
</tr>
<tr>
<td>Above average intelligence</td>
<td>Authoritative parenting</td>
<td>Safe local environment</td>
</tr>
<tr>
<td>Educational achievement</td>
<td>Positive adult role-models</td>
<td>Sport access &amp; participation</td>
</tr>
<tr>
<td>Good social skills</td>
<td>Appropriate monitoring</td>
<td>Accessible health services</td>
</tr>
<tr>
<td>Self-determination</td>
<td>Family mental well-being</td>
<td>Cultural identity</td>
</tr>
<tr>
<td>Adequate physical health</td>
<td>Family bonding</td>
<td>Engagement with mentors</td>
</tr>
<tr>
<td>Spirituality</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* Adapted from the following publications: Coie et al. (1993); Global Consortium for the Advancement of Promotion and Prevention in Mental Health (2008); Institute of Medicine (1994); National Research Council and Institute of Medicine of the National Academies (2009); Shaffer and Yates (2010). This table is for illustrative purposes only (i.e., it is not intended as a list of the most important protective factors).

However, the significance of various points on the continuum often change with context (e.g., developmental stage, culture) meaning that protective factors are seldom mirror images of risk factors (Shaffer & Yates, 2010). In other circumstances, variables may be uniquely risk- or protective-related (Crews et al., 2007; Rae-Grant et al., 1989). For example, Luthar and Latendresse (2005) found that some dimensions of the parent-child relationship had both risk and protective effects in relation to mental health problems while others were specifically risk-related. Similarly, poverty is a common risk factor for a variety of negative outcomes for which wealth is not protective (Durlak, 1998).

58 In fact, affluent youth have been identified as a high-risk group for later psychopathology, including depression, anxiety, and substance abuse issues (Koplewicz, Gurian, & Williams, 2009).
The Interplay between Risk and Protective Factors

As its most basic tenet, prevention science emphasises the avoidance or subjugation of risk factors and the enhancement of factors that serve a protective role (NRC-IOM, 2009). The presence of multiple risk factors and a lack of protective factors culminate in increased individual vulnerability to adverse outcomes (Global Consortium for the Advancement of Promotion and Prevention in Mental Health, 2008; World Health Organization [WHO], 2004). Nevertheless, it is not simply the presence of risk and protective factors, but their interaction and accumulation over time that influences problematic outcomes (DoHAC, 2000b). Within a prevention paradigm, it is important not only to identify the relevant factors for different types of problems, but to understand how these factors operate and interact for various target populations, at different times (Durlak, 1998). In other words, mechanisms of risk and protection cannot be properly understood without examination of the context in which they unfold. Contexts are dynamic, shifting with the course of development and in response to changing circumstances. To be effective, prevention targets must be adjusted accordingly.

During infancy and early childhood, for example, caregiver-infant relationships tend to be the primary focus of intervention (Zeanah & Zeanah, 2009). Universal programs seeking to circumvent pathological developmental trajectories and disrupt the progression to later dysfunction are the most frequent approach (NRC-IOM, 2009; WHO, 2004). These preventive interventions typically concentrate on areas such as parenting skills, nutrition, and school readiness (Shaffer & Yates, 2010). Upon emergence from this developmental stage, children may be faced with different types and style of program consistent with their unique make-up, experiences, and circumstances. Thus, in order maximise opportunities for intervention, prevention science aims to identify as many risk and protective factors that impinge on individuals at different stages of development as possible (IOM, 1994).

THE PREVENTION OF INFANT SLEEP DISTURBANCE

Awareness and understanding of sleep issues among health professionals and the general public is low, given the magnitude of the burden. Not only is childhood sleep disturbance associated with concomitant individual and family distress, it has a long-term maladaptive influence on biopsychosocial adjustment. This includes a contribution to mental, emotional, and behavioural disorders that is potentially enormous, yet under-recognised (NRC-IOM, 2009). While there is no denying that behavioural interventions for
childhood sleep disturbances are highly effective (Kuhn & Elliott, 2003; Mindell et al., 2006; Ramchandani et al., 2000; Sadeh, 2005), the prevention of sleeping problems is preferable to later treatment (Nikolopoulou & St James-Roberts, 2003). Unfortunately, families tend to delay seeking professional help until the problem is well-established, often involving a long history of unsuccessful management attempts and conflicting advice (Burnham, Goodlin-Jones & Anders, 2006; Douglas & Hiscock, 2010; Scott & Richards, 1990b).

Parents typically present in a state of emotional turmoil augmented by chronic partial sleep deprivation, low parenting self-efficacy and difficulty separating from their infant (Daws, 1989; Fisher et al., 2002; Levitzky & Cooper, 2000; Medina et al., 2009; A. Scher, 2008; Thunström, 1999), issues counterproductive to effective program implementation. There are additional difficulties in correcting habitual problematic behaviours after they have become entrenched (Adachi et al., 2009; Cook et al., 2012) meaning that a high level of professional expertise is required to design and implement a behavioural program effectively. To be successful, behavioural techniques need to be applied accurately and consistently, facilitated by a clinician who is cognisant of the common implementation pitfalls. This is usually within the realm of the sleep specialist or experienced clinical psychologist; interventions delivered by other health professionals may be ineffective (Weir & Dinnick, 1988). However, there is considerable competition for this expertise within the current Australian health climate.59

Fortunately, there is little doubt that the introduction of universal preventive measures would alleviate many of the systemic problems in accessing postnatal support services for infant settling difficulties. Certainly, the central role of active physical comforting in the development and maintenance of childhood sleep disturbance suggests that many of these problems are preventable if sleep is well-managed early in the child’s life. In fact, prevention programs that include advice on how to foster adaptive infant sleep associations have been highly successful in reducing night-wakings and promoting healthy sleep patterns.

As discussed earlier, a comprehensive AASM review of behavioural treatments for

---

59 Indeed, numerous reports have drawn attention to the crisis in the Australian mental health system (Australian Bureau of Statistics, 2008; Begg et al., 2007; Groom, Hickie, & Davenport, 2003; Hosie, Vogl, Hoddinott, Carden, & Comeau, 2014; Mental Health Council of Australia, 2005; National Advisory Council on Mental Health, 2009; Rosenberg, Hickie & Mendoza, 2009; Sawyer et al., 2000; Slade et al., 2009; Senate Select Committee on Mental Health, 2006a, 2006b). General practitioners, paediatricians, and child health nurses remain frustrated by the long waiting periods families face in accessing multidisciplinary support during the postnatal period, including sleep centres, mother-baby units, and treatment for mental health issues (Douglas & Hiscock, 2010; Royal Australian College of General Practitioners [RACGP], 2008). Further, these services may not be available at all in many rural areas (Markie-Dadds & Sanders, 2006) while the added expense of overnight accommodation deters families from seeking treatment (RACGP, 2008).
infant and child sleep disturbance found parent preventive education to be one of the two intervention modalities with the strongest empirical support (Mindell et al., 2006). Parent education is thus considered a standard treatment\textsuperscript{60} for parents of neonates and young infants according to a companion document which establishes the appropriate standards of practice (Morgenthaler et al., 2006). This is consistent with previous affirmations of parent training as a well-established, empirically supported approach (Mindell, 1999; Kuhn & Elliott, 2003). All things considered, parent education programs appear to be the most efficient and effective intervention for behaviourally-based paediatric sleep disturbance (Kuhn & Roane, 2012).

Substantial research points to prevention as the gold standard approach, and clearly the only way of reducing the incidence of childhood sleep problems (Johnson & Mindell, 2011; Mindell et al., 2006). More than 2,300 parents across nine studies have been involved in the evaluation of sleep education and prevention strategies during the first 6 months of life (Adachi et al., 2009; Adair et al., 1992; Hiscock et al., 2014; Kerr et al., 1996; Pinilla & Birch, 1993; St James-Roberts, Sleep, Morris, Owen, & Gillham, 2001; Stremler et al., 2006; Symon et al., 2005; Wolfson et al., 1992). This research has typically targeted parental knowledge and perceptions about infant sleep, bedtime routines, sleep associations, and parental involvement during sleep initiation and response to night-wakings. Some of the risk and protective factors which have been addressed by prevention programs and/or discussed in the paediatric sleep literature are shown in Table 3. Interestingly, the overwhelming majority of known risk and protective factors fall into the family (i.e., as opposed to individual and sociocultural) context, confirming that the prevention of infant sleep disturbance is a fertile area for behavioural family intervention.

The broad aim of preventive interventions is to assist the neonate to make a smooth transition to their new environment. Consistent with the concept of parenting as a scaffold that supports the infant’s autonomous learning, St James-Roberts (2007) and Henderson et al. (2010) argue that prevention should occur in synchrony with developmental markers, which in this case, is the ability of the infant to self-regulate sleep-wake states. The latest research concerning the developmental trajectories of infants’ capacity for self-regulated nocturnal sleep suggests that preventive efforts should be focussed on the first 3 months, beginning as early as the neonatal period (Adams et al., 2004; Henderson et al., 2010, 2011).\textsuperscript{61}

\textsuperscript{60} I.e., a generally accepted patient-care strategy reflecting a high degree of clinical certainty.

\textsuperscript{61} Previous considered opinion has emphasised the period from 4 or 5 months onward as the appropriate time for preventive intervention. However, several studies have indicated that the behavioural entrainment of sleep is possible within the first month (Henderson et al., 2010; Pinilla & Birch, 1993; St James-Roberts et al., 2001).
Table 3
*Risk and Protective Factors Associated with Infant Sleep Problems*

<table>
<thead>
<tr>
<th>Risk Factors</th>
<th>Protective Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difficult temperament</td>
<td>Easy temperament</td>
</tr>
<tr>
<td>Birth complications</td>
<td>Normal birth</td>
</tr>
<tr>
<td>Maternal age at birth</td>
<td>Maternal age at birth</td>
</tr>
<tr>
<td>Maladaptive cognitions about infant sleep</td>
<td>Adaptive cognitions about infant sleep</td>
</tr>
<tr>
<td>Ignoring day night differences (bright lights at night/curtains closed during day)</td>
<td>Emphasising the difference between night and day</td>
</tr>
<tr>
<td>Prolonged breastfeeding&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Putting the child into bed asleep at bedtime</td>
<td>Putting the child into bed awake at bedtime</td>
</tr>
<tr>
<td>Holding/rocking the child to sleep at bedtime</td>
<td>Putting the child to bed drowsy but awake</td>
</tr>
<tr>
<td>Feeding the child to sleep at bedtime</td>
<td>Keeping the child awake during bedtime feed</td>
</tr>
<tr>
<td>Holding/rocking the child to sleep following night-wakings</td>
<td>Low stimulatory responses to night-waking</td>
</tr>
<tr>
<td>Prolonged night-feeding</td>
<td>Phasing out night-feeding</td>
</tr>
<tr>
<td>High parenting stress</td>
<td>Low parenting stress</td>
</tr>
<tr>
<td>Postnatal depression</td>
<td>Good postnatal psychological well-being</td>
</tr>
<tr>
<td>Poor co-parenting relationship</td>
<td>Good co-parenting relationship</td>
</tr>
<tr>
<td>Use of a pacifier&lt;sup&gt;62&lt;/sup&gt;</td>
<td>Use of a sleep attachment object</td>
</tr>
<tr>
<td>Infant sleeping within the parental bedroom</td>
<td>Infant sleeping in own room</td>
</tr>
<tr>
<td>Co-sleeping</td>
<td>Infant sleeping in own bed</td>
</tr>
</tbody>
</table>

*Note.* These factors are based on the original planning discussions for the SNSP and the information contained in the resultant *Baby Sleep parent tip sheet* (Watts, Cann, & France, 2000). Some factors (e.g., feeding the child to sleep at bedtime) have been strongly related to infant sleep disturbance in the paediatric sleep literature. Other factors (e.g., birth complications, maternal age, postnatal depression) have an equivocal status or are theoretically related but have not been the subject of quality research (e.g., use of a pacifier, poor co-parenting relationship, primary sleep location). With the exception of emphasising the difference between night and day, all factors are assessed as part of the current program of research.

<sup>a</sup> The benefits associated with breastfeeding are well-established (Department of Health and Ageing, 2009; Evenhouse & Reilly, 2005; Quinn et al., 2001; Schulze & Carlisle, 2010) and clearly outweigh the risks.

<sup>62</sup> Although these objects are typically known as “dummies” in Australia, the term pacifier appears to be more universally accepted and has therefore been preferred in this thesis.
A Review of Infant Sleep Problem Prevention Research

The remainder of this chapter will examine the small but impressive body of research specifically focussed on the prevention of infant sleep disturbance. Studies have been considered in two groups, depending on the timing of the preventive intervention, and presented in chronological order within these categories. A summary of the key features of each study has been provided at the end of this section (Table 4).

Prevention Research Beginning During Pregnancy or the Neonatal Period

Wolfson, Lacks, and Futterman (1992)

Two pioneering studies in the early 1990’s investigated the prevention of sleep problems in very young children. The first of these, by Wolfson et al. (1992), recruited 60 first-time parents from childbirth classes at a local hospital and randomly allocated them to a sleep training or control condition. Intervention parents attended two antenatal training sessions based on Cuthbertson and Schevill’s (1985) philosophy of independent infant sleep. Parents received information on emphasising the difference between night and day, gradually shaping their infant’s sleep to night-time hours, discriminating infant wakefulness, and establishing a regular focal feed. Strategies were reviewed and reinforced at two postnatal booster sessions which included the opportunity for parents to discuss individual issues and ways of improving program adherence. The control group met with the researcher on one less occasion and did not undertake specific sleep-related training.

Intervention infants were considered “settling ready” at 6 weeks providing they were healthy, weighed more than 9 pounds, and were continuously gaining weight. At this point, parents were instructed to move the focal feed to a later time, lengthen the time prior to removing a night-waking baby from the cot, and stretch the time between night-feeds. When the infants were 6 weeks old, parents completed 24-hour sleep diaries over three consecutive weeks. Results showed significant differences in sleep patterns between the groups. Intervention infants exhibited longer mean sleep episodes, less wakings, fewer night-feeds, and were more likely to sleep continuously for 5 hours or more during each week of data collection. The parents of these children also reported an increased sense of competence, while non-intervention parents acknowledged more stress over time. Interestingly, Wolfson et al. (1992) speculated that use of sleep charts together with the focal feed may have been

---

63 A regular late night-feed between 10 p.m. and midnight, for which the baby is woken if required.
sufficient to influence infant sleep-wake development.

A one week sleep diary and other self-report measures were completed again when the infants were aged 16 to 20 weeks. However, the group differences were not maintained on the second occasion. While all mean differences were in the expected direction, these findings are confounded by methodological issues. Firstly, parents received comprehensive “booster session” training immediately prior to, and during the period of diary recording, casting some doubt on the veracity of results. Further, the control infants were followed up an average of 12 days earlier than the training group members, a critical error during a rapid period of development. There was no follow-up beyond 5 months.

*Pinilla and Birch (1993)*

A second pioneering study was conducted by Pinilla and Birch (1993) who investigated whether exclusively breastfed babies could be taught to sleep through the night (i.e., midnight to 5 a.m.) from an early age. Twenty-six first-time parents were randomly assigned to intervention and control conditions. During the last trimester of pregnancy, parents in the treatment group received training and written information aimed at facilitating uninterrupted night-time sleep in their child within the first two months. Areas of focus were similar to those of Wolfson et al. (1992), with parents taught to maximise the distinction between night and day, provide a focal feed prior to midnight, and stretch the interval between night-feeds.

Families were visited once a week for 8 weeks by researchers to gather data and reinforce caregiving strategies for the intervention group. All parents kept 24-hour diaries of their infants’ feeding and sleeping patterns for 3 days of every week during this period. When the results were analysed, Pinilla and Birch (1993) found that many intervention parents failed to implement the suggested focal feeds, presumably because they were unwilling to wake a sleeping baby (St James-Roberts et al., 2001). However, this did not irredeemably impact the results of the program. From the third week onwards, infants in the treatment group demonstrated significant differences in mean total sleep, sleep duration per episode, and longest sleep episode compared with controls.

At 4 weeks, 38% of intervention group infants were sleeping through the night (on at least 2 of the 3 recorded nights) while just 7% of controls had achieved this milestone. By 8 weeks, all infants in the treatment group were sleeping for the requisite 5-hour stretch, compared with only 23% of the control group. Importantly, intervention infants appeared to compensate for the longer feeding intervals during the night by progressively increasing their
early morning milk intake—24-hour consumption did not differ between the groups. It was concluded that through adaptive interactions, parents have the opportunity to powerfully influence the development of healthy infant sleeping patterns. The pattern of results suggested that teaching parents to delay night-time feeding (i.e., to encourage infant self-soothing) was the defining factor.

**St James-Roberts, Sleep, Morris, Owen, and Gillham (2001)**

St James-Roberts et al. (2001) evaluated the use of a behavioural program to prevent infant crying and sleeping problems in the first three months of life. A sample of 610 mothers and their newborns were randomly allocated to one of three conditions: a behavioural program, an educational intervention, or a control group. Participants assigned to the behavioural program received a prescriptive leaflet which was discussed with a researcher. The instructions to parents involved similar information to the previously discussed studies such as emphasising day and night differences, use of a focal feed, stretching feeding intervals after 3 weeks, and other adaptive night-time strategies.

Education group mothers received a 10-page guide which discussed common problems and solutions, and incorporated a step-by-step guide to preventing crying and sleeping problems. It did not discuss the use of a focal feed, and was less prescriptive than the behavioural program. Participants were also made aware of a telephone helpline for mothers with young babies. The control group received the normal services available to all new mothers. Behaviour diaries kept at baseline and at 3 week intervals between 3 and 12 weeks were used to measure infant crying and sleeping, and parental compliance with the interventions. A follow-up questionnaire was sent out when infants were 9 months old.

Findings were unremarkable. The education intervention infants recorded similar sleep patterns to controls while about 10% more behavioural program infants were sleeping through the night\(^{64}\) by 12 weeks. At 9 months, no group differences were found across a range of infant sleeping and parental variables. However, parents who received the behavioural intervention were less likely to have sought help for crying or sleeping problems during the previous 6 months. There was no evidence that the educational program, and negligible evidence that the behavioural intervention, led to adaptive changes in parental practices within the first 3 months. Behavioural caregivers generally failed to implement the focal feed, and attempted to stretch feeding intervals for a shorter time and later than

\(^{64}\) Defined as sleeping uninterrupted between midnight and 5am on at least 2 of 3 nights, partially replicating the methodology of Pinilla & Birch (1993).
recommended, despite ongoing assurances that they were comfortable and adhering to the program. The researchers pointed to a likely reluctance among parents to wake a sleeping baby for feeding, and presumably, stretching the feeding interval for a 3-week-old was considered unacceptable.

These results draw attention to a potential disadvantage of larger scale, less personalised interventions, in that parents may not implement the treatment as intended (Mindell et al., 2006). The study by St James-Roberts et al. (2001) also highlights the importance of providing parents with advice and strategies that are easily understood and they are comfortable putting into practice. In fact, the behavioural leaflet reads as a somewhat randomly organised list of directives which lack explanation/justification and may have been difficult for some parents to process. Other methodological issues include the curious decision to provide additional help-line assistance for the educational group, the effect of which would have been unknown, whatever the results. There is no indication of how many times participants called the helpline, or the nature of any verbal advice given, including whether it was consistent with the contents of the booklet.

**Stremler et al. (2006)**

A small pilot study by Stremler et al. (2006) was the first to evaluate the effect of early parent education on both maternal and infant sleep. Participants were 30 first-time mothers randomly allocated to intervention and control groups. The intervention consisted of a 45-minute meeting with a nurse early in the postpartum period to discuss information and strategies aimed at improving her own, and her baby’s sleep. The consultation was supported by the provision of an 11-page booklet, and weekly telephone contact to reinforce the content and address any problems arising. Control group mothers were given a one-page pamphlet containing basic sleep information which was discussed during a 10-minute meeting with the nurse. Contact was maintained via two telephone calls, but they were not offered any advice or support in regard to maternal or infant sleep.

At 6 weeks, the sleep of all mothers and infants was assessed using actigraphy, with significant group differences emerging. Intervention infants had 35% fewer night-wakings and a maximum uninterrupted sleep period that was 46 minutes longer than controls. In addition, mothers assigned to the experimental condition recorded an average of 57 minutes more sleep at night and fewer rated their sleep as problematic compared to members of the control group. Although limited by its small sample size, this study provides initial empirical

---

65 Details of the leaflet content are provided in the published article and appear to have been reprinted verbatim.
evidence that prevention programs which impact positively on infant sleep also lead to improvements in maternal sleep patterns. A sticking point with this research, however, is that it could not be determined which of the numerous recommended strategies were drawn upon by the participants, and thus whether some were more useful than others. Moreover, the authors conceded that they had little understanding of whether it was the preventive education or follow-up contact/support that led to the success of the intervention.

Symon, Marley, Martin, and Norman (2005)

An Australian study by Symon et al. (2005) recruited 346 families with healthy newborn infants via birth notices and randomly assigned them to intervention and control groups. When neonates were between 2 and 3 weeks of age, intervention parents met for 45 minutes with a trained nurse. Discussion centred on normative infant sleep patterns, sleep achievement as a learned skill, parental handling to promote independent sleep skills, and stretching the interval before responding to a crying child. The consultation was supported by a 50-page book focussed on feeding and sleeping issues for new parents (Symon, 1996).

Parents were asked to complete 7-day infant sleep diaries when their children were 6 and 12 weeks old. Two hundred and sixty-eight participants returned at least one diary (22.5% attrition rate) with approximately equal numbers in each experimental group. Results were impressive. At 6 weeks, infants assigned to the intervention condition slept an average of 1.3 hours in each 24-hour period (or 9 hours per week) more than controls. Intervention infants slept for significantly more hours during both day and night hours. Sixty-two percent of experimental group infants had at least 15 hours of sleep per day, compared to 36% of the control group.

Importantly, almost identical group differences in total sleep were found at 12 weeks. In addition, the longest uninterrupted sleep period among 12-week-old intervention infants was 30 minutes longer than that of their control counterparts. No significant group differences in the average amount of time spent crying were reported at either age. This may indicate that the “controlled crying” aspect of the intervention did not lead to more crying overall or, alternatively, that it was not implemented. Findings highlight the role of parental caregiving strategies in the development and maturation of sleep-wake rhythms. Further, the intervention was cost-effective relative to other research, consisting of just a single 45-minute consultation.

In effect, this aspect appears to draw on graduated extinction principles in a “preventive” treatment for very young babies. This is somewhat harsh, contrary to what is understood about infant sleeping and feeding patterns in early life (Murray & Ramchandani, 2007), and unlikely to be routinely accepted by parents.
session with a trained nurse, and printed material. Unfortunately, lack of any follow-up beyond the twelfth week limits the contribution of this trial. Information about its effect on later sleeping patterns, including night-waking problems would have been valuable, particularly since the earlier study by Wolfson et al. (1992) reported a dissipation of intervention effects by 16 to 20 weeks.

Hiscock et al. (2014)

Another Australian prevention program has recently been published by Hiscock and colleagues. Participants were 770 caregivers of 781 infants, randomly allocated to intervention and control conditions. Intervention parents received educational information about infant crying and sleeping, settling techniques, and self-care, delivered via a 27-page booklet and a 23-minute DVD (at 4 weeks), and were offered a telephone consultation (8 weeks), and 90-minute parent group session (13 weeks). The attrition rate was 19.0% \((n = 633\) infants) at 4 months and 30.3% \((n = 544)\) at 6 months.

Findings in regard to sleep were disappointing. There were no group differences in caregiver report of infant crying or sleeping problems at 4 or 6 months. In terms of maternal cognitions, intervention parents did report fewer doubts about their ability to manage their infant’s sleep at both follow-up points, and less problematic cognitions about limit-setting and fewer concerns about child safety during the night at 6 months. The latter finding supported Morrell’s (1999b) speculation that mothers of young infants may be more cognisant of issues regarding Sudden Infant Death Syndrome (SIDS) than were the parents of toddlers in his MCISQ validation sample. Although the researchers were able to adaptively influence parent cognitions, this did not translate to improved infant sleep patterns. A modest improvement in postnatal depression symptoms between 4 and 6 months was found among intervention mothers, relative to controls.

Prevention Research Beginning After 3 Months

Adair, Zuckerman, Bauchner, Philipp, and Levenson (1992)

A study by Adair et al. (1992), which employed a prospective cohort design with historical controls, is the first of two classic works investigating the use of preventive strategies in slightly older children. These researchers recruited 164 mothers to an intervention group via a routine 4-month health visit to a primary care paediatrician. Parents

---

67 The telephone consultation was received by 92.5% of intervention participants but just 50.1% attended the parent group. Both followed set scripts.
were provided with written information suggesting that their infant would soon be physiologically able to relinquish their night-feeds. In preparation for this change, participants were advised to establish a bedtime routine that involved placing the child into their crib partially awake to encourage the development of self-settling skills. Advice about sleep onset associations was based on Ferber’s (1985b) popular book, while feeding suggestions were also offered as a means of disguising the main purpose of the study. No verbal reinforcement was provided by the paediatrician. At 5 months, intervention parents were sent a 5-day sleep and feeding diary, which was discussed with the paediatrician at a 6-month visit.

The control group, comprising 172 mothers, were engaged at a planned 9-month paediatric appointment. At this time, all participants completed a questionnaire regarding parental presence at sleep onset, and the frequency of night-waking requiring parent involvement during previous week. Parental presence at bedtime, the main focus of the intervention, was significantly reduced among experimental mothers (21%) compared to controls (33%). Unaccompanied infant sleep onset was associated with less night-waking and, importantly, no change in breastfeeding status.

Nine-month-old experimental infants were easier to settle off to sleep (naps and at bedtime) and evidenced 36% fewer night-wakings per week than controls. In addition, frequent night-wakings, defined as seven or more wakings in the previous week, were almost twice as common among control infants. Completion of the daily routine chart at 5 months was not considered to be a crucial component of the intervention. From the published report, the aim, nature, and intensity of the discussion with the paediatrician at 6 months remains somewhat unclear. Nevertheless, in utilising existing infrastructure and planned medical visits to distribute and reinforce written information, Adair et al.’s (1992) program appears to be cost-effective for community implementation, an important prerequisite of universal prevention programs.

Kerr, Jowett, and Smith (1996)

A second oft-cited study investigated whether preventive health information for parents of 3-month-olds would result in improved sleep patterns 6 months later. One hundred and sixty-nine new parents recruited via mail were randomly allocated to experimental and control conditions. Intervention parents were visited at home by a researcher who provided verbal and written advice focussed on the importance of routine and adaptive settling methods. At 9 months, significant differences were noted between the groups in settling
behaviour, the median night-wakings per week, the number of infants waking twice or more per night, and on a composite sleep score.

On the surface, Kerr et al.’s (1996) findings appear promising. However, the results offered appear to be subjectively chosen and are insufficiently detailed, eliminating the possibility of a thorough evaluation. For example, the authors present the median nights waking as the pivotal statistic for group comparison while providing no explanation or other information. A further methodological complication emerges from the involvement of the same person in both the in-home training and the follow-up interview. As a result, some intervention group parents may have provided responses considered less embarrassing to themselves and/or favourable to the researcher.

**Adachi et al. (2009)**

A little-known Japanese prevention study recruited 136 mothers of 4-month-old infants from a local health clinic. Utilising a prospective cohort design, allocation to experimental groups was determined by the timing of the visit. The intervention group was enrolled first, and were privy to a 10-minute group presentation along with a 20-page educational booklet aimed at teaching parents how to facilitate healthy infant sleep patterns. The control group was recruited next, and received routine care only. All participants completed a questionnaire designed to assess parenting strategies and behaviours, maternal and infant sleep patterns and problems, and other caregiving concerns, at baseline and at 7 months.

According to the authors, the study was successful in developing adaptive parental behaviours in terms of bedtime routines and the immediacy of response to night-waking. This is an important outcome, suggesting that it is possible to alter parent night-time practices using very brief training supported by written information. It is worth noting, however, that control parents also recorded improvements in these behaviours, albeit of slightly less magnitude. Night-waking in control infants was significantly higher at follow-up, while it remained relatively stable among the intervention infants over the same time period. In other words, the intervention did not lead to a reduction in infant night-waking 3 months later. Unfortunately, data analysis deficiencies, including a less than ideal approach to group mean comparisons, as well as the use of retrospective surveys limit the overall contribution of this research.
### Table 4

**Summary of Infant Sleep Problem Prevention Research**

<table>
<thead>
<tr>
<th>Study/Design/Location</th>
<th>Target Population/Infant Age at Recruitment</th>
<th>Infant Sample/Group Allocation/Attrition Rate</th>
<th>Intervention Group(s)</th>
<th>Control Group</th>
<th>Major Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adachi et al. (2009)</td>
<td>Not specified (attendees at an infant health centre) 4 months</td>
<td>$N = 136$ Intervention ($n = 70$) Control ($n = 66$) Attrition: 33.0% (originally 203 enrolled)</td>
<td>Received a 20-page booklet (information on practical night-time parenting behaviours) and 10 min group guidance on infant sleep.</td>
<td>Routine health care.</td>
<td>At 7 months: The intervention parents demonstrated an increase in adaptive behaviours at bedtime (regular sleep onset location and scheduling) and following night-wakings (less likely to respond promptly with nappy change or holding/soothing). Note, similar findings of a lesser magnitude were also found among control mothers. The control group evidenced more night-waking relative to intervention infants (night-waking among controls increased significantly 4–7 months, intervention group remained stable).</td>
</tr>
<tr>
<td>Adair, Zuckerman, Bauchner, Philipp, and Levenson (1992)</td>
<td>Not specified (attendees at a paediatric clinic) Intervention, 4 months; control, 9 months</td>
<td>$N = 292$ Intervention ($n = 164$) Control ($n = 128$) Attrition: 25.9% (originally 394 enrolled)</td>
<td>At 4 months: Received an information sheet (bedtime routine, put the child to bed partially awake) with no verbal reinforcement by the paediatrician. At 5 months: Completion of a daily routine chart. At 6 months: Discussion of the daily routine chart with a paediatrician.</td>
<td>Routine health care.</td>
<td>At 9 months: Intervention infants were easier to settle to sleep (naps &amp; bedtime) and experienced 36% fewer wakings, while frequent night-waking was twice as common among controls.</td>
</tr>
<tr>
<td>Study/Design/Location</td>
<td>Target Population/ Infant Age at Recruitment</td>
<td>Infant Sample/ Group Allocation/ Attrition Rate</td>
<td>Intervention Group(s)</td>
<td>Control Group</td>
<td>Major Findings</td>
</tr>
<tr>
<td>----------------------</td>
<td>---------------------------------------------</td>
<td>-----------------------------------------------</td>
<td>----------------------------------------------------------------------------------------</td>
<td>---------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Hiscock et al. (2014)</td>
<td>Parents of normal, healthy babies 4 weeks</td>
<td>( N = 554 ) Intervention ((n = 275)) Control ((n = 279)) Attrition: 29.1% (originally 781 enrolled)</td>
<td>Sent a 27-page booklet with information about normal infant sleep cycles, crying patterns, strategies to promote independent settling, and self-care for parents; and a 23-min DVD with similar information plus settling techniques and parent discussion. Offered an individual telephone consultation at 6–8 weeks (92.5% received) &amp; a 1.5-hr parent group session at approximately 12 weeks (50.9% attended). Both encouraged parents to discuss cry or sleeping problems and to develop a tailored management plan to address any problems. All contact facilitated by trained health professionals (nurses, psychologists) following standardised scripts/training manuals.</td>
<td>Routine health care. At 4 months: No group differences in infant crying or sleeping problems, intervention parents did report fewer doubts about their ability to manage their infant’s sleep. At 6 months: No group differences in infant crying or sleeping problems, intervention parents reported fewer doubts and problematic cognitions about limit-setting and reduced concern about child safety during the night. Intervention mothers reported a modest improvement in postnatal depression symptoms between 4 and 6 months, relative to controls.</td>
<td></td>
</tr>
<tr>
<td>Kerr, Jowett, and Smith (1996)</td>
<td>Normal, healthy infants &lt; 3 months</td>
<td>( N = 169 ) Intervention ((n = 86)) Control ((n = 83)) Attrition: 16.3% (originally 202 enrolled)</td>
<td>At 3 months: Received a home visit from the researcher who provided advice and a health education booklet (focused on setting methods and routine).</td>
<td>Routine health care. At 9 months, significant group differences in settling behaviour, the median night-wakings per week, the number of infants waking twice or more per night, and on a composite sleep score.</td>
<td></td>
</tr>
<tr>
<td>Study/Design/Location</td>
<td>Target Population/Infant Age at Recruitment</td>
<td>Infant Sample/Group Allocation/Attrition Rate</td>
<td>Intervention Group(s)</td>
<td>Control Group</td>
<td>Major Findings</td>
</tr>
<tr>
<td>-----------------------</td>
<td>---------------------------------------------</td>
<td>-----------------------------------------------</td>
<td>-----------------------</td>
<td>---------------</td>
<td>----------------</td>
</tr>
</tbody>
</table>
| Pinilla and Birch (1993) RCT | First-time parents, no medical complications Pre-birth | $N = 26$  
Intervention ($n = 13$)  
Control ($n = 13$)  
Attrition: 21.2% (originally 33 enrolled) | Home visits: 1 x pre-birth; 8 x weekly post-birth.  
Written & verbal information pre-birth (behavioural strategies including a focal feed and stretching night-feeding intervals) and ongoing support. | Home visits: 1 x pre-birth; 8 x weekly post-birth. | Treatment infants showed significantly longer sleep episodes at 3 weeks and all were sleeping through the night by 8 weeks compared to 23% of controls.  
Intervention infants fed less frequently at night but 24 hr milk intake was not affected.  
Treatment infants were rated as more predictable. |
| St James-Roberts, Sleep, Morris, Owen, and Gillham (2001) RCT Berkshire, England | Parents of normal, healthy (singleton) babies < 7 days | $N = 610$  
Behavioural ($n = 205$);  
Education ($n = 202$);  
Control ($n = 203$)  
Attrition: 3.8% at 1 week ($N = 587$), 21.6% by 12 weeks ($N = 478$) | Behavioural Group: Researcher provided a leaflet, and discussed a structured but flexible behavioural program (including focal feed, stretching night-feeding intervals after 3 weeks; telephone interviews at 3, 6, 9, & 12 weeks to discuss progress.  
Education Group: Received a 10-page (less prescriptive) guide to baby crying and sleeping, access to 24-hr helpline; telephone interviews at 3, 6, 9, & 12 weeks to discuss progress. | Routine health care. | At 12 weeks: 10% increase in sleep consolidation among the behavioural group; the educational intervention did not change parental care behaviour.  
At 9 months: Behavioural parents were less likely to have sought help for crying or sleeping problems over past 6 months; no group differences across a range of other infant sleeping and parental variables. |
| Stremler et al. (2006) RCT Toronto, ON, Canada | Mothers of normal, healthy (singleton) babies Soon after birth | $N = 30$  
Intervention ($n = 15$)  
Control ($n = 15$)  
Attrition: 0% | Received an 11-page booklet, a 45 min meeting with a nurse to discuss sleep information and strategies, weekly telephone contact to reinforce information and problem-solve. | Received a 1-page leaflet, a 10 min meeting with a nurse to discuss maternal sleep hygiene and basic information about infant sleep, telephone contact at 3 & 5 weeks to maintain contact (no advice). | At 6 weeks: Intervention infants had fewer night-time awakenings and maximum night-time sleep duration averaged 46 min longer than controls; intervention mothers averaged 57 min more night-time sleep, and fewer rated their sleep as problematic. |
<table>
<thead>
<tr>
<th>Study/Design/Location</th>
<th>Target Population/Infant Age at Recruitment</th>
<th>Infant Sample/Group Allocation/Attrition Rate</th>
<th>Intervention Group(s)</th>
<th>Control Group</th>
<th>Major Findings</th>
</tr>
</thead>
</table>
| Symon, Marley, Martin, and Norman (2005) | Parents of normal, healthy babies < 14 days | $N = 268$  
Intervention ($n = 137$)  
Control ($n = 131$)  
Attrition: 22.5% (originally 346 enrolled) | At 2–3 weeks: Received a 50-page book and a 45-min consultation with a research nurse involving discussion and advice on normal sleep patterns in newborn infants, independent sleep skills, delayed response to night-waking. | Routine health care. | At 6 weeks: Intervention infant total sleep time was 15 hr or more per day on 62% of days compared with 36% in the control group. Intervention infants slept 1.3 hr per 24-hr more than controls (0.5 hr night sleep, 0.8 hr daytime sleep).  
At 12 weeks, intervention infants slept 1.2 hr per day more comprising 0.64 hr night sleep and 0.58 hr daytime sleep. |
| Wolfson, Lacks, and Futterman (1992) | Married first-time parents, normal, healthy babies Pre-birth | $N = 60$  
Intervention ($n = 29$)  
Control ($n = 31$)  
Attrition: 0% | Small group training (behavioural prevention strategies):  
2 x pre-birth;  
2 x post-birth (6–11 weeks);  
1 x follow-up (16–20 weeks). | Small group meeting:  
1 x pre-birth;  
1 x post-birth (6–9 weeks);  
1 x follow-up (16–20 weeks). | At 6–9 weeks intervention infants exhibited better sleep patterns; parents awakened and responded less often to infant signalling and reported greater parental competence.  
Control group parents reported increased stress over time. |
CONCLUDING COMMENTS

There is considerable evidence supporting the use of behavioural methods as a rapid, effective, and long-lasting approach to the treatment of childhood sleep disturbance (Mindell et al., 2006; Morgenthaler et al., 2006; Sadeh, 2005). These interventions generally lead to improved infant sleep patterns and spawn positive secondary benefits in terms of family health, functioning, and well-being (Avis & Mindell, 2008; Kuhn & Elliott, 2003; Mindell et al., 2006; Sadeh, 2005). Despite the efficacy of available treatment options, however, they may be extremely stressful for parents to implement. Moreover, successfully altering established infant and parent behaviours often requires the involvement of a skilled clinician. Unfortunately, this expertise may be difficult to secure within an overburdened health system.

To transform this situation, the field of mental health must embrace a paradigm shift, away from its emphasis on psychopathology and treatment, to focus more on prevention and wellness (Rishel, 2007). This involves renewed consideration of families at a population level, with researchers and practitioners focussed on reducing the incidence of child and family dysfunction, rather than the outcomes of individual clinical cases (Prinz & Sanders, 2007; Sanders & Prinz, 2008). Importantly, rapidly accumulating evidence suggests that interventions during early infancy can have an adaptive influence on child health and development as well as parental well-being (Murray & Ramchandani, 2007). With these points in mind, the area of paediatric sleep medicine is a relatively untapped, fertile area for paradigmatic change.

Considering the vital role of sleep in young children, the family upheaval triggered by infant sleep disturbance, and the difficulties associated with treatment, teaching parents how to facilitate healthy sleep habits in their children appears to be the most effective, economical, and time-efficient approach to behaviourally-based paediatric sleep problems (Kuhn & Roane, 2012). In particular, prevention programs designed to impact multiple risk and protective factors may be most effective method of circumventing maladaptive developmental pathways. Universal interventions must be desirable for everybody in the eligible population, cost-effective, efficacious, acceptable to the target audience, and present low risk (NRC-IOM, 2009). Although there will always be infants and families who develop sleep and other problems, we may be moving towards a time where efforts to prevent adjustment difficulties becomes the norm rather than the exception (Murray & Ramchandani, 2007).
CHAPTER 6

General Method

There is...no universal recipe for scientific advance. It is a matter of groping forward into terra incognita of the outer world by means of methods which should be adapted to the circumstances, such as the variations in approaches and situations of the research workers. (van Bemmelen, 1961, p. 455)

Overview

The main objective of the research program reported in this thesis is to make a meaningful contribution to the amelioration of childhood sleep disturbance, a major societal issue. Although an important aim is to report on the efficacy of a universal preventive intervention, an equal imperative is to shed light on some of the pathways to disordered infant sleep. This chapter presents the methodology common to the concurrently conducted studies reported in the three succeeding chapters. Study-specific methodology is described within the relevant chapter while the methodological limitations, theoretical and practice implications, and future research suggestions are considered in the General Discussion.

Background

The Baby Sleep Parent Tip Sheet

The original impetus for this thesis was the publication of a new Triple P–Positive Parenting Program (Triple P) parent tip sheet aimed at preventing infant sleep disturbance. An initial concept was developed to empirically test the efficacy of this resource. A subsequent agreement was made with the Parenting Research Centre (PRC), who were interested in adapting the Triple P tip sheet for use within the Victorian health system. The PRC generously agreed to assist with a review of the parent tip sheet, utilise their existing networks to introduce the research project to local governments, provide copies of the tip sheet for the study, and delay its general distribution until all data collection was complete.

Initial evaluation revealed that the Triple P resource contained a number of

---

68 Triple P is a multilevel system of parenting and family support developed by the Parenting and Family Support Centre, University of Queensland, Australia. It involves a 5-tiered continuum of increasing strength and narrowing reach as detailed in Appendix A.
inaccuracies and inconsistencies in terms of the empirical literature and was lacking in several important areas. It was determined to create a new evidence-based parent tip sheet and the original pamphlet was wholly discarded. Preliminary advice was sought from Associate Professor Karyn France—69 an experienced theorist, researcher, and health professional in the field of paediatric sleep—who kindly offered to assist in the development of the new resource. The initial version was the outcome of a collaboration between the principal researcher, Associate Professor France, and Mr Warren Cann. 70 This draft was then dispatched for review to a cross-section of infant sleep specialists, including psychology, nursing, and early childhood academics and practitioners. Where possible, any suggested amendments were incorporated into the final version of the parent tip sheet, entitled Baby Sleep, later published by the Victoria’s Department of Human Services (Appendix B).

At the time of publication, Baby Sleep was one of 40 eye-catching, brief, and easy to comprehend parent tip sheets forming part of the Triple P program in Victoria. These pamphlets were intended to provide information and advice on a range of everyday parenting issues covering the promotion of children’s development, the prevention and management of common behaviour problems, and coping with being a parent. Designed as both stand-alone instruments and for use in parent consultations, Triple P tip sheets were widely accessible (free of charge) through child and family health practitioners, and education and welfare professionals. Unfortunately, these tip sheets are no longer published. However, they remain available for parents to purchase in electronic format as detailed in the final chapter.

**The Victorian Maternal and Child Health Service**

The Maternal and Child Health (M&CH) Service is a universal primary care program available to families in Victoria, Australia with children from birth to school age. It is provided by the Victorian Government’s Department of Education and Early Childhood Development (DEECD) in partnership with local government, with overarching goals of maximising the child’s health, well-being, learning, development, and safety (DEECD, 2009, 2012a). Approximately 96% of all Victorian birth notifications are enrolled in the M&CH Service (DEECD, 2012b). 71 A minimum of seven consultations are provided within the first year, involving an initial home visit and scheduled consultations at 2, 4, and 8 weeks, and 4, 8, and 12 months at their local M&CH Centre (DEECD, 2009). Extended needs of the child

---

69 Canterbury Sleep Programme, University of Canterbury, New Zealand.
70 Chief Executive Officer, PRC.
71 The target is 98% excluding children stillborn, or deceased/moving out of the state within 1 month of birth (DEECD, 2012a).
and family are met through a range of additional services and activities, including first-time parent groups, supplementary (including telephone) consultations, a 24-hour helpline, and community strengthening activities (DEECD, 2009, 2012a).

**Ethics Approval**

Ethics approval was granted by the Human Research Ethics Committee, RMIT University.

**Participants**

Subjects comprised 354 first-time mothers \(M = 29.84\) years, \(SD = 4.22\) years, \(R = 18–44\) years) of healthy and normally developing newborn babies, recruited from M&CH Centres throughout Victoria, Australia between April, 2000 and April 2002. Data collection was completed in January, 2003.

**Sampling Procedure**

**Recruitment of Participants**

Information about the proposed study and a request for assistance was sent to M&CH Service Coordinators in all 78 Victorian Local Government Areas (LGAs). Fifty-eight responses were received, with all but two in the affirmative (71.8%). Meanwhile, the study was named the SNSP and a cartooned depiction of a night-waking infant was instilled as the official logo. A power analysis suggested that approximately 600 participants would be required to achieve statistically significant results in the first study, which investigates the efficacy of the Baby Sleep parent tip sheet in preventing child sleep problems. Given the life-changing circumstances of a first-born child, and the reasonably large commitment required, a low participation rate was expected. Consequently, it was determined to send out 6000 information packages (i.e., 10 times the required number of subjects). However, this amount was reduced by 30% due to budget restrictions.

---

72 It was reasoned that first-time parents would benefit most from the intervention, being less likely to have previous experiences in night-time parenting to rely upon. Nuisance variables, including the stress associated with additional caregiving responsibilities, would also be removed. In addition, it allowed a more direct comparison with earlier studies utilizing first-time parents such as Wolfson, Lacks, and Futterman (1992) and Pinilla and Birch (1993).

73 To detect the difference between two independent group means using a conservative significance level of 0.01 and presuming a small effect size, a sample size of at least 586 was required (Cohen, 1992).
Thus, approximately 4200 information packs were prepared and posted to coordinators for distribution by their M&CH Nurses. Practitioner instruction sheets were also included, with nurses asked to identify first-time mothers of healthy, normally developing newborn babies at one of their early visits to the M&CH Centre. They were asked to provide an information pack to parents interested in participating in a research project about infant sleep (Appendix C) and remained blind to the true experimental nature of the study. No further nursing involvement was required as all subsequent correspondence was directly with the principal researcher.

Potential participants received an information sheet, a Registration of Interest form, a Consent form, a demographic questionnaire, a measure of postnatal depression, and a reply-paid envelope (Appendix D). Considering the large network of M&CH Centres involved in distributing materials and the wish to avoid encumbering nurses with additional duties, it was not practical to ascertain how many information packs were actually handed out to prospective subjects; the demographics of those accepting a package but not registering their interest; or the demographics of those who declined an information pack.

**Participant Response**

Four hundred and sixty-eight mothers of 473 infants (5 twin sets) from 48 LGAs and 194 M&CH Centres throughout Victoria completed the requisite initial paperwork and were enrolled into the study. Participants agreed to complete a 4-day infant sleep diary and parent questionnaire when their child was 6 months old, and again at 12 months. All parents were initially screened for abnormally high postnatal depression scores. Mothers with scores above the recommended cut-off of 12/13 on the EPDS were contacted and sensitively informed. Permission to inform the participant’s M&CH Nurse was also sought with all but one mother granting such approval. Since these pretest scores were approximately normally distributed and the sample size was reasonable, it was decided that no participants would be removed on the basis of their EPDS result. Rather, scores were seen as being reflective of normal variations in postnatal adjustment.

**Allocation to Experimental Groups**

Two experimental groups were formed, one with early access to the written anticipatory guidance and the other a control group. Unfortunately, the excellent social

---

74 The mother in question was currently under the care of a psychiatrist for her depression and did not wish her M&CH Nurse to be privy to this information.
support networks encouraged systemically by the M&CH Service in Victoria posed a risk to program integrity. More specifically, it was deemed possible for control group mothers to learn of the written intervention via organised mothers’ groups and/or local friendships. This may have prompted them to seek a copy of the tip sheet from a fellow participant (which probably would have remained undiscovered), or the researcher. Significant leakage between the groups would lead to a dilution of the treatment effect, potentially rendering the project invalid. Following extensive consultation, it was determined to manage this risk by ensuring that mothers from the same M&CH Centre or small rural community were allocated to the same experimental group. While pure random allocation was the preferred option, the project team felt that the risk of contamination outweighed the rewards in this instance.

As a result, subjects were quasi-randomly assigned to the intervention and control conditions on the basis of M&CH Centre or in some small country regions, at the level of LGA. As registrations from each new location were received, they were alternately allocated to one of the two experimental conditions. Participants attending the same M&CH Centre or residing in the same small rural community as a previously registered participant were allocated to the same group. A similar method was employed in research by Hiscock, Bayer, et al. (2007) within the Victorian M&CH system where group allocation could not plausibly be concealed from nurses or parents (Wake, Price, Clifford, Ukoumunne, & Hiscock, 2011).

Unfortunately, some information packages were handed out too late, presumably by nurses misinterpreting the instructions. To maximise the size of the sample, some late offers of participation were accepted providing there was ample time to send out the 6-month paperwork and the applicant could be safely allocated to the control group with respect to the process described above. These applicants could not have joined the intervention group as they had missed the opportunity of receiving the parent tip sheet soon after birth. As such, some participants \( n = 36 \) were allocated to the control group according to the timing of their initial contact with the researcher. Towards the end of the recruitment period, additional timely registrations were allocated to the intervention group where possible to account for this differential. While it is not uncommon to recruit control subjects after the intervention has begun (or has been completed), the main drawback was that pretest EPDS score could not be easily compared among the groups in the first study because of differences in the mean age of the child when the test was completed.

All registered participants were sent an acknowledgment letter and a photocopy of

---

75 Eckerberg (2002) encountered a similar issue whereby intending participants learned of the randomisation process and began requesting access to the most beneficial intervention.
their signed consent form. In addition, subjects assigned to the intervention group received a copy of the Baby Sleep parent tip sheet. To further protect the integrity of the research, each subject was identified using a code number; the participant’s contact details and experimental group status were stored separately until all other primary data had been entered into the database. All sleep diary scoring and data entry was completed by the principal researcher.

**Completion of the Infant Sleep Diary and Parent Questionnaire**

The research materials were finalised and initially tested in a small pilot study of eight members of local first-time mothers’ group. Mothers were asked to complete the infant sleep diary and parent questionnaire and comment on any usability problems. No issues were reported. Each participant in the SNSP subsequently received a copy of the research booklet, together with a reply-paid envelope, approximately a week prior to their infant turning 6 months old (Appendix E) and again at 12 months (Appendix F). Intervention and control group members received identical packages on both occasions. Almost all diaries and questionnaires were returned promptly while participants who did not respond on time were sent reminders. No data was omitted due to the late return of documentation.

**Flow of Research Participants**

The flow of research participants is illustrated in Figure 9. At 6 months, 399 parents of 403 infants fulfilled all research requirements, a response rate of 85.1%. Completed 12-month documentation was received from 370 parents of 374 infants (78.9%), although 9 had re-engaged with the project after failing to return their 6-month paperwork. Overall, 361 parents of 365 infants (77.1%) met all of their participant obligations while just 60 parents (12.8%) remained uninvolved after initially registering their interest. This is an exceptional result, particularly since a number of registrants were lost to the study after changing their address. Given the relatively high completion rate, only parents who fulfilled all study requirements were included in the final sample.

Data relating to four mothers of eight twins was removed to eliminate possible confounding factors. Three further participants were excluded due to chronic child illness

---

76 At 12 months, intervention group participants received an additional short feedback questionnaire regarding the parent tip sheet. However, these responses have not been considered due to space limitations.

77 i.e., all were completed at the appropriate time according to the dates given on the sleep diaries.

78 Due to an oversight, parents of twins were not excluded from participation according to the instructions provided to nurses. Ultimately, it was decided that the removal of these subjects would eliminate any confounding factors associated with the increased caregiving responsibilities associated with twins and issues such as one infant potentially waking the other.
Figure 9. Parent (infant) flow through the four phases of the research program. Quasi-randomisation into Intervention (I) and Control (C) groups occurred upon registration. The first and second studies involved participants who completed all research requirements, excluding parents of twins (4), chronically ill children (2), and one infant with a developmental disability ($N = 354$). Study 3 utilised two groups ($n = 40$) drawn from the final sample, involving parents of infants with enduring healthy sleep (HS) and persistent sleep problems (SP).

or significant infant developmental problems. This left a final sample of 354 first-time mothers of healthy, normally developing infants, consisting of 177 intervention and 177 control subjects. Demographic information, including pregnancy and birthing variables, and pretest EPDS scores for the 60 non-participants was compared with that of the subjects making up the final sample. On average, mothers who were not involved after initially
registering their interest were 2 years younger than those completing all requirements of the study \((F(1, 422) = 9.23, p < .01, \eta^2 = .021)\). No other significant differences were identified.

**Materials**

**Parent Tip Sheet**

The Baby Sleep parent tip sheet (Watts, Cann, & France, 2000) is a six-page, glossy, fold-out pamphlet designed for universal distribution to parents of newborn infants. The aim of the tip sheet is to provide new parents with written anticipatory guidance about infant sleep in an easy to read and practical format. It is applicable from birth, and designed to promote parenting practices and routines thought to be associated with the development of healthy childhood sleep patterns (Appendix B).

**Measures**

**Infant Sleep Diary**

Diaries are a simple and effective means of documenting real-time health behaviour which reduce the loss of information associated with retrospective reflection (Richardson, 1994; Thomas & Burr, 2009) and are widely used to study infant sleeping and feeding patterns (St James-Roberts et al., 2001). In this research, awakenings that draw the attention of parents were of greater interest than short, unsignalled arousals. Accordingly, parent completed sleep diaries were considered appropriate for data collection, even though they may underestimate total infant arousals in comparison with objective measures (Eckerberg, 2004).79

The infant sleep diary for this project was based on an exemplar by Wolfson (1998), chosen for its clarity and functionality. This layout was successfully utilised in an earlier prevention study (Wolfson et al., 1992) and the impressive reliability of similar measures has been demonstrated when compared with concurrent video recordings (Henderson et al., 2010; Paret, 1983). Nevertheless, when parents are required to keep sleep dairies for extended periods, their compliance tends to drop markedly over time (Sadeh, 2008a). Consequently, the aim is to reliably capture infant sleep-wake and feeding behaviours over the fewest

---

79 Notwithstanding the prohibitive cost and logistical problems in a study of this type, instruments such as actigraphs are known to inadequately capture the subjective experience of infant sleep disturbance (Gregory & Sadeh, 2012; Karraker & Young, 2007).
possible recording days (Thomas & Burr, 2009). Wolfson’s (1998) recommendation that the diary be maintained for 2 or 3 weeks was deemed too onerous for new parents, while a reduced data collection period was also likely to encourage higher participation.

On advice from Associate Professor France, a prospective 4-day, 24-hour sleep diary (divided into 15-minute blocks) was developed. The infant sleep diary was aimed at being user-friendly for parents while being mindful of the information required for interpretation according to Richman’s (1981) criteria, described below. In short, parents were requested to shade in the times their infant was sleeping, leave blank the times their infant was awake, and use words and symbols to indicate other events/information such as sleeping location, placing in or removal of the infant from the cot, and feeding. Copies of the parent instruction sheet and infant sleep diary are provided in Appendix E.

**Sleep Behaviour Scale**

To compare the severity of children’s sleep disturbances, Richman (1981), developed a composite sleep score, derived from six dimensions of sleep behaviour. Each dimension is rated on a 5-point ordinal scale from 0–4, giving a maximum score of 24, with higher scores reflecting more disturbed sleep (Richman, 1981, 1985). This continuous measure, known as the Sleep Behaviour Scale (SBS), accommodates variability in the topography of infant sleep by providing a standard, comparable method of summarising a wide range of behavioural observations (France & Hudson, 1990). Richman’s (1981) method of assessing children’s sleep has been used extensively within the paediatric sleep literature (e.g., France et al., 1999; France & Hudson, 1990; Johnson & McMahon, 2008; Morrell, 1999a, 1999b; Priddis, 2009). With the aid of time-lapse video, Minde et al. (1993) concluded that the composite sleep score is a valid measure of children’s sleep with good overall internal consistency ($\alpha = 0.77$). Similarly, Cronbach’s alpha for the SBS in the current research was 0.71 at 6 months and 0.78 at 12 months postpartum, an acceptable result.

---

80 This guidance was based on research at the University of Canterbury (Henderson, 2001, p. 16) The decision to collect data over a 4-day period has also been vindicated by Thomas and Burr (2009) who reported that just 3 days of diary records are required to reliably capture the sleep-wake patterns of mothers and infants.

81 Richman first utilised her composite score in 1981 before clarifying the scoring procedure in 1985.

82 To the author’s knowledge, this label does not appear in any of Richman’s publications and appears to have been coined by France and Hudson (1990). France and colleagues have subsequently used the term repeatedly in their work, whenever referring to Richman’s (1981) composite sleep score. Given the aptness of this descriptive, the SBS label has also been adopted throughout this thesis. However, it should not be confused with the more commonly cited Children’s Sleep Behaviour Scale (CSBS, Fisher, Pauley, & McGuire, 1989).

83 The SBS dimensions are related and may share common variance but they are not necessarily highly inter-related (i.e., the internal consistency statistic may be less relevant). For example, a child may be quickly rocked to sleep (low score on settling dimension) after each frequent night-waking (high score on night-waking factor).
Infant Sleep Questionnaire

The Infant Sleep Questionnaire (ISQ; Morrell, 1999a) is a 10-item, retrospective maternal self-report questionnaire, designed to assess infant sleep behaviours. This measure is based on six dimensions of infant sleep which are measured directly by 6 of the 10 items. These are combined to create a composite sleep score (0–38) with higher scores reflecting poorer sleep patterns. Four supplementary items assess the duration of difficulties and beliefs about a child sleep problem. Although the ISQ was originally designed for mothers of 12- to 18-month-old toddlers, the item content does not preclude its use with younger children.

The psychometric properties of the ISQ have been established using a sample of 467 mothers of 13-month-old infants (Morrell, 1999b). To determine the ISQ’s concurrent validity, a subgroup of 99 subjects completed an infant sleep diary. With a cut-off score of 8 on the SBS as the gold standard for identifying a sleep problem, sensitivity (percentage of true cases identified) and specificity (percentage of true non-cases identified) for sleep problems as indicated by ISQ-derived Richman (1981) research criteria was reported at 89.5 and 96.7%, respectively.84 Almost identical validation figures were found when infants with maternally-perceived sleep problems85 on the ISQ were examined.

Using ISQ-derived Richman (1981) research criteria, Morrell (1999a) found scores of 12 or more on the ISQ to be indicative of severe infant sleep disturbance (sensitivity 94.4%, specificity 92.7%) while 6 or greater were reflective of at least a mild maternally-rated sleep problem (sensitivity 88.1%, specificity 85.5%). Internal consistency was satisfactory for a scale of this nature (α = .77),86 while excellent test-retest reliability over a 2- to 4-week period was demonstrated (r = 0.92) using a subgroup of 41 participants. In a recent evidence-based review of paediatric sleep measures, the ISQ met the criteria for a well-established instrument (Lewandowski, Toliver-Sokol, & Palermo, 2011).

Infant Temperament

The Short Temperament Scale for Infants (STSI; Sanson et al., 1987) is a 30-item self-report questionnaire developed to assess maternal ratings of their 4- to 8-month-old infant’s temperament. Mothers are asked to respond on a 6-point scale anchored by 1 (almost never) and 6 (almost always). Half of the items are reverse-scored. If a question is not

---

84 To clarify, Morrell (1999a) is essentially arguing that sleep problems defined by the ISQ-derived Richman (1981) criteria are identified at a similar rate to a Richman (1981) sleep diary composite score threshold of 8.

85 Infants considered by their mothers to have mild, moderate, or severe sleeping difficulties were grouped and checked against a threshold of 8 on the sleep diary.

86 Previous comments regarding the internal consistency of the SBS are also relevant here.
applicable or cannot be answered, parents are instructed to put a line through it. Due to the consequent potential for missing data, mean scores for items comprising each subscale are used. The assessment is deemed invalid if responses on more than 6 items in the entire scale or 25% of the items on any one dimension are unavailable.

The STSI is an extensive refinement of the 95-item Revised Infant Temperament Questionnaire (RITQ; Carey & McDevitt, 1978). It was developed during the early stages of the Australian Temperament Project (ATP), a large scale, prospective, longitudinal study of temperament and development from infancy to adulthood. A validated Australian version (Oberklaid, Prior, Golvan, Clements, & Williamson, 1984) of the RITQ was completed by a representative sample of 2,443 mothers of 4- to 8-month-old infants (Sanson, Prior, & Oberklaid, 1985). Using factor analysis, Sanson et al. (1987) found limited support for the original 9-factor model, ultimately removing the redundant items and dimensions to create a 30-item short form. The result was a more parsimonious measure with a clear empirical foundation and structure, and good psychometric properties (Gray, Edwards, O’Callaghan, & Cuskelly, 2012; Prior, Sanson, & Oberklaid, 1989). Factor analysis of the shortened scale confirmed its 5-dimensional structure: Approach, Cooperation-Manageability, Rhythmicity, Activity-Reactivity, and Irritability.

Sanson et al. (1987) additionally compared scores on the STSI subscales to measures of colic, sleep, and crying problems. The three dimensions with the strongest relationship to the behaviour-problem ratings (Approach, Cooperation-Manageability, and Irritability) were then combined to create a continuous Easy-Difficult Scale (EDS). The EDS replicated a common feature of the temperament literature while avoiding the limitations of classification into the discrete categories of easy and difficult (e.g., Carey & McDevitt, 1978).

Prior et al. (1989) have noted that anyone choosing to investigate temperament will encounter challenging measurement issues. Regrettably, the coefficient of internal reliability for the original five subscales of the STSI ranged from 0.57 to 0.76, falling short of the accepted minimum of 0.80 for research of this type (Lance, Butts, & Michels, 2006).87 However, Sanson et al. (1987) contend that these results compare favourably to other questionnaires in the field, including the original 9-dimension scale (Sanson et al., 1985). Test-retest reliability for each subscale over a 2- to 9-week period using a separate sample of

87 Interestingly, this view is not shared by all theorists. For example, Boyle (1991) contends that the term “internal consistency” is actually a misnomer. Specifically, a high estimate of item homogeneity may also indicate a high level of item redundancy (i.e., essentially the same item rephrased in several different ways). Similarly, Kline (1979) argues that scales with internal consistency that is too low (α < 0.30) or too high (α > 0.70) are too broad or narrow in their conceptualisation of the dimension, which translates to lower validity.
46 infants was deemed satisfactory ($r = 0.77–0.90$) by the authors. Although the STSI was validated using a sample of 4- to 8-month-olds, it was also required for 12-month-olds in the SNSP. Fortunately, perusal of the item content suggested face validity for slightly older children. The use of this scale was weighed against the introduction of the Short Temperament Scale for Toddlers, developed by the same group of researchers for parents of toddlers aged 12 months to 2 years (Prior, Sanson, Oberklaid, & Northam, 1987). However, advice from the ATP team endorsed the STSI as the most appropriate measure for 12-month-old children in these circumstances. An advantage was that identical instruments were used at both ages, although any measurement concerns are compounded by the rapid development of children between 6 and 12 months. Assuming that temperament is a stable concept, the test-retest statistics in the current program ranged from a respectable 0.46 to 0.56 for the five dimensions, and 0.57 for the EDS. Internal consistency followed a similar pattern to that of the validation research, with Cronbach’s alpha ranging between 0.56–0.77 at 6 months, and 0.54–0.77 at 12 months.

**Maternal Cognitions about Infant Sleep**

The MCISQ (Morrell, 1999b) is a 20-item maternal self-report scale, designed to assess the beliefs and thoughts that mothers have in relation to infant sleep. Respondents indicate their degree of congruence on a 6-point scale ranging from 0 (*strongly disagree*) to 5 (*strongly agree*). Four questions are reverse-scored. Items were based on case vignettes from a popular book by Daws (1989) and refined during an extensive process of consultation and psychometric evaluation. The final version contains five subscales which aggregate to a full-scale score (0–60). Specifically, the domains are concerned with difficulty in limit-setting (Setting Limits); anger in the face of infant demands (Anger); doubts about parenting competence (Doubts); trepidation about feeding issues during the night (Feeding); and fears about SIDS (Safety). Higher scores on all scales are indicative of more problematic maternal cognitions about infant sleep. While the psychometric properties of the MCISQ were established using a sample of 150 mothers of 13- to 16-month-old toddlers, the items appear to have strong applicability to mothers of younger infants.

Construct validity was examined using two extreme groups containing mothers of sleep-disturbed and non-sleep-disturbed toddlers. Significant between-group differences were found on the full-scale means, together with the Setting Limits, Anger, and Doubt subscale scores. Feeding and Safety means did not differ between the groups, suggesting that maternal cognitions associated with these domains are not related to problematic infant sleep.
Morrell (1999b). These findings have led subsequent investigators (e.g., Johnson & McMahon, 2008; Morrell & Cortina-Borja, 2002) to abandon these subscales. Since Morrell (1999b) has postulated a greater relevance of Feeding and Safety among mothers of younger infants, these subscales have been included in the SNSP.

Morrell (1999b) reported adequate internal consistency for the 20-item MCISQ ($\alpha = 0.82$) but did not publish this statistic for the subscales. In this investigation, internal reliability was sufficient at 6 months ($\alpha = 0.78$) and 12 months ($\alpha = 0.80$). However, Cronbach’s alpha was less than adequate (Lance et al., 2006) on four of the five subscales. These statistics at 6 and 12 months were: Setting Limits, 0.75, 0.78; Anger, 0.59, 0.52; Doubt, 0.46, 0.50; Feeding, 0.57, 0.67; and Safety, 0.59, 0.64, respectively. With minor anomalies, two principal components factor analyses with varimax rotation using the current research data confirmed the structure reported by Morrell.

Given this outcome and the exploratory nature of the research (i.e., the subscales are not being used to make clinical decisions) it was reasoned that the potential information gain from each domain probably outweighed the impact of any questionable item homogeneity. Satisfactory test-retest reliability was established by Morrell (1999b) over a one-month period using a subgroup of 34 participants ($r = 0.81$). In later studies, the MCISQ has been shown to be predictive of maternal settling strategies (Morrell & Cortina-Borja, 2002; Johnson & McMahon, 2008) and the persistence of infant sleep disturbance (Morrell & Cortina-Borja, 2002; Morrell & Steele, 2003); and indicative of marked changes in problematic parental thinking following the treatment of infant sleeping problems (Hall, Clauson, Carty, Janssen, & Saunders, 2006).

**Maternal Depression**

The EPDS (Cox et al., 1987) is the most widely used screening instrument for postnatal depression symptoms (Boyd, Le, & Somberg, 2005). It was designed to identify disorders that might otherwise remain undetected in the community and focuses on the cognitive and affective (rather than somatic) features of depression (Cox & Holden, 2003a). There are 10 self-report items, requiring the mother to choose from four possible responses that best describes how she has been feeling over the previous 7 days. Each option is

---

88 The views of Boyle (1991) and Kline (1979), discussed in the previous footnote, are also important here.

89 Most standard depression instruments (e.g., Beck Depression Inventory-II; A. T. Beck, Steer, & Brown, 1996) include somatic (e.g., sleep patterns, fatigue, appetite) symptoms which are inevitably altered by life with a new baby (Astbury, Brown, Lumley, & Small, 1994; Milgrom, Ericksen, Negri, & Gemmill, 2005) resulting in problematic interpretation during the postnatal period.
graduated according to severity and rated on a 4-point scale (0–3). Seven items are reverse-scored. This produces a total score between 0 and 30 with higher scores indicating more severe symptomatology. The EPDS has robust psychometric properties (Rowe, Fisher, & Loh, 2008), including high internal consistency ($\alpha = .87$), split-half reliability ($r = .88$), and sensitivity to changes in depression over time (Cox et al., 1987). In the SNSP, the standardised alpha coefficient was 0.87 at 6 months and 0.88 at 12 months postpartum.

Although the EPDS cannot replace a clinical diagnosis, it has been shown to provide a remarkably accurate indication of the likelihood of clinical depression in many countries and cultures (Cox & Holden, 2003b). In the original validation study, Cox et al. (1987) suggested a score of 10 or more to be of clinical significance in routine primary care and 13 or more indicative of a depressive illness of varying severity. Numerous studies have supported these EPDS scores as recommended cut-offs for possible and probable depression, respectively, in postnatal women (Matthey, Henshaw, Elliott, & Barnett, 2006). These thresholds have also been used as markers of possible minor and major depression in many studies (Gibson, McKenzie-McHarg, Shakespeare, Price, & Gray, 2009). It is unlikely that mothers scoring 9 or less would have clinically meaningful levels of depression (Elliott & Leverton, 2000).

In terms of the recommended optimum cut-off score of 13 or more (Matthey et al., 2006), the EPDS has been reported to have a sensitivity of 85.7 to 95.7%, specificity ranging from 77.6 to 93.3%, and positive predictive value (proportion of cases above the threshold meeting the diagnostic criteria) of 43.0 to 75.0 when compared with a diagnosis of major depression established through psychiatric interview at 6 to 12 weeks postpartum (Cox et al., 1987; Harris, Huckle, Thomas, Johns, & Fung, 1989; Murray & Carothers, 1990). Boyce, Stubbs, and Todd (1993) carried out a similar validation study using an EPDS threshold of 13 or more in an Australian sample of mothers with infants aged between 2 and 29 weeks. Consistent with previous research, they reported sensitivity, specificity, and positive predictive value percentages of 100.0, 95.7, and 69.2 respectively. A more recent Australian study returned an impressive positive predictive value of 90.2 percent (Milgrom, Ericksen, Negri, & Gemmill, 2005).

Despite being developed as a unidimensional measure of depression, there is evidence that the EPDS is also a valid measure of postnatal anxiety. Specifically, scores of 4 or more on a 3-item subscale have been shown to detect anxiety disorders (occurring co-morbidly or in isolation) with adequate reliability in a group of 309 women with unsettled infants (Phillips et al., 2009). Similar findings have been reported by others (Brouwers, van Baar, & Pop, 2001; Jomeen, & Martin, 2005; Matthey, 2008; Swalm, Brooks, Doherty, Nathan, & Jacques,
2010; Tuohy & McVey, 2008) and the multidimensional nature of the EPDS is now well-established (Matthey, Fisher, & Rowe, 2013).

**Parenting Stress**

The Parental Stress Scale (PSS; Berry & Jones, 1995) is a self-report questionnaire designed to measure the level of child-related stress experienced by parents. This questionnaire requires a ninth-grade reading level (Jensen, Fabiano, Lopez-Williams, & Chacko, 2006) and consists of 18 items to which subjects respond on a 5-point scale ranging between 1 (*strongly disagree*) and 5 (*strongly agree*). Eight questions are reverse-scored with higher scores reflecting greater parental stress. In developing the PSS item content, its authors aimed to capture a dichotomy of parenting experience. The result was an instrument which assesses parenting stress by weighing the negative themes (demands on resources, opportunity costs, and restrictions) of parenthood against the positive rewards (emotional benefits, self-enrichment, and personal development) it may provide.

In doing so, the PSS focuses solely on the individual’s perceptions and feelings about the parenting experience, unlike more general measures which tend to confound parental stress with marital, financial, and general life stress (Lessenberry & Rehfeldt, 2004). It was developed as an alternative to the more established Parenting Stress Index (PSI; Abidin, 1986). While both measures are designed to assess the same general concept, the PSI is a lengthy and expensive scale which requires a skilled administrator, and was described by Berry and Jones (1995) as highly invasive and unsuitable for parents of normal children. Further, its theoretical and empirical foundation has been heavily criticised (Gresham, 1989). Conversely, the PSS is brief, easy to understand, more applicable to parents of infants, usable from birth, simple to administer and score, and available in the public domain (Berry & Jones, 1995; Oronoz, Alonso-Arbiol, & Balluerka, 2007).

A total of 1276 participants were involved in the development and psychometric evaluation of the PSS (Berry & Jones, 1995). Convergent validity was established by comparison with various stress instruments and via expected associations with a variety of emotional (e.g., guilt, anxiety) and role satisfaction (e.g., marital satisfaction, social support) measures. The validity of the PSS was further demonstrated via significant comparisons with the PSI (Abidin, 1986) and a global measure of life stress (Cohen, Kamarck, & Mermelstein, 1983). Adequate internal consistency was demonstrated ($\alpha = 0.83$), while 6-week test-retest

---

90 Note, however, that Gresham disparages virtually every aspect of the PSI in what reads as a hostile and inequitable review. A more balanced perspective is provided by Wantz (1989) in the same volume.
reliability was commendable ($r = 0.81$). In addition, the PSS was shown to discriminate parents of children with developmental disabilities and others receiving treatment for behavioural/emotional problems from parents with typically developing children. In the SNSP, Cronbach’s alpha was 0.82 at both data collection points.

Interestingly, Berry and Jones (1995) also reported details of a 4-factor\(^91\) underlying structure. However, exploratory factor analyses using present data did not support this or any other unequivocal solution. Further, two attempts to translate the scale into other languages have uncovered a 2-factor structure (Cheung, 2000; Oronoz et al., 2007). As such, interpretation of the PSS data in this thesis has been limited to the full-scale score.

**Parenting Alliance**

The Parenting Alliance Inventory (PAI; Abidin & Brunner, 1995)\(^92\) is a 20-item self-report questionnaire developed to assess the degree to which parents believe that they have a sound working relationship with their child’s other parent. It provides an assessment of how cooperative, communicative, and mutually respectful they are in terms of their parenting responsibilities. Parents grade their responses on a 5-point scale, with 1 (*strongly disagree*) and 5 (*strongly agree*) at its extremes. A seventh grade reading level is required (Jensen et al., 2006). All items are scored in a positive direction with higher scores reflective of a stronger parenting alliance. Although the PAI is aimed at parents of 1- to 19-year-old children, it has been used successfully with parents of infants (e.g., Burney & Leerkes, 2010). In this research, the wording of one item\(^93\) was changed to a more global statement,\(^94\) to increase its relevance to first-time parents of infants. Reliability analyses did not reveal any response anomalies or psychometric issues in relation to the revised item. Chronbach’s alpha was 0.93 and 0.95 at 6 and 12 months, respectively.

In the initial psychometric study, Abidin and Brunner (1995) also reported high levels

---

\(^91\) These factors were labelled Parental Rewards, Parental Stressors, Lack of Control, and Parental Satisfaction. However, the domains lacked clarity with two items associated with more than one latent variable and an additional two items failing to load significantly on any of the dimensions.

\(^92\) This scale is also available commercially as the Parenting Alliance Measure (PAM, Abidin & Konold, 1999). According to Konold and Abidin (2001), the PAM is a refinement of the PAI. However, Abidin (personal communication, June, 2008) advised that “the refinement as described in Konold and Abidin (2001) relates to the factor structure and the gender of the parent. The items, instructions, and basic scoring for both scales are identical and therefore research results for the PAI can be generalized to the PAM.” More precisely, Konold and Abidin reported details of a new 2-factor model which is different for mothers and fathers. A series of exploratory factor analyses using data from the current project did not reproduce this factor structure, and nor did they result in any consistent or clearly interpretable solution. Hence, interpretation of the PAI results is limited to the full-scale scores in this thesis.

\(^93\) “If our child needs to be punished, my child’s other parent and I usually agree on the type of punishment.”

\(^94\) “My child’s other parent and I agree on how you should punish a misbehaving child.”
of internal consistency ($r = 0.97$) and the capacity of the PAI to discriminate between single, married, separated, and divorced women. The test-retest reliability after a 4- to 6-week period was satisfactory ($r = 0.80$). Scores on the PAI correlated in expected fashion with established marital adjustment, parenting stress, and parental attitudes instruments, as well as various measures of child adjustment and functioning. In particular, high scorers on the PAI were more likely to experience their child as a source of positive reinforcement and have an authoritative parenting style. These correlates were unrelated to marriage satisfaction, supporting the independence of parenting alliance construct from overall marital adjustment.

Independent evidence of the PAI’s predictive validity has been reported by Bearss and Eyberg (1998) who found a strong relationship between maternal parenting alliance scores and a measure of child behavioural adjustment. This association remained meaningful and significant after controlling for marital quality. Although this same measure of marital adjustment was moderately correlated with parenting alliance, it was not significantly related to child behaviour problems. This research provided strong evidence of both the parenting alliance theory and the utility of the PAI in measuring this construct.

**Summary of the Study Variables**

The parent questionnaire contains many items tapping additional relevant information (e.g., feeding practices, child illness). For clarity, Table 42 (Appendix G) provides a summary of all research variables, including those pertaining to the instruments described above. The aim is to familiarise the interested reader with the assessment components of this project and provide a practical reference point for the study reports that follow.

**Characteristics of the Sample**

**Parent Characteristics**

Table 5 presents the parent demographic characteristics of the final sample of 354. Mothers were generally well-educated, married, and an average of 2 years younger than their partners. The rate of marriage was similar to the marriage ratio among all Victorian parents following a birth (75.3%, Riley & Halliday, 2001). On average, sample mothers were 2 years older than the mean age of first-time mothers in Victoria (Riley & Halliday, 2001). The largest discrepancy in terms of the representativeness of the sample was with regard to residential location. In Victoria, approximately 26.2% of births occur in rural locations.
Table 5

*Parent Demographic Characteristics*

<table>
<thead>
<tr>
<th>Parent Characteristics</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (M years)</td>
<td></td>
</tr>
<tr>
<td>Maternal</td>
<td>29.8</td>
</tr>
<tr>
<td>Paternal</td>
<td>32.2</td>
</tr>
<tr>
<td>Maternal Education (University degree %)</td>
<td>49.8</td>
</tr>
<tr>
<td>Relationship Status (%)</td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>73.8</td>
</tr>
<tr>
<td>De facto</td>
<td>19.9</td>
</tr>
<tr>
<td>Single</td>
<td>3.4</td>
</tr>
<tr>
<td>Residential Location (Metropolitan %)</td>
<td>53.7</td>
</tr>
<tr>
<td>Pretest EPDS (M)</td>
<td></td>
</tr>
<tr>
<td>Study 1 (N = 354)</td>
<td></td>
</tr>
<tr>
<td>Intervention (n = 177)</td>
<td>6.3</td>
</tr>
<tr>
<td>Control (n = 177)</td>
<td>6.0</td>
</tr>
<tr>
<td>Study 2 (N = 354)</td>
<td>6.2</td>
</tr>
<tr>
<td>Study 3 (N = 80)</td>
<td></td>
</tr>
<tr>
<td>Enduring Healthy Sleep Pattern (n = 40)</td>
<td>5.9*</td>
</tr>
<tr>
<td>Persistent Sleep Problem (n = 40)</td>
<td>7.6*</td>
</tr>
</tbody>
</table>

*Note.* EPDS = Edinburgh Postnatal Depression Scale.
Percentages may not total 100.0 due to rounding.
* * *<br>*p < .05.*

(Riley & Halliday, 2001); however, 46.3% of the study participants were from country regions. This statistic is probably reflective of the relatively large number of M&CH Service Coordinators from non-metropolitan or rural LGAs indicating their willingness to be involved in the research.\(^95\)

While the Study 1 mean pretest EPDS scores did not differ significantly between the

\(^95\) It is difficult to determine whether the metropolitan/rural boundaries used in this study (based on LGA) were the same as those used in the Victorian statistical records, but any differences are likely to be minor.
groups, control mothers, on average, completed their pretest EPDS 37 days later than intervention mothers.\textsuperscript{96} Therefore, as an additional check, further analyses were conducted using mothers who completed this measure within 60 days of childbirth and between 61 and 120 days postpartum. No significant differences were revealed. However, mean pretest EPDS scores differed significantly between the Study 3 groups ($F(1, 78) = 4.02$, $p < .05$, partial $\eta^2 = .049$) with no timing of assessment anomalies.

**Infant Characteristics**

The infant demographic characteristics are shown in Table 6. Infants were typically healthy babies born approximately at term, and delivered vaginally following a half day of labour and weighing an average of 3500 grams (7lb 11.5oz). In Victoria, 92.6\% of newborns record an APGAR\textsuperscript{97} of 9 or 10 at 5 minutes (Riley & Halliday, 2001), almost identical to the corresponding sample percentage of 92.7. The APGAR mode was 9 at each time of measurement. The rate of caesarean births was similar to the Victorian percentage of 22.6 while a gestation period of greater than 37 weeks was observed in 95.2\% of participants compared to the Victorian ratio of 93.7\% (Riley & Halliday, 2001).

Table 6

*Infant Demographic Characteristics*

<table>
<thead>
<tr>
<th>Infant Characteristics</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex (Male %)</td>
<td>50.2</td>
</tr>
<tr>
<td>Gestation Period (M weeks)</td>
<td>39.6</td>
</tr>
<tr>
<td>Labour (M hours)</td>
<td>12.2</td>
</tr>
<tr>
<td>Delivery Type (%)</td>
<td></td>
</tr>
<tr>
<td>Caesarean</td>
<td>23.3</td>
</tr>
<tr>
<td>Normal</td>
<td>50.9</td>
</tr>
<tr>
<td>Forceps</td>
<td>12.1</td>
</tr>
<tr>
<td>Vacuum extraction</td>
<td>12.5</td>
</tr>
<tr>
<td>Other</td>
<td>1.2</td>
</tr>
</tbody>
</table>

\textsuperscript{96} As explained earlier, some registrants late to the study were included as controls, skewing this figure.

\textsuperscript{97} The APGAR score is an objective evaluation system of newborn health based on heart rate, respiratory effort, muscle tone, reflex irritability, and colour (Apgar, 1953; Apgar, Holaday, James, Weisbrot, & Berrien, 1958) which has stood the test of time (Finster & Wood, 2005). Dr Apgar intended her score to be used 1 minute after birth but it is also repeated at 5 minutes. A score of 10 indicates an infant in the best possible condition.
### Infant Characteristics

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>APGAR (M)</strong></td>
<td></td>
</tr>
<tr>
<td>1 Min</td>
<td>8.1</td>
</tr>
<tr>
<td>5 Min</td>
<td>9.2</td>
</tr>
<tr>
<td><strong>Birth Weight (M grams)</strong></td>
<td>3500.4</td>
</tr>
<tr>
<td><strong>Age at Recruitment (M weeks)</strong></td>
<td>9.2</td>
</tr>
<tr>
<td>Intervention (n = 175)</td>
<td>6.3</td>
</tr>
<tr>
<td>Control (n = 177)</td>
<td>11.9</td>
</tr>
<tr>
<td><strong>Infantile Colic Symptoms (%)</strong></td>
<td>26.1</td>
</tr>
<tr>
<td>Hours per night (M)</td>
<td>3.0</td>
</tr>
<tr>
<td>Colicky period (M weeks)</td>
<td>8.3</td>
</tr>
<tr>
<td>Colic ceased (M weeks)</td>
<td>11.1</td>
</tr>
</tbody>
</table>

### Feeding (%)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>6 Months</strong></td>
<td></td>
</tr>
<tr>
<td>Exclusive breastfeeding</td>
<td>56.2</td>
</tr>
<tr>
<td>Breastfed &amp; formula/other</td>
<td>16.1</td>
</tr>
<tr>
<td>Formula/other only</td>
<td>24.6</td>
</tr>
<tr>
<td>Formula/other, never breastfed</td>
<td>3.1</td>
</tr>
<tr>
<td><strong>12 Months</strong></td>
<td></td>
</tr>
<tr>
<td>Exclusive breastfeeding</td>
<td>10.2</td>
</tr>
<tr>
<td>Breastfed &amp; formula/other</td>
<td>21.8</td>
</tr>
<tr>
<td>Formula/other only</td>
<td>65.0</td>
</tr>
<tr>
<td>Formula/other, never breastfed</td>
<td>3.1</td>
</tr>
</tbody>
</table>

*Note.* Percentages may not total 100.0 due to rounding.

*Skewed due to the later recruitment of some control infants (n = 36) as described in the sampling procedure. *Refers only to the type of milk provided to the baby (i.e., takes no account of when solid foods were first introduced).
Almost all infants were breastfed initially, with one in three still receiving breastmilk at 12 months. Over the course of the 12-month period, infants were breastfed for an average of 8.6 months (37.2 weeks) or, with infants who were never breastfed \((n = 11)\) included in the analysis, 8.3 months (36.1 weeks). About a quarter of infants comprising the sample were reported to have experienced symptoms of infantile colic at some point in their development (26.1\%). This figure is very similar to the rate of new cases of colic identified at 6 weeks and 3 months (27.1\%) by Clifford et al. (2002b)\(^98\) and approximately 30\% of infants in the ATP who experienced moderate to severe colic symptoms (Prior, Sanson, Smart, & Oberklaid, 2000).

---

\(^{98}\) Does not include cases that began and remitted outside the data collection points.
CHAPTER 7

Study 1: The Efficacy of Written Anticipatory Guidance in the Prevention of Infant Sleep Disturbance

I read all the major books on baby sleep. Here is what I learned...Don’t let your baby sleep too long, except when they’ve been napping too much, then you should wake them. Never wake a sleeping baby. Any baby problem can be solved by putting them to bed earlier, even if they are waking up too early. If your baby wakes up too early, put them to bed later or cut out a nap. Don’t let them nap after 5 pm. Sleep begets sleep, so try to get your child to sleep as much as possible. Put the baby to bed awake but drowsy. Don’t wake the baby if it fell asleep while nursing...Sleep when the baby sleeps. Clean when the baby cleans. Don’t worry. Stress causes your baby stress and a stressed baby won’t sleep. (Neyer, 2013)

Paediatric sleep disturbance continues to pervade modern societies at alarming rates with wide-scale prevention programs yet to be realised. This is remarkable, considering the individual, family, and community costs of problematic childhood sleep. A compelling issue for prevention theorists is the active role that parents play in the biobehavioural organisation and adaptation of their newborn children, including the emergence of the sleep-wake rhythm. Although the dramatic evolution of infant sleep during the first year of life is propelled by underlying biological forces, it is facilitated and augmented by environmental influences, including patterns of caregiving (Becker, Brazy, & Grunwald, 1997; Sadeh & Anders, 1993).

A mature and stable sleep-wake rhythm emerges in the context of parent-child interactions which encourage self-regulation via developmentally appropriate challenges and opportunities for mastery (Benoit et al., 1992; Sadeh, Mindell, & Owens, 2011; Sroufe, 2000; St James-Roberts, 2007; Winnicott, 1953). Conversely, failure to provide a caregiving environment accommodating of the emerging circadian rhythm may hinder the child’s capacity for self-regulation (Benoit et al., 1992). The vulnerability of this complex developmental process is manifested in the high rates of paediatric sleep disturbance across many countries and cultures (Mindell, Sadeh, Wiegand, et al., 2010; Sadeh et al., 1995; Sadeh, Raviv, & Gruber, 2000).

Fortunately, an important inference is that teaching parents how to facilitate the development of healthy sleep patterns from an early age may reduce the incidence of
childhood sleep disorders. Impetus for the use of preventive education programs has emerged from the treatment literature, which has consistently demonstrated the value of focussing on parents as the agents of change (Schwichtenberg & Goodlin-Jones, 2010; Tikotzky & Sadeh, 2009). On balance, parent education about adaptive sleep strategies and practices may be the most acceptable, effective, economical, time-efficient, and ethical approach to behaviourally-based paediatric sleep problems (Adachi et al., 2009; Kuhn & Roane, 2012; Mindell et al., 2006; St James-Roberts et al., 2001).

The overarching goal of parent education and prevention programs is for the child to learn how to settle to sleep independently; at bedtime, and following normal awakenings during the night (Ferber, 2006; Wolfson, 1998). Parents are typically provided with information about normal sleep and cry patterns, appropriate sleep onset associations, the importance of a predictable environment, and methods of reducing infant stimulation (Cook et al., 2012; Kuhn & Roane, 2012; Mindell et al., 2006). The aim of preventive education is to guide parents in supporting their infant’s early sleep skill development while avoiding the inadvertent reinforcement of maladaptive night-time behaviours (Forbes, 2006). Although research into the prevention of paediatric sleep problems has demonstrated promising results, there is no published evidence of community-wide uptake, suggesting that more work is required before universal approaches become a reality.

Indeed, studies to date have typically involved initial training and follow-up support arrangements which render them cost-prohibitive for universal implementation. In addition, an emphasis on infant sleep outcome measures has meant that there is virtually no data regarding parental behavioural changes following preventive interventions (Adachi et al., 2009; Stremler et al., 2006). Such programs are of limited practical use considering the range of priorities competing for available government funding (CoAG, 2009);99 and the fragmented, disparate, and uncertain system of resource allocation for illness prevention and health promotion in Australia (Harris & Mortimer, 2009). It is vital that preventive interventions have the capacity to impact large numbers of families at a suitable fraction of the monetary and time investment of later treatment.

Remarkably, no work has investigated the use of a pure written information-only approach to the prevention of childhood sleep disturbance. The success of interventions providing minimal face-to-face training supported by written anticipatory guidance (e.g.,

---

99 While there has been increased recognition of the need for preventive interventions in recent years (Department of Health and Ageing [DoHA], 2010), particularly among children (CoAG, 2009; DoHA, 2009; National Public Health Partnership, 2005), in real terms, the health budget allocation to mental health is in decline (Rosenberg & Hickie, 2013).
Symon et al., 2005) suggests that many parents might benefit from well-presented, written information that could be consulted at a convenient time. Moreover, studies of children with established sleep problems indicate that parents are capable of successfully absorbing and implementing the requirements of a treatment program in written format (Eckerberg, 2002; Seymour et al., 1989).

This study represents the first systematic evaluation of a written anticipatory guidance approach to the prevention of paediatric sleep disturbance. On this occasion, the intervention is a concise, well-organised, and user-friendly pamphlet entitled Baby Sleep, which provides practical assistance from birth. As a test of the efficacy of this intervention, reports of caregiving practices, maternal well-being, and infant sleep are expected to differ significantly between families receiving the parent tip sheet soon after birth, and families not privy to this resource, at both 6 and 12 months postpartum.100

With deference to the theoretical models of child sleep presented in Chapter 4 (see Figures 6 & 7), it is predicted that mothers receiving the written advice will report more adaptive cognitions about infant sleep than those not privy to this information. As a result, intervention mothers will be significantly more likely to demonstrate parenting behaviours thought to be associated with the development of healthy infant sleep patterns at bedtime and following night-wakings. To the extent that the advice in the parent tip sheet is successful in encouraging adaptive maternal cognitions and related non-stimulatory caregiving strategies, it is anticipated that the intervention group infants will exhibit significantly superior sleep patterns in comparison with controls.

The expectation is that group differences will be evident on both the prospective infant sleep diary and retrospective maternal report, and also borne out across a range of additional risk and protective variables, at each time of measurement. It is envisaged that participants receiving the parent tip sheet will report significantly lower levels of maternal depression and parenting stress. In addition, intervention mothers will be more unified with their partner in terms of night-time parenting strategies and report a stronger parenting alliance than their control contemporaries. However, there is less confidence in these latter predictions since the intervention effect size is presumed to be small, and in the literature, the

100 In this thesis, global rather than specific hypotheses are provided. Notwithstanding the exploratory nature of the research, the intention is to synthesise the large numbers of variables under investigation and avoid unnecessary repetition. Thus, rather than offering numerous specific predictions at the beginning of each study report, more general expectations in terms of a reasonably self-explanatory adaptive/maladaptive outcome dichotomy (e.g., adaptive vs. maladaptive maternal cognitions, non-stimulatory vs. stimulatory caregiving strategies) are offered. A more detailed explanation on each subset of these predictions (e.g., limit-setting cognitions, rocking the child to sleep) will be provided as the study unfolds.
relationship between infant sleep problems and these variables is more ambiguous or unknown.

**METHOD**

**Participants**

Participants were 354 first-time mothers ($M = 29.84$ years, $SD = 4.22$ years, $R = 18–44$ years) of healthy, normally developing newborn babies recruited from M&CH Centres throughout Victoria, Australia. These subjects were drawn from an original sample of 412 mothers ($M = 29.67$ years, $SD = 4.51$ years, $R = 18–44$ years) on the basis of having attempted all requirements of the study. The detailed characteristics of the participants have been specified in the General Method. Both the intervention and control groups were comprised of 177 participants. There were no significant between-group differences on any of the parent or infant demographic variables (see Tables 5 & 6).

**Materials**

The Baby Sleep parent tip sheet (Watts et al., 2000) is a glossy pamphlet, comprised of six (fold-out) A4 pages. The development of this resource has been described previously.

**Measures**

Demographic information was gathered as a part of the registration process. The MCISQ (Morrell, 1999b) was used to assess mothers’ beliefs and thoughts about infant sleep; parental approaches to infant feeding and sleeping were determined using specific items on the parent questionnaire; infant sleep quality and patterns were examined prospectively using the SBS (Richman, 1981) by way of a 4-day infant sleep diary (Wolfson, 1998; Wolfson et al., 1992), and retrospectively via the ISQ (Morrell, 1999a); the EPDS (Cox et al., 1987) was employed as a measure of maternal depression; stress associated with the parenting role was indexed using the PSS (Berry & Jones, 1995); and co-parenting quality was assessed with the PAI (Abidin & Brunner, 1995). The particulars and/or psychometric properties of these instruments have been detailed earlier.

**Procedure**

All prospective participants completed a Registration of Interest form, which involved basic demographic information, a pretest EPDS, and written informed consent. Registrants
meeting the study inclusion criteria were quasi-randomly allocated to one of two conditions, as described in the General Method. Mothers assigned to the intervention group received a copy of the Baby Sleep parent tip sheet via mail. At 6 and 12 months postpartum, subjects completed a 4-day infant sleep diary and parent questionnaire. All participants had access to routine care from their local M&CH Service over the 12-month period of the study.

Data Analyses

A series of multivariate and univariate tests were conducted to assess the efficacy of providing first-time mothers of healthy newborn babies with written anticipatory guidance about infant sleep. The aim was to determine whether participants receiving the written advice differed significantly from control mothers in terms of their mean scores across a broad range of variables thought to be associated with infant sleep behaviours during the first year of life. Additional similar comparisons considered whether the infants of participants varied in their actual sleep patterns relative to group membership. For comprehensive details of the constructs/variables utilised in these analyses, please refer to Appendix G.

RESULTS

Parent Cognitions, Strategies, and Behaviours

Infant Sleep Location

A series of exploratory analyses were conducted to examine whether the provision of written information about infant sleep influenced the sleeping location of the child (i.e., within the parental bedroom vs. in his/her own room) over the course of the first 12 months. Preliminary inspection of the data revealed that on arrival immediately from hospital, 96 intervention infants and 112 control infants were sleeping within their parents’ bedroom. This difference was not statistically significant, suggesting that it was a chance finding.

At 6 months, 79 (82.3%) of the intervention infants previously sleeping with their parents had moved to their own room compared with just 66 (58.9%) control children. This left 17 (9.6%) 6-month-old intervention and 46 (26.0%) control infants sleeping within the parental bedroom. By 12 months, just 9 (5.1%) intervention group and 21 (11.9%) control group infants continued to sleep in their parents’ room. This appeared to be a relatively even

101 The decision regarding each infant’s sleeping location as a newborn could not have been influenced by the parent tip sheet as it was not available to any parents prior to the baby’s first night at home.
distribution, given the slight difference in initial sleeping locations. Analysis of covariance (ANCOVA) was used to examine whether there were any parent tip sheet treatment effects. To control for the initial group discrepancy referred to above, a series of between-subjects analyses were conducted with newborn sleeping location as a covariate. Findings revealed that mothers privy to the parent tip sheet were significantly more likely to have their infant sleeping in his/her own room at 6 months than were mothers who were not sent the written advice ($F(1, 351) = 13.81, p < .001, \eta^2 = .038$), an unanticipated finding. Since most infants had moved to their own room by 12 months, there was no significant difference between the groups at this point.

Parents were additionally questioned about the pattern of their infant’s main sleeping location throughout the first and second six months of life. Over the first 26 weeks, control infants spent an average of 11.18 weeks sleeping in their parents’ room compared to 6.97 by intervention infants. During the second six months, control children spent a mean of 3.6 weeks sleeping in the parental bedroom, with intervention parents reporting a corresponding mean figure of 1.7 weeks. Over the course of the entire 52 weeks, infants in the control group spent an average of 15.6 weeks sleeping in their parents’ rooms while intervention infants spent just 9.0 weeks. With the variation due to the initial room location statistically controlled, infants in the intervention group spent, on average, more time sleeping in their own bedroom than control infants throughout the first 12 months of life. Findings were significant in separate analyses relating to the first six months of life ($F(1, 351) = 15.34, p < .001, \eta^2 = .042$), the second six months ($F(1, 351) = 8.19, p < .01, \eta^2 = .023$), and the 12-month period as a whole ($F(1, 351) = 14.54, p < .001, \eta^2 = .040$). Considering the tip sheet content, none of the above results might have been reasonably forecast.

**Maternal Cognitions**

The next analyses investigated whether the provision of early anticipatory guidance was associated with differences in mothers’ cognitions about infant sleep. At 6 months, MCISQ total scale scores differed significantly between the groups ($F(1, 335) = 4.75, p < .05, \eta^2 = .014$). As forecast, intervention mothers were significantly more likely to report adaptive beliefs and thoughts about their infant’s sleep than those allocated to the control condition. Comparison of the subscale scores revealed two significant results. Mothers who had been sent the written advice were significantly less prone to problematic cognitions involving limit-setting ($F(1, 344) = 15.97, p < .001, \eta^2 = .044$) and doubts about night-time parenting competence ($F(1, 347) = 4.91, p < .05, \eta^2 = .014$) than were controls.
The results at 12 months were somewhat unexpected. There was no significant difference between the groups in terms of the mean MCISQ total scale scores. However, there were three significant results pertaining to the subscale scores. As anticipated, maternal cognitions relating to limit-setting were significantly more adaptive among the intervention group mothers \( (F(1, 349) = 11.10, p < .001, \eta^2 = .031) \). Contrary to expectations, mothers who were privy to the parent tip sheet reported significantly more maladaptive cognitions in terms of anger \( (F(1, 347) = 5.44, p < .05, \eta^2 = .015) \) and safety \( F(1, 352) = 5.48, p < .05, \eta^2 = .015) \). Intervention mothers conceded more feelings of intolerable anger, regret, and helplessness in relation to their infant’s demands at night, and more concerns about the possibility of SIDS at 12 months.

**Parental Involvement at Bedtime**

At each time of measurement there were significant differences in two important parental practices at the beginning of the night—both result sets support the efficacy of the Baby Sleep parent tip sheet. At 6 months, 140 (79.1%) intervention group parents reported that their infants were awake when placed in their crib at bedtime compared to 118 (66.7%) in the control group \( (F(1, 352) = 7.02, p < .01, \eta^2 = .020) \). By 12 months, more than 4 out of 5 infants across the sample were placed in their cribs awake. However, the 24 (13.6%) intervention and 38 (21.5%) control infants who were already asleep when placed in their cribs by their parents still represented a significant difference between the groups \( F(1, 352) = 3.85, p < .05, \eta^2 = .011) \). While there was a tendency to move to a more adaptive strategy over time, a similar number of intervention group parents were putting their child to bed awake at 6 months \( n = 140 \) as were controls at 12 months \( n = 139 \).

The second behaviour relating to bedtime settling involved whether or not parents intervened in their infant’s initial sleep onset. As Table 7 shows, four main methods of active physical comforting were reported. At 6 months, significant group differences were found in the percentages of parents using rocking and feeding to induce sleep. Overall, 99 (55.9%) control group parents assisted their infant to fall asleep in some way at bedtime compared to just 66 (37.3%) parents privy to the tip sheet information, a further significant result. A similar pattern was evident when the infants were 12 months old, with rocking and feeding strategies used by significantly more control parents. In total, 69 (39.0%) control group parents continued to utilise one or more stimulatory strategy at bedtime, representing a further significant premium on the 44 (24.9%) intervention group parents who acknowledged engaging in this practice. Again, the percentage of control group parents using the more
Table 7

Group Percentages of Parents using Various Methods of Assisting their 6- and 12-Month-Old Infants to Fall Asleep at Bedtime

<table>
<thead>
<tr>
<th>Age/Bedtime Strategy</th>
<th>Group</th>
<th>F(1, 352)</th>
<th>p</th>
<th>η²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intervention</td>
<td>Control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Months</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rocking</td>
<td>8.5</td>
<td>16.4</td>
<td>5.13</td>
<td>&lt; .05</td>
</tr>
<tr>
<td>Feeding</td>
<td>17.5</td>
<td>31.1</td>
<td>9.02</td>
<td>&lt; .01</td>
</tr>
<tr>
<td>Parental presenceᵇ</td>
<td>6.2</td>
<td>9.6</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Music/musical toy</td>
<td>15.8</td>
<td>14.1</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Otherᶜ</td>
<td>0.6</td>
<td>1.1</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Totalᵈ</td>
<td>37.3</td>
<td>55.9</td>
<td>12.74</td>
<td>&lt; .01</td>
</tr>
<tr>
<td>12 Months</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rocking</td>
<td>6.8</td>
<td>13.6</td>
<td>4.48</td>
<td>&lt; .05</td>
</tr>
<tr>
<td>Feeding</td>
<td>11.3</td>
<td>20.3</td>
<td>5.48</td>
<td>&lt; .05</td>
</tr>
<tr>
<td>Parental presenceᵇ</td>
<td>7.3</td>
<td>11.9</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Music/musical toy</td>
<td>7.9</td>
<td>6.2</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Otherᶜ</td>
<td>0.0</td>
<td>1.7</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Totalᵈ</td>
<td>24.9</td>
<td>39.0</td>
<td>8.27</td>
<td>&lt; .01</td>
</tr>
</tbody>
</table>

Note. ns = not statistically significant.

ᵃ n = 177. b Includes gentle patting/massaging. c All other reported practices (e.g., driving around in a car until asleep). d Percentage of parents using one or more strategies.

The adaptive bedtime strategy did not approach that of the intervention group until 6 months later.

To facilitate comparison with a well-known prevention study by Adair et al. (1992), further analyses were conducted to investigate the levels of parental presence (including rocking and feeding) at the child’s bedtime. At 6 months, 83 (46.9%) control parents were present at sleep onset compared to 46 (26.0%) in the intervention group (F(1, 352) = 17.42, p < .001, η² = .047). When the infants were 12 months old, 61 (34.5%) parents in the control group continued to offer a bedtime presence as opposed to just 34 (19.2%) members of the intervention group (F(1, 352) = 10.75, p < .01, η² = .030).
Pacifier Use

The next set of analyses examined the use of pacifiers at bedtime. Parents were asked to rate how often their child fell asleep each night using a pacifier on a 3-point scale, as detailed in Table 8. Chi-square tests at 6 or 12 months found no significant relationships between pacifier use and group membership. Contrary to expectations, the parent tip sheet was not successful in influencing parents to avoid using pacifiers with their infants.

Table 8
Group Comparison of Infant Bedtime Pacifier Use at 6 and 12 Months

<table>
<thead>
<tr>
<th>Group</th>
<th>Frequency of Use</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Never</td>
<td>Sometimes</td>
</tr>
<tr>
<td>6 Months</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention</td>
<td>92 (52.0)</td>
<td>31 (17.5)</td>
<td>54 (30.5)</td>
</tr>
<tr>
<td>Control</td>
<td>83 (46.9)</td>
<td>37 (20.9)</td>
<td>57 (32.2)</td>
</tr>
<tr>
<td>Total</td>
<td>175 (49.4)</td>
<td>68 (19.2)</td>
<td>111 (31.4)</td>
</tr>
<tr>
<td>12 Months</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention</td>
<td>94 (53.1)</td>
<td>12 (6.8)</td>
<td>71 (40.1)</td>
</tr>
<tr>
<td>Control</td>
<td>97 (54.8)</td>
<td>16 (9.0)</td>
<td>64 (36.2)</td>
</tr>
<tr>
<td>Total</td>
<td>191 (54.0)</td>
<td>28 (7.9)</td>
<td>135 (38.1)</td>
</tr>
</tbody>
</table>

*Note.* Percentage within group shown in brackets.

*Note.* \( n = 177. \)

Use of Transitional Objects

Participants were also asked whether or not their infants slept with a favourite transitional object (such as a teddy bear or special blanket) each night. Overall, 69 (19.5%) parents reported the use of a sleep attachment object by their infant at 6 months, with the corresponding 12-month figure increasing to 123 (34.9%). Surprisingly, the relative use of attachment objects was almost identical between the groups with the parent tip sheet failing to inspire a significant increase in the utilisation of transitional objects over the first 12 months.
Typical Parent Response to Infant Night-Waking

Immediacy of Response

Parents were then asked about their typical reaction if they were to hear their child crying during the night. As shown in Table 9, three possible categories of response were available. A chi-square test found no significant difference in these parental behaviours at 6 months, although group differences were in the expected direction. At 12 months, however, the group disparity in parental behaviours appeared to have increased somewhat, and this result was statistically significant ($\chi^2(2, N = 354) = 18.08, p < .001$).

Table 9
Typical Parent Response to Infant Night-Crying at 6 and 12 Months by Group

<table>
<thead>
<tr>
<th>Group</th>
<th>Ignore</th>
<th>Wait before attending</th>
<th>Attend immediately</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>6 Months</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention</td>
<td>3 (1.7)</td>
<td>121 (68.4)</td>
<td>53 (29.9)</td>
</tr>
<tr>
<td>Control$^a$</td>
<td>1 (0.6)</td>
<td>107 (61.1)</td>
<td>67 (38.3)</td>
</tr>
<tr>
<td><strong>12 Months</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention</td>
<td>12 (6.5)</td>
<td>151 (81.2)</td>
<td>23 (12.4)</td>
</tr>
<tr>
<td>Control</td>
<td>5 (2.8)</td>
<td>123 (69.5)</td>
<td>49 (27.7)</td>
</tr>
</tbody>
</table>

*Note.* Percentage within group shown in brackets.

$^a$ $n = 175$, all other groups $n = 177$.

Consistent with the written advice, intervention parents estimated waiting a significantly longer period of time before attending to their child than did controls. At 6 months, parents in receipt of the tip sheet reported a mean attending delay of 4 minutes and 10 seconds compared to 2 minutes and 47 seconds among control group parents ($F(1, 346) = 10.68, p < .01, \eta^2 = .030$). Corresponding figures at 12 months were, again, slightly more divergent at 3 minutes and 30 seconds, and 5 minutes and 4 seconds ($F(1, 335) = 13.05, p < .001, \eta^2 = .037$), respectively. At both data collection points, intervention parents waited about a minute and a half longer than controls before attending to their waking child.

$^{102}$ Parents who reported ignoring all crying were excluded from these analyses.
**Nature of the Response**

As forecast, parents of 6-month-old infants who had been sent the written anticipatory guidance were significantly less likely to respond to infant night-waking with maladaptive strategies than were parents allocated to the control group \( F(1, 352) = 13.69, p < .001, \eta^2 = .037 \). Eighty-two (46.3%) intervention group parents reported responding to night-waking with active physical comforting, compared to 116 (65.5%) controls.

Specifically, control group parents were significantly more likely to use the following strategies when their child woke at night: feeding \( F(1, 352) = 16.10, p < .001, \eta^2 = .044 \); rocking and/or holding \( F(1, 352) = 11.76, p < .01, \eta^2 = .032 \); and bringing the child to the parental bed \( F(1, 352) = 8.09, p < .01, \eta^2 = .022 \). The difference between the groups remained significant at 12 months with 61 (34.5%) tip sheet recipients acknowledging their use of night-time stimulatory practices compared to 83 (46.9%) of their fellow control participants \( F(1, 352) = 5.73, p < .05, \eta^2 = .016 \). Control parents were significantly more likely to feed their waking child \( F(1, 352) = 6.54, p < .05, \eta^2 = .018 \); and bring him/her to their bed \( F(1, 352) = 4.88, p < .05, \eta^2 = .014 \).

**Phasing Out of Night-Feeding**

In support of the written anticipatory guidance, there were significant group differences in parental night-feeding practices. At 6 months, 165 (46.6%) participants reported continuing to feed their infant at least once during the night. A significantly higher 103 (58.2%) control group infants were regular night-feeders compared to 62 (35.0%) intervention infants \( F(1, 352) = 20.06, p < .001, \eta^2 = .049 \). At 12 months, just 47 (13.3%) parents across the entire sample persisted with regular night-feeding and three-quarters of these were controls. Only 12 (6.8%) parents privy to the tip sheet continued to regularly feed their infants nocturnally compared to 35 (19.8%) control group parents, a further significant discrepancy \( F(1, 352) = 13.40, p < .001, \eta^2 = .037 \).

Over the course of the first year, mothers without access to the Baby Sleep parent tip sheet persisted with night-feeding for an average of just over 7 months (30.9 weeks). The comparable figure was 7 weeks (23.7 weeks) less among intervention group mothers \( F(1, 344) = 18.08, p < .001, \eta^2 = .050 \). Further analyses were conducted using just the parents who were no longer feeding at night. Among these mothers, there was a significant group difference in the mean age of their child when they ceased regular night-feeding \( F(1, 297) = 6.51, p < .05, \eta^2 = .021 \). On average, control group parents \( n = 142 \) reported ending night-
feeds at about the sixth month postpartum (25.5 weeks) with parents allocated to the written prevention advice condition \( n = 165 \) ceasing 4 weeks earlier (21.5 weeks). Despite these findings, there were no significant group differences in breastfeeding practices, including the duration of breastfeeding over the course of the 12-month period.

**Infant Sleep Outcomes**

**Raw Sleep Measure Scores**

Below and continuing onto the next page, Table 10 presents the raw figures obtained from the prospective infant sleep diary and retrospective parent questionnaire. Visual inspection of the data revealed reasonable agreement between the two instruments,\(^{103}\) with 12-month ISQ-reported night-time resettling the only counterintuitive outcome. It did appear though, that when parents completed the survey they may have underestimated the frequency of their infants’ night-waking as well as their average resettling time. For example, at 6 months, the average time awake per waking was in excess of 28 minutes according to diary records.\(^{104}\) On the ISQ, however, just 14.7% of participants indicated a typical resettling time of 20 minutes or more. Nevertheless, on each measure, at each age, control group parents reported that their infants woke more often each night and on more nights of the week, on average, than did their intervention contemporaries. To determine the statistical significance of these and other possible group discrepancies, data from the infant sleep diary and parent questionnaire was examined separately.

<table>
<thead>
<tr>
<th>Sleep Dimension</th>
<th>Group</th>
<th>6 Months</th>
<th></th>
<th>12 Months</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Diary</td>
<td>ISQ</td>
<td>Diary</td>
<td>ISQ</td>
</tr>
<tr>
<td>Sleep onset delay (min:s)</td>
<td>Intervention</td>
<td>11:20</td>
<td>9:52</td>
<td>11:35</td>
<td>10:22</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>11:29</td>
<td>12:29</td>
<td>11:54</td>
<td>11:06</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td>11:25</td>
<td>11:00</td>
<td>11:45</td>
<td>10:44</td>
</tr>
</tbody>
</table>

\(^{103}\) Note that it is difficult to precisely assess the degree of concordance between the measures, since some factors are unique to one instrument, and common dimensions have been mostly derived using slightly different approaches. For example, the questionnaire (10 min) and sleep diary (15 min) use different units of time.

\(^{104}\) Again, this is an imprecise figure based 15-minute blocks of time.
<table>
<thead>
<tr>
<th>Sleep Dimension</th>
<th>Group</th>
<th>6 Months</th>
<th>12 Months</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Diary</td>
<td>ISQ</td>
</tr>
<tr>
<td>Settling problems (nights/week)</td>
<td>Intervention</td>
<td>0.86</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>1.27</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td>1.06</td>
<td></td>
</tr>
<tr>
<td>Average bedtime</td>
<td>Intervention</td>
<td>8.08 p.m.</td>
<td>8.00 p.m.</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>8.11 p.m.</td>
<td>8.04 p.m.</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td>8.09 p.m.</td>
<td>8.02 p.m.</td>
</tr>
<tr>
<td>Night sleep hours</td>
<td>Intervention</td>
<td>10 hr 10 min</td>
<td>10 hr 39 min</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>9 hr 53 min</td>
<td>10 hr 22 min</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td>10 hr 02 min</td>
<td>10 hr 30 min</td>
</tr>
<tr>
<td>Night-waking (nights per week)</td>
<td>Intervention</td>
<td>3.87</td>
<td>2.72</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>5.07</td>
<td>4.39</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td>4.48</td>
<td>3.56</td>
</tr>
<tr>
<td>Night-waking (per night)</td>
<td>Intervention</td>
<td>0.95</td>
<td>0.86</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>1.36</td>
<td>1.36</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td>1.16</td>
<td>1.11</td>
</tr>
<tr>
<td>Resetsleeping time (min:s)</td>
<td>Intervention</td>
<td>24:53</td>
<td>10:46</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>31:27</td>
<td>10:53</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td>28:11</td>
<td>10:49</td>
</tr>
<tr>
<td>Co-sleeping (nights per week)</td>
<td>Intervention</td>
<td>0.27</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>0.85</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td>0.56</td>
<td></td>
</tr>
<tr>
<td>Co-sleeping (hours per week)</td>
<td>Intervention</td>
<td>3 hr 29 min</td>
<td>3 hr 58 min</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>1 hr 50 min</td>
<td>3 hr 06 min</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td>2 hr 40 min</td>
<td>3 hr 32 min</td>
</tr>
</tbody>
</table>

*Note.* Diary = Infant Sleep Diary; ISQ = Infant Sleep Questionnaire; hr = hour(s); min = minutes. Figures involving units of time are estimates only, based on 15-minute (sleep diary) or 10-minute (questionnaire) blocks.
Infant Sleep Diary Variables

In evaluating the effect of the Baby Sleep parent tip sheet on infant sleep patterns, sleep scores were calculated from the 6- and 12-month infant sleep diaries using Richman’s (1981) criteria. Results were obtained across six dimensions and then summed to create a full-scale SBS score for each child at 6 and 12 months. Higher scores on each facet indicated more disturbed child sleep. Perusal of the full-scale mean scores revealed a general improvement in sleep patterns between the two data collection points. As Figure 10 shows, however, the intervention group mean at 6 months was comparable with the control group mean at 12 months. This suggested that on average, intervention infants developed a healthy sleep-wake rhythm much earlier than controls.

Two subsequent single-factor between-subjects analyses of variance were conducted to determine if indeed the parent tip sheet was successful in influencing infant sleep patterns at each age. The first test revealed a significant difference in the sleep scores of intervention ($M = 8.61, SD = 4.41$) and control ($M = 10.65, SD = 4.01$) group infants at 6 months ($F(1, 347) = 20.44, p < .001, \eta^2 = .056$). To assess whether the effect of the tip sheet was

![Figure 10. Comparison of Intervention and Control group Sleep Behaviour Scale (SBS) scores at 6 and 12 months.](image-url)
maintained over time, equivalent testing was completed using the 12-month data. Mean scores of intervention ($M = 6.27, \ SD = 4.43$) and control ($M = 7.91, \ SD = 4.75$) infants again differed significantly ($F(1, 347) = 11.20, p < .01, \eta^2 = .031$). According to findings on a prospective sleep diary, the infants of parents with access to the parent tip sheet demonstrated significantly better sleep patterns than their control counterparts at both 6 and 12 months.

Additional group comparisons were carried out to identify which dimensions of the SBS measure differed significantly between the two groups. At 6 months, these tests revealed significant group differences in mean scores across all SBS dimensions excepting the first, which is concerned with bedtime settling. According to Richman’s (1981) method of sleep diary assessment, on average, the infants of mothers in receipt of the parent tip sheet slept for more total hours each night, exhibited fewer wakings per week, woke on fewer occasions each night, spent less time awake per awakening, and spent less time co-sleeping, than did control infants. As Table 11 indicates, all findings were in the expected direction.

<table>
<thead>
<tr>
<th>SBS Dimension</th>
<th>Group</th>
<th>$M$</th>
<th>$SD$</th>
<th>$F$</th>
<th>$p$</th>
<th>$\eta^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sleep onset delay/</td>
<td>Intervention</td>
<td>0.69</td>
<td>0.91</td>
<td>ns</td>
<td></td>
<td></td>
</tr>
<tr>
<td>average bedtime$^a$</td>
<td>Control</td>
<td>0.66</td>
<td>0.88</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Night sleep hours</td>
<td>Intervention</td>
<td>2.28</td>
<td>1.01</td>
<td>4.16</td>
<td>&lt; .05</td>
<td>.012</td>
</tr>
<tr>
<td>(per night)</td>
<td>Control</td>
<td>2.51</td>
<td>1.04</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Night-waking</td>
<td>Intervention</td>
<td>2.21</td>
<td>1.64</td>
<td>17.15</td>
<td>&lt; .001</td>
<td>.047</td>
</tr>
<tr>
<td>(nights per week)</td>
<td>Control</td>
<td>2.90</td>
<td>1.45</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Night-waking</td>
<td>Intervention</td>
<td>1.43</td>
<td>1.12</td>
<td>16.27</td>
<td>&lt; .001</td>
<td>.045</td>
</tr>
<tr>
<td>(per night)</td>
<td>Control</td>
<td>1.90</td>
<td>1.10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resettling time</td>
<td>Intervention</td>
<td>1.72</td>
<td>1.23</td>
<td>16.79</td>
<td>&lt; .001</td>
<td>.046</td>
</tr>
<tr>
<td>(per waking)</td>
<td>Control</td>
<td>2.22</td>
<td>1.04</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Co-sleeping</td>
<td>Intervention</td>
<td>0.27</td>
<td>0.73</td>
<td>4.63</td>
<td>&lt; .05</td>
<td>.013</td>
</tr>
<tr>
<td>(hours per week)</td>
<td>Control</td>
<td>0.47</td>
<td>0.96</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. SBS = Sleep Behaviour Scale. Means are SBS sleep scores not time periods (for specific details about how these scores were computed see Appendix G). ns = not statistically significant.

$^a$ Whichever is worst.
At 12 months, a corresponding series of single-factor between-subjects ANOVAs revealed significant group differences on three of the six SBS dimensions of infant sleep. According to results on the prospective sleep diary, intervention infants slept for longer and had fewer night-wakings each night, and woke on fewer nights per week, on average, than did controls. The specific details of these analyses are presented in Table 12.

Table 12

<table>
<thead>
<tr>
<th>SBS Dimension</th>
<th>Group</th>
<th>M</th>
<th>SD</th>
<th>F</th>
<th>p</th>
<th>η²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sleep onset delay/</td>
<td>Intervention</td>
<td>0.54</td>
<td>0.82</td>
<td></td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>average bedtime*</td>
<td>Control</td>
<td>0.58</td>
<td>0.85</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Night sleep hours</td>
<td>Intervention</td>
<td>1.77</td>
<td>0.96</td>
<td>11.95</td>
<td>&lt; .01</td>
<td>.033</td>
</tr>
<tr>
<td>(per night)</td>
<td>Control</td>
<td>2.13</td>
<td>0.99</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Night-waking</td>
<td>Intervention</td>
<td>1.42</td>
<td>1.49</td>
<td>9.96</td>
<td>&lt; .01</td>
<td>.028</td>
</tr>
<tr>
<td>(nights per week)</td>
<td>Control</td>
<td>1.94</td>
<td>1.56</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Night-waking</td>
<td>Intervention</td>
<td>0.90</td>
<td>0.91</td>
<td>11.09</td>
<td>&lt; .01</td>
<td>.031</td>
</tr>
<tr>
<td>(per night)</td>
<td>Control</td>
<td>1.25</td>
<td>1.06</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resettling time</td>
<td>Intervention</td>
<td>1.27</td>
<td>1.28</td>
<td></td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>(per waking)</td>
<td>Control</td>
<td>1.54</td>
<td>1.20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Co-sleeping</td>
<td>Intervention</td>
<td>0.36</td>
<td>0.95</td>
<td></td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>(hours per week)</td>
<td>Control</td>
<td>0.47</td>
<td>0.98</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. SBS = Sleep Behaviour Scale. Means are SBS sleep scores not time periods (for specific details about how these scores were computed see Appendix G). ns = not statistically significant. *Whichever is worst.

Infant Sleep Questionnaire Variables

A second measure of infant sleep behaviour was obtained retrospectively via parental self-report. Full-scale ISQ scores were obtained from six dimensions of infant sleep behaviour with higher scores indicative of poorer sleep. A similar pattern of results to those on the SBS was found, with an overall downward trend in ISQ full-scale means indicating improved infant sleep over time. On this occasion, however, the 6-month intervention group
score was markedly lower than the equivalent 12-month mean for controls (Figure 11). A direct comparison of these scores confirmed a significant group difference ($F(1, 352) = 6.75$, $p < .01$, $\eta^2 = .019$), suggesting that the sleep patterns of 6-month-old intervention infants were significantly healthier (or more mature) than those of the 12-month-old controls. As these results suggest, the concurrent mean composite scores on the ISQ differed significantly ($F(1, 352) = 31.28$, $p < .001$, $\eta^2 = .082$) between infants in the intervention ($M = 5.75$, $SD = 5.23$) and control ($M = 9.19$, $SD = 6.30$) groups at 6 months. According to retrospective report, the infants of parents with access to the parent tip sheet developed significantly better sleep patterns by 6 months than did the children whose parents had not received this information.

![Figure 11. Comparison of Intervention and Control group Infant Sleep Questionnaire (ISQ) scores at 6 and 12 months.](image)

To investigate the specific types of problematic sleep behaviour separating the groups, mean scores on the six dimensions of the ISQ were considered. A series of single-factor ANOVAs revealed significantly better sleep patterns in 6-month-old intervention infants across all ISQ dimensions, with the exception of overnight resettling time. As Table 13 shows, group differences were especially pronounced with regard to infant night-waking. On
### Table 13

**Group Comparison of Infant Sleep Questionnaire Scores at 6 Months**

<table>
<thead>
<tr>
<th>ISQ Dimension</th>
<th>Group</th>
<th>M</th>
<th>SD</th>
<th>F</th>
<th>p</th>
<th>$\eta^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sleep onset delay (per night)</td>
<td>Intervention</td>
<td>0.45</td>
<td>0.77</td>
<td>8.74</td>
<td>&lt; .01</td>
<td>.024</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>0.74</td>
<td>1.04</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Settling problems (nights per week)</td>
<td>Intervention</td>
<td>0.86</td>
<td>1.28</td>
<td>6.18</td>
<td>&lt; .05</td>
<td>.017</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>1.27</td>
<td>1.72</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Night-waking (nights per week)</td>
<td>Intervention</td>
<td>2.72</td>
<td>2.91</td>
<td>30.01</td>
<td>&lt; .001</td>
<td>.079</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>4.39</td>
<td>2.81</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Night-waking (per night)</td>
<td>Intervention</td>
<td>0.86</td>
<td>0.91</td>
<td>21.80</td>
<td>&lt; .001</td>
<td>.058</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>1.36</td>
<td>1.06</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resettling time (per waking)</td>
<td>Intervention</td>
<td>0.58</td>
<td>0.92</td>
<td>.02</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>0.59</td>
<td>0.81</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Co-sleeping (nights per week)</td>
<td>Intervention</td>
<td>0.27</td>
<td>1.15</td>
<td>11.68</td>
<td>&lt; .01</td>
<td>.032</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>0.85</td>
<td>1.95</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* ISQ = Infant Sleep Questionnaire. Means are ISQ sleep scores not time periods (for further details see Appendix G). Responses for settling, waking nights/week, and co-sleeping are equal to the number of nights per week (e.g., control parents reported settling problems on 1.27 nights per week). Night-waking times per night = number of times waking each night but may not be exact due to the possibility of a ceiling effect.\(^{105}\) ns = not statistically significant.

average, the infants of tip sheet recipients fell asleep more quickly at bedtime, exhibited settling problems on fewer nights per week, woke less frequently per night, woke on fewer nights per week, and were less likely to experience reactive parent co-sleeping, than controls. In particular, control infants woke on 1.7 more nights per week and 0.5 times per night more than intervention infants. To facilitate comparison with Kerr et al. (1996), the median number of nights per week that control infants woke was 5, compared with 2 among the intervention group children. Sixty-three (35.6%) control infants woke an average of twice or more per night as opposed to 34 (19.2%) children allocated to the intervention group.

When group comparisons of the mean ISQ composite scores at 12 months were made,

\(^{105}\) On this item, the ISQ includes a possible response of 5 times or more. However, it was endorsed by just 2 of 354 participants at 6 months.
a further significant difference in the sleeping behaviours of intervention ($M = 4.57$, $SD = 5.73$) and control ($M = 7.44$, $SD = 6.93$) infants was uncovered ($F(1, 352) = 18.04$, $p < .001$, $\eta^2 = .049$). Detailed analyses of the subscales underlying these results are shown in Table 14. Findings were similar to those at 6 months, the only dissimilarity being that the sleep onset delay scores were no longer significantly different between the groups. Again, the strongest group discrepancies involved the frequency of night-waking. At 12 months of age, controls woke an average of 1.4 more nights per week ($Mdn = 3$) than intervention infants ($Mdn = 0$). Control infants also woke 0.5 more times per night, on average, than their intervention counterparts. Forty-nine (27.7%) controls were routinely waking on 2 or more occasions per night, compared with just 21 (11.9%) intervention children.

Table 14

<table>
<thead>
<tr>
<th>ISQ Dimension</th>
<th>Group</th>
<th>$M$</th>
<th>$SD$</th>
<th>$F$</th>
<th>$p$</th>
<th>$\eta^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sleep onset delay</td>
<td>Intervention</td>
<td>0.53</td>
<td>0.97</td>
<td>0.66</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>(per night)</td>
<td>Control</td>
<td>0.61</td>
<td>0.86</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Settling problems</td>
<td>Intervention</td>
<td>0.65</td>
<td>1.22</td>
<td>5.59</td>
<td>&lt; .05</td>
<td>.016</td>
</tr>
<tr>
<td>(nights per week)</td>
<td>Control</td>
<td>1.02</td>
<td>1.67</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Night-waking</td>
<td>Intervention</td>
<td>1.79</td>
<td>2.49</td>
<td>23.36</td>
<td>&lt; .001</td>
<td>.062</td>
</tr>
<tr>
<td>(nights per week)</td>
<td>Control</td>
<td>3.16</td>
<td>2.84</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Night-waking</td>
<td>Intervention</td>
<td>0.64</td>
<td>0.84</td>
<td>20.20</td>
<td>&lt; .001</td>
<td>.054</td>
</tr>
<tr>
<td>(per night)</td>
<td>Control</td>
<td>1.10</td>
<td>1.09</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resettling time</td>
<td>Intervention</td>
<td>0.44</td>
<td>0.98</td>
<td>0.17</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>(per waking)</td>
<td>Control</td>
<td>0.40</td>
<td>0.83</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Co-sleeping</td>
<td>Intervention</td>
<td>0.53</td>
<td>1.55</td>
<td>9.04</td>
<td>&lt; .01</td>
<td>.025</td>
</tr>
<tr>
<td>(nights per week)</td>
<td>Control</td>
<td>1.15</td>
<td>2.30</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. ISQ = Infant Sleep Questionnaire. Means are ISQ sleep scores not time periods (for further details see Appendix G). Responses for settling, waking nights/week, and co-sleeping are equal to the number of nights per week (e.g., control parents reported settling problems on 1.02 nights per week). Night-waking times per night = number of times waking each night but may not be exact due to the possibility of a ceiling effect.\textsuperscript{106} $ns$ = not statistically significant.

\textsuperscript{106} The response of 5 times or more on this item was endorsed by 3 of 354 participants at 12 months.
Discrete Infant Sleep Disorders

In addition to considering infant sleeping problems along a continuum of severity, they may also be identified as a discrete disorder. Morrell (1999a) has demonstrated empirically that a full-scale ISQ score ranging from 6 to 11 may be of clinical concern, suggestive of a mild to moderate sleep disturbance. Further, he found a composite score of 12 or more to be a reliable threshold for determining severely disordered paediatric sleep. Details of each ISQ-derived sleep disorder category in the current study delineated by experimental group at each data collection point are presented in Table 15.

Table 15

\textit{Group Representation among Discrete Infant Sleep Disorder Categories at 6 and 12 Months}

<table>
<thead>
<tr>
<th>Age/Group</th>
<th>ISQ-Derived Infant Sleep Disorder</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>None\textsuperscript{a}</td>
</tr>
<tr>
<td>6 Months</td>
<td></td>
</tr>
<tr>
<td>Intervention</td>
<td>100 (56.5)</td>
</tr>
<tr>
<td>Control</td>
<td>52 (29.4)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>152 (42.9%)</td>
</tr>
<tr>
<td>12 Months</td>
<td></td>
</tr>
<tr>
<td>Intervention</td>
<td>123 (69.5)</td>
</tr>
<tr>
<td>Control</td>
<td>86 (48.6)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>209 (59.0%)</td>
</tr>
</tbody>
</table>

\textit{Note.} Percentage within group shown in brackets. ISQ = Infant Sleep Questionnaire.

\textsuperscript{a} ISQ full-scale score < 6. \textsuperscript{b} ISQ full-scale score >= 6 & < 12. \textsuperscript{c} ISQ full-scale score >= 12.

With respect to these thresholds, 202 (57.1\%) infants had sleep patterns of at least clinical concern at 6 months. The comparative figure at 12 months of 145 (41.0\%) was similar to Morrell’s (1999b) finding of 37.8\% among slightly older children. It was also within the 36 to 46\% range reported in Australian studies in this age group (Armstrong et al., 1994; Hiscock & Wake, 2001). A total of 109 (30.8\%) infants had at least mild–moderate sleeping difficulties at both 6 and 12 months. The rate of severely disordered sleep at 6
months (24.0%) is consistent with findings from a large Australian cross-sectional survey by Armstrong et al. (1994) in which 27% of parents reported a significant sleep problem in their 4- to 6-month-old child. Similarly, the 12-month ratio (17.2%) is comparable to Morrell’s (1999a) results which discriminated severe sleep-disorders in 12- to 18-month-old infants at a rate of 18.7% using the same threshold. Thirty-three (9.3%) infants in the present study exceeded the threshold for severely disturbed sleep at each time of measurement. Only 10 infants with no sleep disorder at 6 months (2.8% of the sample or 6.6% of the non-disordered group) had developed a severe disorder by 12 months.

Further perusal of the data revealed that the intervention group was substantially under-represented among both groups of sleep-disordered infants at each data collection point. Chi-square tests revealed highly significant group differences in the pattern of these results at 6 months \( \chi^2(2, N = 354) = 28.93, p < .001 \) and 12 months \( \chi^2(2, N = 354) = 16.83, p < .001 \). When the group status of 109 infants with sleep disturbance of clinical concern at both 6 and 12 months was examined, almost 70% were controls. Of 33 infants with severe sleep problems at both ages, just 8 (19.5%) were intervention infants. At each time of measurement there were more than twice as many control children with severely disordered sleep.

**Parental Reported Concerns and Beliefs about their Infant’s Sleep Patterns**

Parents were also asked about their level of concern regarding their infant’s sleeping patterns and behaviours, and whether or not they believed their child had a sleeping problem. Table 16 displays these responses at each age, delineated by group. Although responses to both questions were moderately to strongly, and highly significantly, correlated with the relevant SBS and ISQ sleep scores at 6 and 12 months, a series of chi-square tests found no significant group differences in all but one of these analyses. On average, intervention group parents were significantly less concerned about their infants’ sleeping patterns and/or behaviours at 12 months than were controls \( \chi^2(3, N = 354) = 8.26, p < .05 \).

**Parental Mood, Stress, and Relationship**

**Postnatal Depression**

To examine whether the provision of written advice about infant sleep had an impact on the experience of postnatal depression symptoms, EPDS scores for intervention and control mothers were compared using a single-factor between-subjects ANOVA. Across the
Table 16
Parent Concern and Beliefs about Infant Sleep Patterns at 6 and 12 Months by Group

<table>
<thead>
<tr>
<th></th>
<th>6 Months</th>
<th></th>
<th>12 Months</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intervention</td>
<td>Control</td>
<td>Intervention</td>
<td>Control</td>
</tr>
<tr>
<td>Level of parent concerna</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not at all concerned</td>
<td>118 (66.7)</td>
<td>112 (63.3)</td>
<td>131 (74.0)</td>
<td>112 (63.3)</td>
</tr>
<tr>
<td>Mildly concerned</td>
<td>46 (26.0)</td>
<td>49 (27.7)</td>
<td>30 (16.9)</td>
<td>51 (28.8)</td>
</tr>
<tr>
<td>Moderately concerned</td>
<td>12 (6.8)</td>
<td>13 (7.3)</td>
<td>11 (6.2)</td>
<td>12 (6.8)</td>
</tr>
<tr>
<td>Very concerned</td>
<td>1 (0.6)</td>
<td>3 (1.7)</td>
<td>5 (2.8)</td>
<td>2 (1.1)</td>
</tr>
<tr>
<td>Belief about sleep problemb</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>139 (78.5)</td>
<td>138 (78.0)</td>
<td>140 (79.1)</td>
<td>130 (73.4)</td>
</tr>
<tr>
<td>Yes, mild</td>
<td>34 (19.2)</td>
<td>30 (16.9)</td>
<td>31 (17.5)</td>
<td>34 (19.2)</td>
</tr>
<tr>
<td>Yes, moderate</td>
<td>4 (2.3)</td>
<td>9 (5.1)</td>
<td>4 (2.3)</td>
<td>11 (6.2)</td>
</tr>
<tr>
<td>Yes, severe</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>2 (1.1)</td>
<td>2 (1.1)</td>
</tr>
</tbody>
</table>

Note. Percentage within group shown in brackets.

a Refers to the question: “How concerned are you about your child’s sleep patterns/behaviour?” b Refers to the question: “Do you believe that your child has a sleeping problem?”

sample, the mean score on the EPDS was 5.4 among mothers of 6-month-olds. Contrary to expectations, there was no significant difference between the groups and, in fact, mean scores were almost identical. This process was then repeated using the 12-month data yielding a similar non-significant result. The mean score was 4.5 for all participants.

In addition, there were no between-group differences in the rates of minor and major depression at 6 or 12 months using the established thresholds of 9/10 and 12/13, respectively. Across the entire sample, 17.3% of mothers of 6-month-olds reported at least minor depression while 5.7% of these exceeded the cut-off for probable clinical depression. By 12 months, the corresponding percentages had fallen to 9.4 and 4.0. In contrast to the global hypotheses, mothers who received early anticipatory guidance about infant sleep did not differ significantly from control mothers in their rates of EPDS minor or major depression.
Parenting Stress

To establish whether mothers who had been sent the parent tip sheet reported less parenting stress, 6- and 12-month mean scores on the PSS were compared using two single-factor ANOVAs with experimental group as the between-subjects factor. These results were not statistically significant. Surprisingly, early access to the parent tip sheet was not associated with a reduction in parental stress at 6 or 12 months.

Parenting Alliance

Further analyses investigated whether the sleep advice had any impact on perceptions of the co-parenting relationship. The Mean PAI result at both data collection points was 88.7 with negligible between-group variation in scores. Contrary to expectations, there were no significant group differences in parenting alliance scores at 6 or 12 months.

DISCUSSION

To the author’s knowledge, this study is the first to demonstrate the efficacy of written anticipatory guidance in the prevention of infant sleep disturbance. Moreover, unlike other prevention reports to date, clinically meaningful results have been demonstrated across a comprehensive range of variables. In its present form, the Baby Sleep parent tip sheet has the potential to positively impact the lives of many new parents. With further refinement, and conceivably augmented by regular support from M&CH Nurses during routine health visits, the ceiling is high indeed. Perhaps the most exciting aspect is that the outcome is comparable to previous investigations involving more intensive professional commitment, and therefore considerable additional cost. The major expenses of this intervention are likely to be in the printing and distribution of the parent tip sheet as well as the development of any companion documents for clinicians. This suggests that universal program roll-out is an achievable reality.

The Baby Sleep parent tip sheet has shown promise in influencing the two dimensions most commonly associated with infant sleep problems—maternal cognitions about infant sleep and parental night-time interactive behaviours (Hiscock, 2010; Sadeh et al., 2010). As suggested by the theoretical models presented in Chapter 4 (see Figures 6 & 7), preventive interventions have the highest probability of influencing infant sleep patterns if they aim to cultivate beneficial cognitions about infant sleep, rectify maladaptive beliefs and thoughts, and influence the development of adaptive interactive behaviours at bedtime and following
night-wakings. The implementation of this minimalist intervention appears to have brought about discernible changes in these critical areas and consequential improvements in infant sleep in comparison with controls. Findings are all the more remarkable when one considers that the control condition may be somewhat of a misnomer in real-world settings (Weissberg & Greenberg, 1998). While controls were prevented from receiving the intervention, it was not possible to control for a multitude of additional influences (e.g., media, internet, popular books) that may have powerfully affected the attitudes and behaviours of all parents in relation to child sleep.

**Parent Cognitions, Strategies, and Behaviours**

**Infant Sleep Location**

Unexpected findings regarding the infants’ main sleeping location were intriguing. The dominant paradigm in Western societies is that infants belong in their own space for sleeping (Ball & Klingaman, 2008). However, when drafting the written advice, the authors did not feel mandated to comment strongly about this issue, instead offering just a brief suggestion about where the infant might sleep. The tip sheet states that some parents prefer to have their baby sleep near their bed for the first 3 months or so, while others find that their own sleep may be disturbed by the sound of a sleeping baby. An inference is that not many infants spend longer than 3 months sleeping in the parental bedroom. Nevertheless, this apparently subtle coercion was inadvertent, with little decisive research for guidance. Our only motivation was the overarching goal of independent sleeping.

The proportion of control infants found to be sleeping in their own room at 6 months (74.0%) and 12 months (88.1%) was consistent with a large internet-based study of Australian and New Zealander infants which recently found that about 80% aged between 9 and 11 months slept in their own rooms (Teng et al., 2012). A similar internet study of infants from the United States and Canada revealed slightly lower rates of 65% in the 9- to 11-month age group and just 70% among 12- to 17-month-old toddlers (Sadeh et al., 2009). In the current study, infants assigned to the intervention group spent a significantly larger proportion of time sleeping in their own bedroom during the first 6 months, and throughout the 12-month period. Findings remained significant when the initial difference in sleeping location was statistically controlled, and when children who had spent time co-sleeping with

---

107 According to these authors, the common creed is that the mother might bring a waking baby to her bed to breastfeed, but neither should return to sleep until the original sleeping arrangements have been reinstated.
their parents were removed from the analyses.

At the very least, it seems that parents in receipt of the tip sheet felt more confident about leaving their first-born baby to sleep in its own space from an earlier age. While the brief statements in the pamphlet do not provide direct advice, they do indicate something about normative parenting practices with regard to infant sleeping location. New and inexperienced parents may be particularly sensitive to any subtle guidelines about societal norms. Findings might also be explained by the fact that control children did not sleep as well; to have the infant closer during the night may have been more convenient for the attending parent. This is supported by an overall significant negative relationship between number of weeks spent in the child’s own room and scores on the two sleep measures.

In this regard, it is possible that the amount of time spent within the parental bedroom is connected with the practice of night-feeding. While control group infants spent an average of six and a half weeks more of the first 12 months sleeping within the parental bedroom, they were also night-fed for an additional 7 weeks. A further issue is that a child sleeping in the same room has an increased likelihood of disturbing the sleep of one or both parents when waking briefly between sleep cycles. Clearly, the more a child is attended to after normal awakenings, the less likely he/she is to learn to resume sleep without parental intervention.

Nonetheless, previous empirical support for the notion that babies with poor sleep habits are more likely to sleep physically closer to their parents is scant. An internet survey by Sadeh (2004) found that children (0–30 months) sleeping outside the parental bedroom had fewer night-wakings and shorter settling times. Another study also found an association between sleep location and outcomes, although this relationship was predominantly mediated by parental behaviours (Mindell, Sadeh, Kohyama, et al., 2010). Further investigation is required to determine whether the infant’s primary sleeping location has a unique impact on sleep outcomes or whether a combination of factors may have influenced the results presented in this study.

Maternal Cognitions

As anticipated, intervention mothers reported more adaptive cognitions, suggesting that the information presented in the parent tip sheet had a positive effect on parental beliefs and thoughts about infant sleep. Findings intimate that the provision of written anticipatory guidance assists parents to develop more constructive thinking in terms of night-time parenting behaviours and by extension, helps them to facilitate an adaptive sleep-wake rhythm in their child. The strongest impact was in terms of cognitions about limit-setting.
This is gratifying, because it was one of the key messages of the Baby Sleep parent tip sheet. Parents are encouraged to focus on the big picture, and to avoid the overstimulatory, micromanagement practices thought to be associated with unhealthy sleep outcomes. Parents may know, for example, that rocking a child to sleep is an ill-advised strategy. However, without robust adaptive cognitions, parents might easily revert to the easiest option under duress. The aim is for parents to be cognisant of the need to facilitate infant independence and to engage in strategies that promote the development of self-regulatory skills. The MCISQ Limit-Setting subscale contains items about the immediacy of their response to infant cries at night, whether or not they are able to resist signalling behaviours, and the likely effects on the parent of resisting the child’s demands. Consistent with predictions, intervention mothers reported significantly fewer difficulties with limit-setting cognitions than did their control contemporaries. Findings suggest that having read the tip sheet, parents are more likely to report adaptive sleep-related cognitions in this important domain.

Contrary to expectations, there were no group differences in MCISQ Anger scores at 6 months, while intervention mothers scored significantly higher than controls on this subscale at 12 months. The relevant subscale items are mainly concerned with feelings of anger, regret, and helplessness in relation to the perceived demands of the child when he/she cries at night. It was anticipated that parents with increased knowledge about infant sleep would feel less threatened by, or resentful of, any of their infant’s unpredictable night-time behaviours. However, it would seem that the parent tip sheet advice has greater utility in influencing other types of maternal cognitions.

Maternal sleep-related cognitions about anger may be more strongly associated with severe or chronic infant sleep problems and/or mediated by other concepts, such as maternal personality and adult attachment style. According to the second theoretical model of infant sleep (see Figure 7), for example, personality factors such as introversion and neuroticism (Gelman et al., 1998), and openness to experience (Benoit et al., 1997) will influence the way that mothers interpret sleep-related events and her appraisal of whether or not she has the ability to cope. Still, this does little to explain the counterintuitive 12-month result. It is possible that personality and attachment issues come to the fore when an infant does not settle through the night as easily as the parent tip sheet makes it seem. Having straight-forward and clear advice might provoke a degree of frustration in a small subset of mothers in need of a higher level of assistance than written advice can provide. It is worth noting that several of the Anger items are about the parent’s likely internal response if they try to resist the infant’s demands rather than explicit feelings of anger toward the child. A greater understanding of
this dimension may be possible via the other studies in this series, where its direct relationship with infant sleep patterns will be explored.

As anticipated, parents in the control group reported higher levels of doubt at 6 months than their intervention counterparts. According to Morrell (1999b), high scores on the Doubt subscale suggest that the subject might be experiencing apprehension and misgivings about their adequacy and competence as a parent. In a sense, this scale exploits many of the insecurities involved in the transition to parenthood. Items are mainly related to uncertainties when the child wakes at night and may also tap attachment issues. Given that control infants woke more often at 6 months and that their parents were not privy to the anticipatory guidance, Doubt scores would be anticipated as being higher in this group. The lack of a significant result on this subscale at 12 months is probably reflective of the global improvement in infant sleep patterns, and a tendency for first-time parents to gradually find their feet and gather confidence in the parenting role over time.

It was somewhat surprising that the groups did not report differences on the MCISQ Feeding subscale. Baby Sleep deals comprehensively with issues related to feeding, and intervention parents were therefore expected to feel more confident about this topic than parents without such information. There are three main reasons why differences may not have been observed. First, both groups had regular access to normal support from their M&CH Nurse, acknowledged experts on feeding schedules and practices. Second, having the responsibility of providing an infant with nutrition may be stressful for all first-time parents—amplified by differing professional and lay opinions and advice—and considerably more complex than can be adequately encapsulated by a sleep advice pamphlet. Third, it is clear that the tip sheet was instrumental in changing certain parental behaviours, such as the earlier phasing out of night-feeds. However, MCISQ Feeding is specifically concerned with uncertainties about the infant receiving enough sustenance. Parents following the tip sheet advice of providing shorter night-feeds or cooled boiled water during the night may have similar concerns about the potential for infant night-time hunger as those parents who respond automatically to their infant’s signalling behaviour with a feed.

At 12 months, intervention parents reported higher mean MCISQ Safety scores than did controls. Items on this scale assess parental cognitions specifically related to the possibility of their child dying unexpectedly during the night. On the surface, it seems unusual that parents in the intervention group would be significantly more concerned about

---

108 Including a 24-hour helpline.
109 e.g., “When my child wakes at night, I think I might not have fed him/her enough during the day.”
the likelihood of SIDS than control parents. However, it should be remembered that the tip sheet appeared instrumental in altering the sleep location of infants over time, with intervention group infants spending significantly less time sleeping within their parents’ bedroom. They were also more likely to be settling through the night. It may be that parents sleeping separately have more concerns about the vulnerability of their child when they are unable to regularly hear his/her normal sleeping noises and movement, coupled with the fact that the baby signals for attention less often during the night.

A further possible reason for this unexpected result lies within the design of the parent tip sheet itself. The front page has a prominent sketch of a baby shown from above, safely lying in a crib. This picture bears a striking similarity to a well-known illustration used in brochures by organisations involved in SIDS prevention. Additionally, the tip sheet’s second page deals specifically with safe sleeping arrangements in considerable detail. It is possible that Baby Sleep’s emphasis on the safety aspects of infant sleep has encouraged intervention parents to be more cognisant of SIDS-related issues. If this were the case though, a significant result would have also been expected at 6 months.110

Parental Involvement at Bedtime

One of the main aims of the Baby Sleep parent tip sheet is to encourage parents to develop adaptive bedtime routines and practices. In the present study, intervention infants were significantly more likely to be awake when placed in their cribs at the beginning of the night, at both 6 and 12 months. This is important, since children who regularly fall asleep away from their own crib find themselves in unfamiliar surroundings when they wake and are less likely to return to sleep without parental intervention (Anders et al., 1992; Ferber, 2006; Ferber & Boyle, 1983b; Montgomery-Downs, 2008).

In addition, parents privy to the parent tip sheet information were significantly less prone to using active methods of soothing their infant to sleep at bedtime. The written anticipatory guidance clearly advises against the most insidious of these; holding/rocking, and feeding the baby to sleep at night. Stimulatory strategies deprive the child of the opportunity to learn how to fall asleep unassisted, effectively inhibiting the development of self-soothing skills. Fewer intervention children were rocked or fed to sleep at both ages, suggesting that parents were often able to absorb and implement this advice. Of concern were the large numbers of control infants still being actively soothed to sleep at 12 months.

110 Note, however, that recent research by Hiscock et al. (2014) found intervention mothers to be less concerned by infant safety issues at 6 months.
Ferber (2006) advises that left untreated, sleep onset association problems will improve on their own but the process may take many months or even years.

A non-significant result with respect to parental presence at bedtime was probably due to the fact that the written advice is somewhat vague in this area. While findings imply that this section of the parent tip sheet is in need of review, not enough is known about the impact of parental presence on the development of a healthy sleep-wake rhythm for definitive preventive statements to be made. To further cloud this issue, recent advances in behavioural treatment suggests that parental presence can actually be helpful in some situations, although its influence is not completely understood (France, 2011). In the same way, Baby Sleep does not mention the use of music or musical toys so there was, again, nothing remarkable about the lack of group disparity in this regard.

In this study, there was a general tendency for all maladaptive bedtime practices to be used less frequently over time. However, the 6-month intervention group results in this regard were comparable, if not superior, to those among 12-month-old controls. For example, similar rates of sleep onset away from the crib were evident in control infants at 12 months as that of intervention infants 6 months earlier. Moreover, a greater percentage of control parents reported using active physical comforting methods at bedtime at 12 months than did the advice recipients at 6 months. Although not expressly part of the statistical comparisons, these findings suggest that in reading the tip sheet, many parents were encouraged to engage in healthy bedtime practices at an earlier age.

Taken together, the results pertaining to bedtime routine suggest that it is possible to influence common maladaptive parental behaviours through the implementation of straightforward and clearly written anticipatory guidance. Overall, findings from the SNSP stood up well in comparison with more labour-intensive prevention programs such as the report by Adair et al. (1992), who investigated the impact of their intervention on parental presence of any kind at bedtime. Findings at 9 months postpartum by these researchers were extremely consistent with the 6- and 12-month results in the current report. In fact, the data could easily be from the one study, providing further evidence that the provision of written information is an efficient and effective method of preventing sleep problems in infants and children.

Use of Pacifiers and Transitional Objects

Access to the parent tip sheet had little impact on the use of pacifiers at the time of initial sleep onset. Although more control children used pacifiers at 6 months, the difference was not strong enough to reach statistical significance. Baby Sleep suggests that parents
avoid the use of pacifiers, instead advocating the use of a favourite toy or object to soothe the child to sleep at bedtime. However, the data also revealed no increased use of attachment objects by intervention over control infants.

A pacifier takes advantage of the infant’s sucking reflex, present at birth. It may therefore be useful in helping to settle the child from a very early age with both parent and child being positively reinforced by its use. First-time parents may be reluctant to discard a comforter that works well in the short-term, despite its potential long-term effects. While a favourite teddy, for example, can be soothing for an infant, their salience as transitional objects is strongest between 9 months and 3 years (Anders, 1994). Interestingly, the use of attachment objects across the entire sample increased from 19.5% at 6 months to 34.7% at 12 months. This finding is consistent with Wolf and Lozoff (1989) who reported bedtime transitional object use in 24% of infants between 6 and 11 months.

In particular, it appears that the use of pacifiers as settling tools is embedded further into cultural norms than are other objects, such as soft toys, and parents may be less willing to take advice on this issue. Given their surprisingly high use, the relatively low employment of sleep attachment objects, and the similarities between the groups in this regard, it would seem that this section of the parent tip sheet requires additional emphasis. Notwithstanding this, the pacifier issue is complex, with any advice transcending issues of breastfeeding and SIDS risk. This aspect of the prevention advice will be addressed in more detail in the General Discussion, incorporating the results of the other studies.

Typical Parent Response to Infant Night-Waking

**Immediacy of Response**

When children did wake during the night, intervention group parents reported waiting a significantly longer period before responding than did control parents. This trend was evident at both times of measurement and is a noteworthy result considering the non-invasive nature of intervention. A word of caution is warranted, however, as the response delay represents a fairly general estimate by parents. Nevertheless, the result was impressive and in the expected direction, rendering it worthy of consideration. A contributing factor in this instance was that parents in the control group were significantly more likely to report

---

111 Winnicott (1953) suggested that a pattern of transitional phenomena emerges between 4 and 12 months which may persist into childhood. The original soft object continues to be essential at bedtime and in times of emotional instability.

112 In fact, two studies have shown a high use of pacifiers among parents instructed not to use them (Collins et al., 2004; Kramer et al., 2001).
responding immediately to their waking child than were mothers receiving the tip sheet.

This approach has been identified as an influential factor in the development of infant sleep disturbance (France and Blampied, 1999). In fact, there may be a complex relationship between infant crying behaviours and the speed and timing of parental responses (Sander, 1969). The parent tip sheet addresses this issue by suggesting that parents wait and listen when their baby wakes. Additionally, it emphasises that rushing to comfort babies may rouse rather than settle them, and that parents should wait until they are really complaining before intervening. Given the discrepancy in reported immediate responding, it would appear that parents were generally able to implement this piece of advice.

**Nature of the Response**

In addition to responding promptly, the parents of children with sleep problems tend to use more stimulating interventions (France & Blampied, 1999). Baby Sleep tackles this issue by emphasising the importance of doing the least necessary to help the child resettle, and also through its discussion of phasing out night-feeding. The findings of the present study suggest that parents in the control group were indeed more prone to responding with active physical comforting than were their intervention group contemporaries. At 6 months, tip sheet recipients were significantly less likely to resettle their waking child by rocking/holding, feeding, or bringing him/her back to the parental bed. At 12 months, control parents continued to respond to signalling more often with a feed and/or removing the child to their own bed.

All of these practices have been linked to persistent sleeping problems (Mindell & Owens, 2010). Blampied and France (1993) suggest that parents may reinforce infant night-waking when they respond intensively to soothe their children back to sleep. Since most parents consider both infant signalling and being awake during the night to be aversive, they often choose to engage in behaviours that rapidly eliminate the crying and allow a return to sleep (Karraker, 2008). Conversely, parents who respond less intensively may avoid reinforcing the signalling behaviour, and encourage their infant to self-settle, reducing the risk of ongoing sleep disturbance (France et al., 2003). Taken as a whole, the results relating to parental response to night-waking provide further support for the utility of the tip sheet in reducing maladaptive night-time parenting practices.

It should be pointed out that a strength of this project’s design is its focus on assessment of the actual parent behaviours relevant to the intervention, an element often neglected in prevention studies to date. For example, Stremler et al. (2006) championed
numerous strategies via multiple means but the researchers had no way of knowing which aspects of their advice were successfully put into practice. St James-Roberts et al. (2001) argue that failure to directly examine changes in parental behaviour is a common weakness in behavioural research. Rather, the tendency has been to make assumptions about this aspect if the infant behaviour changes in the desired direction. An advantage of the current project is the direct correlation between the practical advice advocated in the written material and the measurement of the corresponding parent actions.

Phasing Out of Night-Feeding

The Baby Sleep parent tip sheet appeared to strongly influence feeding practices, with intervention parents significantly less likely to report feeding their child during the night than control parents at both 6 and 12 months post-birth. Over the course of the 12-month period, intervention parents spent, on average, about 7 fewer weeks feeding at night. Further, the interventionists who had ceased this practice by 12 months estimated that they had discontinued night-feeds about 4 weeks earlier than their control counterparts. These results are noteworthy since it is now beyond question that prolonged nocturnal feeding contributes to the development of infant sleep problems. For example, Touchette et al. (2005) found that the factor most strongly associated with fragmented infant sleep at 5 months was feeding after an awakening. Consistent with other studies (e.g., Adair et al., 1992), the written advice did not negatively impact the duration of breastfeeding. This is critically important for the integrity of the parent tip sheet as a resource that promotes child health. It was able to discernibly influence problematic night-feeding practices without disrupting the availability of breastmilk to the child.

Indeed, as the developing infant adapts to a new environment over the first few months of life, it is progressively more able to obtain its nutritional requirements during daylight hours. While night-waking in the initial months is often related to hunger and physical discomfort (Anders, 1994), infants who continue to feed during the night after about 4 months do so as a learned behaviour (Schmitt, 1981). The Baby Sleep parent tip sheet deals comprehensively with this issue, including information about when night-feeding should be withdrawn and suggestions for how this might be accomplished. The results suggest that provision of written anticipatory guidance may assist some parents to feel increased confidence in gradually altering their feeding schedules and consequently, assisting their child to habituate to a 24-hour sleep-wake and feeding rhythm.
Infant Sleep Outcomes

Infant Sleep Behaviours

Given its impact on parent cognitions and behaviours, it was not surprising that tip sheet availability was associated with significantly more adaptive infant sleep patterns. Findings were significant for composite sleep scores obtained from two different measures of infant sleep: a prospective 4-day sleep diary, and a retrospective parent questionnaire, at both 6 and 12 months of age. Access to early written anticipatory guidance about infant sleep was associated with significantly healthier infant sleep outcomes across a range of behavioural dimensions.

Six-month findings on both measures revealed significant differences in the sleep habits of infants assigned to each experimental group. On average, intervention infants fell asleep more quickly at bedtime, had settling problems on fewer nights per week, slept more hours at night, woke on fewer occasions each night, resettled more quickly after night-waking, slept through on more nights per week, and were less likely to sleep in the parental bed. With the exception of the average sleep onset delay and time awake per waking, these results were also found at 12 months. This is a remarkable result for a brief written intervention involving no additional verbal reinforcement or complementary parent training.

Comparison with Kerr, Jowett, and Smith (1996)

Findings are broadly consistent with a previous study by Kerr et al. (1996) whose intervention for parents of 3-month-old babies was followed up with a parent interview at 9 months. These researchers reported that controls woke a median of 4 nights per week compared with 2 among intervention group infants. Comparative median figures from the retrospective parent report in the present study were 5 and 2 nights per week at 6 months, and 3 and 0 at 12 months. Given the general improvement in infant sleep patterns across the sample between 6 and 12 months, the finding by Kerr and colleagues appears to integrate with this data quite well. However, Kerr et al.’s intervention involved two home visits from the researcher which included parent training about settling methods and the importance of routine, and the provision of an information booklet—considerably more resources than those used in the current research. Findings from the SNSP suggest that equivalent results are possible using a written information-only approach.
Comparison with Adair, Zuckerman, Bauchner, Philipp, and Levenson (1992)

Further validation of the present study results is available via comparison with another more costly paediatrician-based intervention by Adair et al. (1992). This research was similar to the SNSP in terms of its preventive design and relatively large sample size. However, in addition to providing written information at 4 months, the paediatrician discussed a completed sleep chart for each infant during a routine 6-month visit, evidently providing individualised parental guidance. Information about infant sleep outcomes was collected by way of a parent questionnaire when infants were 9 months old. The results were almost identical to the current research in terms of group differences in the mean number of night-wakings per week. For clarity, Figure 12 shows a visual representation of these findings. Adair and colleagues reported that their intervention infants evidenced 36.0% fewer awakenings per week than controls at 9 months. Comparative figures in the SNSP were 38.0% at 6 months and 43.4% at 12 months.

![Figure 12](image-url)  
*Figure 12. Comparison with Adair, Zuckerman, Bauchner, Philipp, and Levenson (1992). Shows the mean night-wakings per week at 9 months as reported by Adair et al. (1992) integrated with the 6- and 12-month findings from the current study. SNSP = the Silent Night Sleep Project.*
This chart indicates that with respect to infant night-waking, the SNSP again holds up extremely well against more labour-intensive preventive interventions. As stated earlier, the data could easily be from the same study, an exceptional outcome. This suggests that preventive interventions involving written anticipatory guidance can be at least as effective as more expensive programs requiring the contribution of paediatric specialists. An underlying message is that the content of the written material may be more important than the mode of delivery as a predictor of effectiveness (Ramchandani et al., 2000; Seymour et al., 1989).

In addition, the format and brevity of the six-page Baby Sleep parent tip sheet may have increased its utility. Other Australian programs have supplemented their direct training with much more detailed written material. Hiscock et al. (2014) incorporated a 27-page booklet and Symon et al. (2005) a 50-page book, with little, if any demonstrated advantage over the present stand-alone resource. In fact, the enthusiasm of prevention researchers in providing participants with all manner of relevant information may be a misguided strategy. It is likely that many new parents become overwhelmed by too much detail and disengage. Precise information presented in an accessible format may be the most efficacious preventive approach.

Further support for the functional value of the parent tip sheet was apparent in an additional unexpected result. In examining the total scale scores on the ISQ, the mean for the intervention group infants at 6 months was significantly lower than the 12-month mean for the control group. According to parental retrospective report, the sleep habits and patterns of intervention children at 6 months were superior to those of control children 6 months later. Although ISQ scores across the entire sample improved markedly as infants matured, control group scores had not improved sufficiently at 12 months to surpass the 6-month intervention group index. Considering the relatively large sample size, this is an extraordinary outcome, and a sound endorsement of the Baby Sleep parent tip sheet’s effectiveness. While findings were not fully replicated on the infant sleep diary, they were comparable and a very similar trend was evident.  

These results are perhaps even more striking when considered in terms of clinical importance. When infants were classified according to the severity of their sleep problem, parents with access to the written advice were less likely to have a 6- or 12-month-old infant suffering from mild–moderate or severe sleep disturbance. More than two-thirds of the

---

113 Since the ISQ and SBS scores are derived using slightly different dimensions of infant sleep behaviour; discrepancies may be due to the varying theoretical approaches of the authors rather than the contrasting retrospective and prospective natures of the instruments.
infants with healthy sleep patterns at both 6 and 12 months were members of the intervention group. Conversely, more than three-quarters of children with severely disordered sleep at each age were controls. These outcomes provide strong support for the efficacy of the Baby Sleep parent tip sheet as a stand-alone preventive measure in terms of both subclinical and clinical level sleep disturbance in infants.

**Parental Reported Concerns and Beliefs about their Infant’s Sleep Patterns**

Interestingly, there were no significant group differences in parental concerns about their infant’s sleeping patterns, nor opinions regarding the possible manifestation of a sleep problem. It was expected that parental alarm and the frequency of perceived sleep issues would be significantly higher among control parents. In reality, intervention children were sleeping better at each age, and their parents had access to information aimed at alleviating concerns, and preventing sleep problems. This information ought to have helped parents to feel more confident and knowledgeable with respect to these matters. Surprisingly, this did not transpire.

It may be that parents with access to the tip sheet were more cognisant of sleep issues and more likely to question certain aspects of their child’s sleep behaviour than were parents in the control condition. For example, the sleep pamphlet is deliberately forthright in its approach and this might alarm parents who feel unable to live up to standards that ought to be achievable. Knowledge that healthy, normally developing babies no longer require feeding at night after 3 or 4 months may trouble an inexperienced parent who feels unable to withdraw the night-feed several weeks past a recommended target. Conversely, a parent who has not had access to the written advice may believe that it is normal behaviour for a 6- or 12-month-old child to wake each night for a feed. In other words, some intervention parents may have felt unnecessarily concerned about their infant’s sleep behaviour and this may have been confounded by the characteristic poor knowledge of infant sleep development in the community represented by control parents.

Findings are, however, consistent with a broad theme in the paediatric sleep literature—parental perceptions of what equates to sleep patterns of concern, or sleep behaviours indicative of a problem, varies greatly between individuals. As Richman (1987) has pointed out, some parents may not perceive a child’s disturbed sleep as problematic, but as a normal part of development. What is considered incredibly frustrating for one parent may be deemed a classic parenting challenge for another.
Parental Mood, Stress, and Relationship

Postnatal Depression

The expectation that parents with early access to a parent tip sheet about infant sleep would report lower mean levels of postnatal depression at 6 and 12 months was not supported. The impetus for this hypothesis was a large Australian study by Hiscock and Wake (2001) which suggested a strong link between the treatment of infants with frequent night-waking and the alleviation of postnatal depression symptoms. These authors speculated that appropriate anticipatory guidance about child sleep may decrease maternal report of depressive symptoms. The current results suggest that this is not the case, at least in terms of written prevention advice. In addition, Hiscock and Wake’s data was analysed using three categories of participants, demarcated by the accepted thresholds for possible and probable depression. In the present study, however, the parents groups with EPDS scores above the same recognised cut-off scores at 6 and 12 months were not dominated by control (or intervention) parents.

It is notable that although the Hiscock and Wake (2001) sample was also drawn from Victorian M&CH Centres, the mean EPDS score among their mothers of 6- to 12-month-olds was substantially higher ($M = 7.6$) than that found in the SNSP ($M = 6.2$ at pretest, $M = 5.4$ at 6 months, $M = 4.5$ at 12 months). This suggests that on average, the mothers volunteering to participate had less intense symptoms of postnatal depression, making any group differences more difficult to uncover. Further, Hiscock and Wake relied on maternal perception of an infant sleep problem which may have an inflated relationship with postnatal depression symptomatology (Loutzenhiser et al., 2011).

Findings do not necessarily infer that postnatal depression and infant sleep disturbance are unrelated in community samples; the matter of a direct association is a separate, albeit related question. Potential links between maternal depressive symptoms and poor sleep outcomes in infants will be more thoroughly explored in the second and third studies. Nonetheless, it may be that the relationship between infant sleep problem prevention and postnatal depression is more complex than Hiscock and Wake (2001) have suggested, and/or that face-to-face or interactive preventive interventions are required to positively impact postnatal adjustment.

114 For example, there is a growing belief that the maternal experience of depression may be more closely linked to the subjective quality of her own sleep (Bei et al., 2010; Gress et al., 2010; Posmontier, 2008).
Parenting Stress

Similar non-significant results were obtained in relation to parenting stress. It was anticipated that parents receiving advice on the facilitation of healthy infant sleep patterns would feel less stressed than parents without access to this information. The mainstay of any parenting stress definition is the parent’s appraisal of the demands of the parenting role relative to the resources available (Deater-Deckard, 1998). Resources include access to knowledge about, and competence in, both day-to-day and long-term parenting tasks and responsibilities. Given the high prevalence of infant sleep disturbance and the family stress known to be associated with a sleepless child, it was envisaged that the infant sleep advice would be a valuable stress-reducing resource for parents. Unfortunately, this did not occur.

Given the findings in relation to postnatal depression, it is conceivable that the absolute levels of parenting stress in this sample (6 months \( M = 32.9 \), 12 months \( M = 32.4 \)) were lower than average, rendering group differences more difficult to identify. Berry and Jones (1995) originally reported means for parents of children in treatment for behavioural problems (43.2), with developmental disabilities (40.1), and with typical development (37.1). However, inferences are limited because the validation research involved parents of older children and no other suitable comparative research is available.

As mentioned earlier, it is possible that parents privy to the parent tip sheet were more sensitive to sleep-related issues. Effectively, they may have been more stressed about deviations from the information supplied, including the normative sleep data, and relying on parenting strategies that the tip sheet advises against. Conversely, control group parents may have been less cognisant of departures from adaptive parenting methods or normative sleep behaviours, but more anxious about a lack of direction or inconsistent advice from various sources. In other words, parents in each group may have been equally stressed, for different reasons. A more finely-grained analysis would be required to properly reveal any meaningful differences in this instance.

More likely, however, is that infant sleep problems are a less prominent explanatory factor for parenting stress than originally envisaged. Any parent tip sheet effects may have been subsumed by related factors or constructs such as marital harmony, level of social support, daily hassles, domestic workload, negative life events, maternal depression, sense of competence, personality factors, and infant temperament (Abidin, 1990; Deater-Deckard, 1998; Gelfand, et al., 1992; Östberg, & Hagekull, 2000). There was also no evidence that parenting stress levels decrease slightly in all new parents over the first 12 months as has
been reported in previous research (Milgrom & McCloud, 1996). To the extent that a lack of knowledge of adaptive night-time parenting strategies and child normative sleep behaviours is associated with increased parenting stress, the written advice investigated in the present study had minimal impact.

**Parenting Alliance**

A final expectation was that the provision of written anticipatory guidance about infant sleep may have contributed to perceptions of a significantly more sound working relationship between parents. However, analyses revealed no significant group differences at either age. While the tip sheet clearly provides a logical, structured guide to night-time parenting, there was never a guarantee that clarity over this issue would lead to more congruous co-parenting. As stated in the introduction, there was less confidence in the predictions involving the postnatal depression, parenting stress, and parenting alliance constructs given their likely complex causal/explanatory pathways. Although this construct was worthy of exploration in relation to sleep problem prevention advice, there are clearly numerous other issues impacting on perceptions of the alliance between new parents. Alternatively, the non-significant result may be due to a measurement issue—perusal of the data suggests that the PAI is encumbered with a clear ceiling effect, at least for parents of children in this age group.

**CONCLUDING COMMENTS**

The current study provides strong evidence for the efficacy of the Baby Sleep parent tip sheet as a stand-alone preventive intervention for sleep problems in the first year of life. Mothers in receipt of this anticipatory guidance reported more adaptive cognitions about infant sleep, and were more likely to engage in night-time parenting practices thought to be associated with healthy infant sleep. As a consequence, the infants of intervention parents demonstrated significantly better sleep patterns at both 6 and 12 months of age. These findings were confirmed by two independent, empirically validated linear measures of infant sleep behaviour. Early access to the parent tip sheet was also associated with fewer cases of mild–moderate, and severe infant sleep disturbance at 6 and 12 months. This is the first study to demonstrate that written information-only approaches to the prevention of paediatric sleep problems can be successful.
CHAPTER 8

Study 2: Risk and Protective Factors Associated with Infant Sleep Disturbance.

Good habits are hard to form and easy to live with. Bad habits are easy to form and hard to live with. Pay attention. Be aware. If we don’t consciously form good habits, we will unconsciously form bad ones. (Matteson, 2000, pp. 8, 11)

I believe parents are never truly prepared for the degree to which the babies’ sleep-wake patterns will dominate and completely disrupt their daily activities. (Parmelee, 1977, p. 390)

The concepts of risk and protection are the nucleus of prevention science (Coie et al., 2000). As such, all prevention trials should be conceptualised and fashioned on the basis of contemporary understandings of the influential factors within a particular population (DoHAC, 2000b). A comprehensive review of the paediatric sleep literature has revealed an array of factors thought to be associated with sleep outcomes in early childhood (e.g., see Table 3). Based on this information, the first study incorporated empirically supported contemporary advice into a parent tip sheet and evaluated its effectiveness in preventing infant sleep disturbance. Notwithstanding the relative success of the intervention, this research program provides an additional opportunity for further enquiry into the relative contributions of a multiplicity of proximal factors to the development of disordered paediatric sleep. Enhanced knowledge of these processes has implications, not only for improvement of the tip sheet content, but for future prevention research and practice in this area.

Ideally, developmental pathways are best illuminated by longitudinal research involving systematic assessment of large, population-based samples (Goodlin-Jones, Burnham, & Anders, 2000; Owens & Palermo, 2008). In the absence of this work, the current study examines infant sleep problems cross-sectionally in light of an extensive range of known or presumed risk and protective factors during the first year of life. Parental interactive behaviours at bedtime and following night-wakings have attracted the most research interest and have been most consistently associated predictors of infant sleep problems (Hiscock, 2010). Therefore, parenting practices are expected to have the strongest relationships with infant sleep patterns.
Even where the evidence is strong, however, it is valuable to investigate the role of additional potential influences because targeting multiple factors may increase the success of a prevention program (NRC-IOM, 2009). Past research has typically been narrow in scope, exploring the effects of a limited range of constructs on infant sleep patterns or disordered infant sleep. While this work has undoubtedly provided valuable information about important predictor variables such as parental presence at bedtime (Adair et al., 1991), its narrow focus has often restricted the amount of functional information that may be extracted. Similarly, much of the intervention research within the paediatric sleep field has contributed broad information about prevention and treatment efficacy but limited information about the specific aspects of the program that have directly impacted on infant sleep behaviours.

As an extension of prior research, the SNSP began with the aim of incorporating as many constructs linked theoretically and/or empirically with infant sleep behaviours as was realistically possible. The objective of this broad focus was to contribute to a more comprehensive understanding of the predisposing conditions, precipitating circumstances, perpetuating factors (Spielman, 1986), and protecting processes associated with sleep problems in the first year of life. Using a variety of statistical techniques, this study examines the relative contributions of these predictors to the development of problematic paediatric sleep, both individually and within logical domains.

The current study begins with the premise that parental cognitions about child sleep are based on information from a variety of sources including pamphlets, magazines, books, websites, television, health professionals, mothers’ groups, friends, family, and personal experiences. However, these beliefs and thoughts do not necessarily translate into night-time parenting behaviours. For example, parents may appreciate that night-feeds are no longer necessary, but continue to utilise this practice if it results in a short-term benefit, such as rapid resumption of sleep after night-wakings.

This investigation looks at the direct relationship between infant sleep patterns and specific concepts such as maternal cognitions, emotional experience, and parenting behaviours, irrespective of the participant’s prior knowledge. It explores the associations between these constructs regardless of whether the participant received a parent tip sheet, and whether or not it was successful in influencing any of the assessed variables.\textsuperscript{115} In other words, this study takes a more pragmatic approach, looking at what actually occurred among

\textsuperscript{115} Where pertinent, however, access to the tip sheet will be included in analyses to ascertain whether there is any associated unique variance (presumably relating to aspects of the advice other than what has been successfully measured).
all participants and how this might be linked to, or influenced by, infant sleep outcomes.

In terms of the theoretical model presented earlier (see Figure 6), maternal cognitions are expected to be related at least concurrently, and possibly over time, with infant sleep patterns via parenting practices and the interpretation of infant sleep behaviours. Consistent with the rationale for global hypotheses offered in the previous chapter, it is anticipated that problematic parent cognitions and maladaptive sleep-related parenting behaviours will be associated with poor infant sleep outcomes. Other potential risk and protective factors included in this study are likely to have less robust relationships with infant sleep patterns. Considering the lack of research and/or equivocal nature of the paediatric sleep literature relating to variables such as parent and infant demographics, obstetric events, infant temperament, infantile colic, postnatal depression, parenting stress, and the co-parenting alliance in community samples, these comparisons are considered exploratory.

METHOD

Participants

Participants were 354 first-time mothers ($M = 29.84$ years, $SD = 4.22$ years, $R = 18–44$ years) of healthy newborns as described in the previous study. The sample characteristics have been outlined in the General Method.

Materials

The Baby Sleep parent tip sheet (Watts et al., 2000) as described earlier.

Measures

All measures specified in the sixth chapter were utilised in this study. Infant temperament was indexed by the STSI (Sanson et al., 1987); maternal beliefs and thoughts about infant sleep were assessed using the MCISQ (Morrell, 1999b); information about parental caregiving strategies was obtained via the parent questionnaire; infant sleep behaviour was recorded prospectively using a 4-day infant sleep diary (Wolfson, 1998) and quantified using the SBS (Richman, 1981), and measured retrospectively with the ISQ (Morrell, 1999a); maternal depression was assessed using the EPDS (Cox et al., 1987); the PSS (Berry & Jones, 1995) was utilised to gauge parenting stress levels; and the quality of the co-parenting alliance was determined with the PAI (Abidin & Brunner, 1995). The particulars and/or psychometric properties of each measure have been outlined previously.
Definitional Clarification

In this research, infantile colic is defined as parent-reported daily inconsolable crying (Wikander & Wahlberg, 1987) and should be differentiated from Wessel et al.’s (1954) criteria. Accordingly, 92 (26.1%) infants across the sample were described as having periods of colicky behaviour at some point during their early development. Just 24 (6.8%) of these appeared to meet Wessel et al.’s (1954) definition.116 As suggested in Chapter 4, however, the Wessel criteria appears overly stringent, particularly for a community sample, and would result in valuable information being omitted.117 In the current study, all but one of the 92 colicky infants was reported to be inconsolable for an hour or more each night (a reasonable period of stress for any parent, much less a new parent) and 82.6% for two or more hours per night. Most parents also indicated that symptoms continued over a substantial period of time. Consequently, the experiences of these families remains relevant to any consideration of whether parental night-time practices may have been permanently shaped by colic events.

Procedure

All studies in this series were conducted concurrently. The sampling and data collection procedure has been articulated in the methods chapter.

Data Analyses

Product-moment correlations were computed to investigate the relationship between all variables of theoretical relevance and specific measures of infant sleep behaviour at 6 and 12 months. Variables identified as the most important in terms of predictive value were entered as groups of independent variables (IVs) into a series of hierarchical regression analyses with scores on an infant sleep quality index as the dependent variables (DVs). Parental behaviour and cognition variables were then isolated and entered simultaneously into a further series of regression models to explore their unique contributions to infant sleep patterns. Finally, the relative importance of parents’ bedtime strategies, night-waking responses, and sleep-related cognitions were explored via commonality analyses.

116 However, due to an oversight, only two of Wessel et al.’s (1954) three criteria were measured. While it can be inferred from the wording on the parent questionnaire that these 24 infants did endure colic on more than 3 nights per week (i.e., the missing statistic), it is possible that some did not. Thus, even if it was desirable, the precise Wessel et al. definition could not be reliably utilised in this study.

117 i.e., it is illogical to disregard an infant because he/she cries inconsolably for slightly less than 3 hours (Lehtonen, Gormally, & Barr, 2000; D. J. Moore, 2009). Moreover, there is little consensus on how much crying is considered normal in Western societies (St James-Roberts, 2001a) and, in fact, the concept of a ‘normal’ amount of crying is difficult to define, conceptually problematic, and clinically useless (Barr 1993).
RESULTS

Bivariate Correlations

All variables of theoretical interest were correlated with scores on the SBS and ISQ to gain insight into their possible links with infant sleep disturbance. Table 17 shows the relationship between pretest, 6-month, and 12-month variables and concurrent or later sleeping patterns, colour-coded to assist with interpretation. For the most part, it seemed counterintuitive to correlate the prospective risk and protective mechanisms with sleep data collected earlier (i.e., effectively going back in time according to the theoretical model). Exceptions occur in relation to the assessment of infant temperament, parental adjustment, and the co-parenting alliance which have been separately colour-coded (green) to avoid confusion. The marital status of 10 people changed between the 6- and 12-month data collection points. In expounding the strength of the correlation coefficients reported in the table below and throughout this thesis, primary consideration has been given to a seminal guide by Cohen (1992).

The demographic variables exhibited few meaningful relationships with the infant sleep outcome measures. However, the pattern of results did suggest an association between marital status and infant sleep patterns, particularly in terms of the retrospective measure at 12 months. Unmarried parents were significantly more likely to have an infant with sleep problems than were married parents. Consistent with expectations, the pregnancy and birthing variables were not significantly related to the indices of infant sleep. The final pretest variable involving experimental group status from the first study was significantly related to infant sleep outcomes. Parents in receipt of the Baby Sleep parent tip sheet were significantly more likely to have an infant with good sleep patterns, with the strongest associations evident at 6 months.

118 Given that temperament is generally considered an innate and stable construct, scores may be more easily discernible at 12 months (with increased development) and therefore may be the most accurate representation. Of course, this needs to be balanced against the fact that the STSI was designed for use with parents of 4- to 8-month-old infants. For brevity, these results will not be examined further in the text.
119 i.e., poor infant sleep at 6 months may lead to increased postnatal depression and parenting stress, and a destabilised co-parenting relationship at 12 months. However, since the focus of this study is the prediction of infant sleep quality, these statistics are shown for the sake of completeness and will not be discussed in detail.
120 Six de facto partners married during this period while 4 married couples became separated or divorced. Since the results were almost identical, only the 6 month marital status correlations have been presented.
121 Cohen posits that correlations in the order of 0.1 are considered to be “small”, 0.3 “medium”, and 0.5 “large” in terms of the magnitude of effect sizes. Parenthetically, attention is drawn to a review by Hemphill (2003) who cautioned that “the value Cohen used to represent a large correlation coefficient occurs somewhat infrequently in many key research studies in psychology and...a lower value might be warranted in some instances” (p. 79).
Table 17

*Bivariate Correlations between Pretest, 6-Month, and 12-Month Variables, and Infant Sleep Outcome Measures at 6 and 12 Months*

<table>
<thead>
<tr>
<th>Variables of Theoretical Interest</th>
<th>Phase</th>
<th>6 Months</th>
<th>12 Months</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SBS</td>
<td>ISQ</td>
</tr>
<tr>
<td>Demographic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maternal age</td>
<td>Pretest</td>
<td>0.10</td>
<td>0.11 *</td>
</tr>
<tr>
<td>Paternal age</td>
<td>Pretest</td>
<td>0.03</td>
<td>0.04</td>
</tr>
<tr>
<td>Education</td>
<td>Pretest</td>
<td>0.07</td>
<td>0.06</td>
</tr>
<tr>
<td>Location</td>
<td>Pretest</td>
<td>-0.11 *</td>
<td>-0.01</td>
</tr>
<tr>
<td>Income</td>
<td>Pretest</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Marital status</td>
<td>6 Months</td>
<td>-0.08</td>
<td>-0.16 **</td>
</tr>
<tr>
<td>Pregnancy and Birthing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gestation period</td>
<td>Pretest</td>
<td>-0.01</td>
<td>0.06</td>
</tr>
<tr>
<td>Estimated labour</td>
<td>Pretest</td>
<td>0.00</td>
<td>0.02</td>
</tr>
<tr>
<td>Caesarean birth?</td>
<td>Pretest</td>
<td>0.03</td>
<td>0.03</td>
</tr>
<tr>
<td>Sex of child^2</td>
<td>Pretest</td>
<td>-0.08</td>
<td>0.00</td>
</tr>
<tr>
<td>APGAR (1 min)</td>
<td>Pretest</td>
<td>0.02</td>
<td>0.04</td>
</tr>
<tr>
<td>APGAR (5 min)</td>
<td>Pretest</td>
<td>-0.01</td>
<td>0.00</td>
</tr>
<tr>
<td>Birth weight</td>
<td>Pretest</td>
<td>-0.03</td>
<td>0.03</td>
</tr>
<tr>
<td>ICU admission</td>
<td>Pretest</td>
<td>0.00</td>
<td>-0.01</td>
</tr>
<tr>
<td>Access to the Parent Tip Sheet</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study 1 group</td>
<td>Pretest</td>
<td>-0.24 ***</td>
<td>-0.29 ***</td>
</tr>
<tr>
<td>Infant Health</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infantile colic</td>
<td>6 Months</td>
<td>0.13 *</td>
<td>0.14 **</td>
</tr>
<tr>
<td>Colic burden</td>
<td>6 Months</td>
<td>0.17 **</td>
<td>0.18 ***</td>
</tr>
<tr>
<td>Illness (0–6 months)</td>
<td>6 Months</td>
<td>0.14 **</td>
<td>0.15 **</td>
</tr>
<tr>
<td>Illness (6–12 months)</td>
<td>12 Months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infant Temperament</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Approach-Avoidance</td>
<td>6 Months</td>
<td>0.09</td>
<td>0.07</td>
</tr>
<tr>
<td>Rhythmicity</td>
<td>6 Months</td>
<td>0.29 ***</td>
<td>0.31 ***</td>
</tr>
<tr>
<td>Variables of Theoretical Interest</td>
<td>Phase</td>
<td>6 Months</td>
<td></td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>-----------</td>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SBS</td>
</tr>
<tr>
<td>Cooperation-Manageability</td>
<td>6 Months</td>
<td>0.14 *</td>
<td>0.21 ***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.06</td>
<td>0.08</td>
</tr>
<tr>
<td>Activity-Reactivity</td>
<td>6 Months</td>
<td>0.27 ***</td>
<td>0.38 ***</td>
</tr>
<tr>
<td></td>
<td>0.15 **</td>
<td>0.12 *</td>
<td></td>
</tr>
<tr>
<td>Irritability</td>
<td>6 Months</td>
<td>0.23 ***</td>
<td>0.31 ***</td>
</tr>
<tr>
<td></td>
<td>0.10</td>
<td>0.12 *</td>
<td></td>
</tr>
<tr>
<td>Easy-Difficult</td>
<td>6 Months</td>
<td>0.20 ***</td>
<td>0.20 ***</td>
</tr>
<tr>
<td></td>
<td>0.15 **</td>
<td>0.11 *</td>
<td></td>
</tr>
<tr>
<td>Approach-Avoidance</td>
<td>12 Months</td>
<td>0.00</td>
<td>0.05</td>
</tr>
<tr>
<td>Rhythmicity</td>
<td>12 Months</td>
<td>0.20 ***</td>
<td>0.20 ***</td>
</tr>
<tr>
<td></td>
<td>0.10</td>
<td>0.12 *</td>
<td></td>
</tr>
<tr>
<td>Cooperation-Manageability</td>
<td>12 Months</td>
<td>0.10</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>0.15 **</td>
<td>0.11 *</td>
<td></td>
</tr>
<tr>
<td>Activity-Reactivity</td>
<td>12 Months</td>
<td>-0.05</td>
<td>0.60</td>
</tr>
<tr>
<td></td>
<td>0.17 **</td>
<td>0.17 **</td>
<td></td>
</tr>
<tr>
<td>Irritability</td>
<td>12 Months</td>
<td>0.23 ***</td>
<td>0.28 ***</td>
</tr>
<tr>
<td></td>
<td>0.15 **</td>
<td>0.20 ***</td>
<td></td>
</tr>
<tr>
<td>Easy-Difficult</td>
<td>12 Months</td>
<td>0.20 ***</td>
<td>0.24 ***</td>
</tr>
<tr>
<td></td>
<td>0.10</td>
<td>0.10</td>
<td></td>
</tr>
<tr>
<td>Infant Sleep Location</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sleep location (post-birth)</td>
<td>Pretest</td>
<td>-0.21 ***</td>
<td>-0.24 ***</td>
</tr>
<tr>
<td>Sleep location (6 months)</td>
<td>6 Months</td>
<td>-0.31 ***</td>
<td>-0.25 ***</td>
</tr>
<tr>
<td>Own room (0–6 months)</td>
<td>6 Months</td>
<td>-0.30 ***</td>
<td>-0.29 ***</td>
</tr>
<tr>
<td>Sleep location (12 months)</td>
<td>12 Months</td>
<td>-0.26 **</td>
<td>-0.39 ***</td>
</tr>
<tr>
<td>Own room (0–12 months)</td>
<td>12 Months</td>
<td>-0.29 **</td>
<td>-0.34 ***</td>
</tr>
<tr>
<td>Own room (0–12 months)</td>
<td>12 Months</td>
<td>-0.25 **</td>
<td>-0.35 ***</td>
</tr>
<tr>
<td>Feeding Practices</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breastfeeding status</td>
<td>6 Months</td>
<td>0.26 ***</td>
<td>0.21 ***</td>
</tr>
<tr>
<td>Exclusive breastmilk?</td>
<td>6 Months</td>
<td>0.20 ***</td>
<td>0.13 *</td>
</tr>
<tr>
<td>Breastfeeding period (0–6 months)</td>
<td>6 Months</td>
<td>0.26 ***</td>
<td>0.21 ***</td>
</tr>
<tr>
<td>Breastfeeding status</td>
<td>12 Months</td>
<td>0.17 **</td>
<td>0.14 **</td>
</tr>
<tr>
<td>Exclusive breastmilk?</td>
<td>12 Months</td>
<td>0.10</td>
<td>0.10</td>
</tr>
<tr>
<td>Breastfeeding period (0–12 months)</td>
<td>12 Months</td>
<td>0.12 *</td>
<td>0.09</td>
</tr>
<tr>
<td>Parenting Strategies at Bedtime</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sleep status upon entering cot</td>
<td>6 Months</td>
<td>0.28 ***</td>
<td>0.23 ***</td>
</tr>
<tr>
<td>Rocked to sleep</td>
<td>6 Months</td>
<td>0.14 *</td>
<td>0.18 ***</td>
</tr>
<tr>
<td>Fed to sleep</td>
<td>6 Months</td>
<td>0.27 ***</td>
<td>0.27 ***</td>
</tr>
<tr>
<td>Variables of Theoretical Interest</td>
<td>Phase</td>
<td>6 Months</td>
<td>12 Months</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>---------</td>
<td>----------</td>
<td>-----------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SBS</td>
<td>ISQ</td>
</tr>
<tr>
<td>Parental presence until asleep</td>
<td>6 Months</td>
<td>0.08</td>
<td>0.15 **</td>
</tr>
<tr>
<td>Play music/musical toy</td>
<td>6 Months</td>
<td>-0.06</td>
<td>-0.02</td>
</tr>
<tr>
<td>Other parental involvement</td>
<td>6 Months</td>
<td>0.08</td>
<td>0.06</td>
</tr>
<tr>
<td>Any parent involvement</td>
<td>6 Months</td>
<td>0.25 ***</td>
<td>0.29 ***</td>
</tr>
<tr>
<td>Sleep status upon entering cot</td>
<td>12 Months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rocked to sleep</td>
<td>12 Months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fed to sleep</td>
<td>12 Months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parental presence until asleep</td>
<td>12 Months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Play music/musical toy</td>
<td>12 Months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any parent involvement</td>
<td>12 Months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use of Sleep Aids/Objects</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pacifier at sleep onset</td>
<td>6 Months</td>
<td>-0.01</td>
<td>0.02</td>
</tr>
<tr>
<td>Sleep attachment object</td>
<td>6 Months</td>
<td>0.01</td>
<td>0.02</td>
</tr>
<tr>
<td>Any transitional object</td>
<td>6 Months</td>
<td>-0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Pacifier at sleep onset</td>
<td>12 months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sleep attachment object</td>
<td>12 Months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any transitional object</td>
<td>12 Months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response to Infant Night-Waking</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attending delay</td>
<td>6 Months</td>
<td>-0.18 ***</td>
<td>-0.22 ***</td>
</tr>
<tr>
<td>Reassure &amp; leave</td>
<td>6 Months</td>
<td>-0.08</td>
<td>-0.01</td>
</tr>
<tr>
<td>Feed the child</td>
<td>6 Months</td>
<td>0.53 ***</td>
<td>0.55 ***</td>
</tr>
<tr>
<td>Change nappy</td>
<td>6 Months</td>
<td>0.11</td>
<td>0.22 ***</td>
</tr>
<tr>
<td>Hold or rock</td>
<td>6 Months</td>
<td>0.23 ***</td>
<td>0.22 ***</td>
</tr>
<tr>
<td>Parental presence until asleep</td>
<td>6 Months</td>
<td>0.17 **</td>
<td>0.21 ***</td>
</tr>
<tr>
<td>Replace covers</td>
<td>6 Months</td>
<td>-0.04</td>
<td>0.01</td>
</tr>
<tr>
<td>Medicine/teething gel</td>
<td>6 Months</td>
<td>0.11 *</td>
<td>0.14 **</td>
</tr>
<tr>
<td>Play music/musical toy</td>
<td>6 Months</td>
<td>0.01</td>
<td>0.08</td>
</tr>
<tr>
<td>Give/replace pacifier</td>
<td>6 Months</td>
<td>0.02</td>
<td>0.06</td>
</tr>
<tr>
<td>Variables of Theoretical Interest</td>
<td>Phase</td>
<td>6 Months</td>
<td>12 Months</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-------</td>
<td>----------</td>
<td>-----------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SBS</td>
<td>ISQ</td>
</tr>
<tr>
<td>Take to parents’ bed</td>
<td>6 Months</td>
<td>0.30 ***</td>
<td>0.45 ***</td>
</tr>
<tr>
<td>Any stimulatory response</td>
<td>6 Months</td>
<td>0.52 ***</td>
<td>0.58 ***</td>
</tr>
<tr>
<td>Total stimulatory responses</td>
<td>6 Months</td>
<td>0.32 ***</td>
<td>0.45 ***</td>
</tr>
<tr>
<td></td>
<td>12 Months</td>
<td>-0.24 ***</td>
<td>-0.28 ***</td>
</tr>
<tr>
<td>Attending delay</td>
<td>12 Months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reassure &amp; leave</td>
<td>12 Months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feed the child</td>
<td>12 Months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nappy change</td>
<td>12 Months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hold or rock</td>
<td>12 Months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parental presence until asleep</td>
<td>12 Months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Replace covers</td>
<td>12 Months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medicine/teething gel</td>
<td>12 Months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Play music/musical toy</td>
<td>12 Months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Give/replace pacifier</td>
<td>12 Months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Take to parents’ bed</td>
<td>12 Months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any stimulatory response</td>
<td>12 Months</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Maternal Concern/Opinion

| Concern about infant sleep patterns | 6 Months | 0.33 ***  | 0.45 *** | 0.13 *    | 0.15 **   |
| Belief in a sleep problem          | 6 Months | 0.37 ***  | 0.50 *** | 0.19 ***  | 0.20 ***  |

Maternal Cognitions

<p>| Setting Limits                     | 6 Months | 0.32 ***  | 0.34 *** | 0.29 ***  | 0.34 ***  |
| Anger                              | 6 Months | 0.19 ***  | 0.26 *** | 0.11 *    | 0.08      |
| Doubt                              | 6 Months | 0.26 ***  | 0.40 *** | 0.22 ***  | 0.32 ***  |
| Feeding                            | 6 Months | 0.37 ***  | 0.37 *** | 0.16 **   | 0.21 ***  |
| Safety                             | 6 Months | -0.18 *** | -0.08    | -0.04     | -0.02     |
| MCISQ Full-scale score             | 6 Months | 0.35 ***  | 0.42 *** | 0.27 ***  | 0.33 ***  |</p>
<table>
<thead>
<tr>
<th>Variables of Theoretical Interest</th>
<th>Phase</th>
<th>6 Months</th>
<th>12 Months</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SBS</td>
<td>ISQ</td>
<td>SBS</td>
<td>ISQ</td>
</tr>
<tr>
<td>MCISQ (excluding Safety items)</td>
<td>6 Months</td>
<td>0.41 ***</td>
<td>0.48 ***</td>
<td>0.30 ***</td>
<td>0.36 ***</td>
</tr>
<tr>
<td>Setting Limits</td>
<td>12 Months</td>
<td>0.38 ***</td>
<td>0.50 ***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anger</td>
<td>12 Months</td>
<td>0.22 ***</td>
<td>0.30 ***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doubt</td>
<td>12 Months</td>
<td>0.26 ***</td>
<td>0.35 ***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feeding</td>
<td>12 Months</td>
<td>0.28 ***</td>
<td>0.32 ***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety</td>
<td>12 Months</td>
<td>-0.01</td>
<td>-0.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCISQ Full-scale score</td>
<td>12 Months</td>
<td>0.38 ***</td>
<td>0.49 ***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCISQ (excluding Safety items)</td>
<td>12 Months</td>
<td>0.42 ***</td>
<td>0.54 ***</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Maternal Depression**

| Postnatal depression             | Pretestb   | 0.01 | 0.05 | -0.07 | 0.01 |
| Postnatal depression             | 6 Months   | 0.17 ** | 0.23 *** | 0.04 | 0.13 * |
| Postnatal depression             | 12 Months  | 0.13 * | 0.17 ** | 0.10 | 0.18 *** |

**Maternal Parenting Stress**

| Parenting stress                 | 6 Months   | 0.20 *** | 0.29 *** | 0.10 | 0.12 * |
| Parenting stress                 | 12 Months  | 0.11 * | 0.15 ** | 0.10 | 0.15 ** |

**Co-parenting Relationship**

| Parenting alliance                | 6 Months   | -0.06 | -0.17 ** | -0.11 * | -0.08 |
| Parenting alliance                | 12 Months  | -0.04 | -0.14 * | -0.12 * | -0.17 ** |

Note. SBS = Sleep Behaviour Scale (Richman, 1981); ISQ = Infant Sleep Questionnaire (Morrell, 1999a). For additional descriptive information on each variable, please refer to Appendix G. Information collected at pretest (tan), 6 months (yellow), and 12 months (blue) has been colour-coded to assist with interpretation. Pearson coefficients shaded the same colour as the variable name are contemporaneous correlations. Unlike the bulk of the table, data shaded green correlates various scores at 12 months with sleep scores at 6 months as explained in the accompanying text.

a Refers only to the type of milk provided to the baby. It takes no account of when solid foods were introduced and should not be confused with the concept of exclusive breastfeeding (WHO, 2008). b Pretest postnatal depression refers to a subset of participants who completed the EPDS within 60 days of the birth of their child (n = 102). Although not reported, there were no significant relationships between sleep scores and EPDS assessments completed within 60 days (n = 194) or 90 days (n = 264) postpartum. Partial correlations controlling for the time of completion also failed to reveal any significant associations.

*p < .05. **p < .01. ***p < .001.
There were some significant but small positive correlations between the experience of infantile colic and sleep scores, predominantly at 6 months. Parents who reported having attended to a colicky baby were significantly more likely to report a poorly sleeping infant at 6 months, a finding also reflected on the prospective sleep diary at 12 months. Results additionally imply that higher levels of colic burden increased this likelihood. Major childhood illnesses were associated with concurrent sleeping problems on both measures at 6 months and the sleep diary at 12 months.

The strongest relationships between the dimensions of temperament and infant sleep disturbance involved concurrent associations with rhythmicity and irritability at 6 and 12 months. Infants perceived as less rhythmical and more irritable by their parents were significantly more likely to be sleeping poorly. Relationships varied in strength between small and medium according to Cohen’s (1992) criteria. In addition, infants rated as more difficult by their mothers at 6 months were more prone to problematic sleep concurrently and at 12 months on both indices, while this was also true of the contemporaneous 12-month findings. In general, 6-month infant temperament scores predicted 12-month sleep outcomes and vice versa, suggesting a continuity of association between temperament and sleep.

Associations between the infant’s physical sleep location and sleep scores on the infant diary and questionnaire were unexpected. The pattern of results provides good evidence that, on average, children sleeping in their own room are more likely to exhibit healthy sleep patterns. All measures involving sleep location, whether recorded at pretest, 6 months, or 12 months, were significantly associated with the prospective and retrospective accounts of infant sleep at both 6 and 12 months. Perhaps the most revealing outcome was that infant sleep location from birth predicted sleep health at 12 months. While the strength of these relationships was in the small to medium range, all findings were highly significant.

Breastfeeding practices were predictably related to the sleep of infants involved in the current study. Mothers continuing to breastfeed at 6 and 12 months, and who breastfed for longer periods, were significantly more likely to have infants with disrupted sleep patterns. However, the strongest relationships were at 6 months and involved concurrently measured variables. There was no evidence that breastfeeding routines at 6 months predicted sleep problems at 12 months.

The overall picture of results confirmed a robust link between parental assistance in the sleep onset process in the early evening and infant sleep disturbance. This was particularly the case for more stimulatory forms of involvement. As anticipated, infants who fell asleep away from their normal sleeping location and those who were rocked/held or fed
to sleep displayed significantly less adaptive sleep patterns at each data collection point. There was some evidence of an association between parental presence until sleep onset at bedtime and impaired child sleep, particularly at 12 months. Overall, parents who interfered with the sleep initiation process in any way at the beginning of the night were significantly more likely to have a child with less healthy sleep routines at 6 and 12 months. These bedtime stimulatory practices at 6 months moderately predicted inferior sleeping patterns at 12 months, while the 12-month concomitant relationship was moderate to strong.

There was scant evidence of a connection between transitional objects and infant sleep. The use of pacifiers at bedtime was not associated with sleep problems concurrently, and nor was it predictive of later disturbances. There were small negative relationships between the use of sleep attachment objects and both sleep measures at 12 months. Children utilising a soft toy, special blanket, or favourite object as part of their sleep routine at 12 months were found to have significantly healthier sleep.

In terms of the response to infant night-waking, parents who reported waiting longer periods before attending at 6 and 12 months were significantly more likely to have a child with healthy sleep patterns. Waking infants who encountered one or more forms of active comforting were also more prone to sleep disturbance. The concurrent results were all large in magnitude and highly significant, indicating an unambiguous connection between parental stimulatory practices during the night and infant sleep problems. Parents of sleep-disturbed infants also tended to use a higher number of active response methods. Highly stimulatory responses such as feeding, rocking, and removing the child to the parental bed were the most strongly related to poorer sleep patterns at each time of measurement. Further, the use of one or more stimulatory strategies and a wider variety of active methods at 6 months was predictive of more disturbed sleep patterns 6 months later.

Full-scale scores on the ISQ were associated with higher levels of infant sleep disturbance concurrently and, in the case of the 6 months scores, at follow-up. With the exception of Safety, all subscale scores on the MCISQ were highly significantly correlated with concurrently measured sleep scores, whether collected prospectively or retrospectively. Mothers of infants with less healthy sleep patterns were significantly more likely to report cognitions indicating a low threshold for responding to, and difficulty resisting, infant...

---

122 These analyses may be somewhat conservative as they do not include parents who reported ignoring all crying during the night completely. No information was collected on the “breaking point” at which these parents might finally attend and therefore they were excluded from the analyses. If, for example, this threshold averaged 20 minutes, the disparity between the groups would have likely widened, since more intervention parents reported ignoring all crying.
signalling behaviour; feelings of anger, regret, and helplessness in the face of infant demands; doubt and uncertainty apropos the adequacy of their parenting; and concerns about child hunger, including the utility of feeding as a soothing strategy during the night. In addition, maladaptive cognitions about limit-setting, competency doubts, and feeding issues were predictive of higher sleep scores on both indices at 12 months. There was a small but highly significant negative correlation between the Safety subscale and scores on the sleep diary at 6 months, indicating increased concerns about SIDS among mothers of infants with healthy sleep patterns. Given that the MCISQ was designed to assess maladaptive cognitions about infant sleep, this result was illogical. Thus, with the Safety items removed, the revised full-scale scores were more strongly associated with the infant sleep measures.123

At both 6 and 12 months, there were moderate to large positive relationships between the scores indicating more problematical sleep behaviours and mothers’ concerns about children’s sleeping patterns and beliefs about the existence of a sleep problem. All results were highly significant. There was also evidence to suggest these concerns and beliefs at 6 months may be a marker for more disturbed infant sleep at 12 months.

There were no relationships between scores on the EPDS recorded early in the postnatal period and infant sleep behaviours. At 6 and 12 months, concurrent postnatal depression and sleep scores were significantly associated in three of the four analyses, the strongest involving the ISQ. Mothers of infants with poorer sleep patterns were more likely to report higher levels of postnatal depression symptomatology. There was also an indication that disturbed infant sleep at 6 months was associated with higher postnatal depression scores 6 months later. The only evidence of the predictive value of postnatal depression scores was a very weak relationship between the 6-month EPDS and 12-month ISQ scores. Mothers with higher postnatal depression scores at 6 months were significantly more likely to report poorer infant sleep via the questionnaire at 12 months.

The strongest links between parenting stress and more disturbed infant sleep were at 6 months. Highly significant associations suggested that parents of infants with more disturbed sleep behaviours were more likely to report parenting stress of a slightly higher magnitude. Again, there was evidence of poorer infant sleep being predictive of increased parenting stress at 12 months. Six-month stress scores were related to 12-month ISQ sleep scores, but the connection was probably too weak to be meaningful, as was a similar concurrent relationship at 12 months.

123 Recall also that the majority of recent MCISQ research has disregarded items from the Safety and Feeding subscales (e.g., Johnson & McMahon, 2008; Morrell & Cortina-Borja, 2002; Tikotzky et al., 2010).
The parenting alliance construct yielded a couple of significant but very small and possibly inconsequential negative correlations with scores on the ISQ at 6 and 12 months. Findings suggested a slight tendency among mothers of children with healthier sleep patterns to report a more constructive working relationship with their child’s other parent. However, there was only negligible support for this notion on the infant sleep diary—a significant but extremely weak relationship at 12 months and conversely, with infant sleep at 6 months being a small marker for a compromised co-parenting relationship 6 months later.

**Multiple Linear Regression Series I: All Variables of Theoretical Interest**

To closely examine the major influences associated with infant sleep disturbance at 6 and 12 months, a multiple linear regression approach has been adopted. In doing so, it is acknowledged that research strategies involving this approach may be applied along a continuum anchored by exploratory and confirmatory research (Kelley & Maxwell, 2010). With all things considered, the analyses following are clearly closer to exploratory in nature. They should be cognised as indicative rather than conclusive, and regarded as a starting point for further confirmatory work, including structural equation modelling.

**An Index of Sleep Quality**

In planning this examination, consideration was given to conducting separate analyses for each measure of infant sleep, at each age. However, it was reasoned that a combined sleep score would be a more reliable indicator of each infant’s sleep behaviour, while simplifying the reporting process. To accomplish this, scores on the ISQ and the SBS at 6 and 12 months were standardised, with a constant added to eliminate negative results. A pooled score was then created for each participant, by averaging the standardised scores for each scale, at each time of measurement. Effectively, an index of sleep quality was created, made up of both prospective and retrospective maternal accounts of the child’s sleep at 6 and 12 months, with higher scores indicating healthier sleep patterns.

The sagacity of this exercise is underwritten by the consistent rates of infant sleep disturbance found in the paediatric sleep literature, the relatively large sample size, and knowledge that the SBS data was almost perfectly normally distributed. Moreover, the

---

124 This is not strictly correct. Ten mothers had missing SBS information at either 6 or 12 months (5 at each). In other words, 344 participants had 3 of the 4 elements of data required to create the 2 indices of infant sleep quality. For these computations, the standardised ISQ score only was used for each subject, on one occasion. As a result, all participants were potentially involved in each subsequent analysis (N = 354).
proportion of children meeting Morrell’s (1999b) criteria for a sleep disorder and the level of concern about infant sleep patterns among parents in the first study was consistent with previous findings in Australia (Armstrong et al., 1994; Hiscock & Wake, 2001). A beneficial by-product of this process was that a slight negative skew in the ISQ data was corrected.

Variable Selection Process: The Less is More Principle

In practical terms, however, the most confronting problem was the large number of variables available within the study. In regression analyses, Francis (2005) recommends a minimum of 100 cases and at least 20 cases for each predictor (20:1), providing the dependent variable (DV) is approximately normally distributed. A more common guideline has been a ratio of 10:1 according to Maxwell (2000).\(^{125}\) Taken together, the current sample size would lend itself to between 18 and 36 predictors. In any analysis, it is desirable to remove as many peripheral and predominantly redundant variables as possible, an approach referred to as the \textit{less is more} principle. Large numbers of predictors reduce the power of the test on each independent variable (IV), increase the probability of spurious significance,\(^{126}\) dilute the significance of important research factors, and may create severe difficulties in interpretation (Cohen, Cohen, West, & Aiken, 2003).

Hence, it was resolved to reduce about 65 potential IVs of interest to as few as was theoretically and practically feasible. Consideration was given to using a \textit{tear-down} procedure in which the researcher begins with a full set of variables and removes them selectively if they do not contribute materially to the multivariate squared correlation (Cohen et al., 2003). However, given the dearth of wide-ranging studies investigating the pathways to infant sleep disturbance, it was thought that some non-significant results may yield valuable information. A more pragmatic approach was to logically group all variables and remove spurious measures by locating the most reliable and/or effective predictor(s) from each category for inclusion in the model.

To achieve this, the variables of interest were initially arranged into six logical categories: mother/baby, infant development/health, infant sleep location, parent cognitions, parent emotional experience, and night-time parenting practices. Experimental group status from the previous study was also added as a control variable. The bivariate correlational findings were then carefully considered and the most effective and informative variables in each group were selected for use in the regression analyses.

\(^{125}\) However, others advise against rule of thumb guidelines (Green, 1991; Kelley & Maxwell, 2010).

\(^{126}\) i.e., investigation-wide Type I error.
Variable Entry Approach

The next phase was to determine a strategy for entry into the regression equation. The apparent bidirectional relationship between infant sleep patterns and factors such as parental interactions, in some ways lends itself to a model in which all parental variables are entered simultaneously. Similarly, an argument could be made for merely finding the most efficient set of predictors, regardless of direct or indirect causal relationships (Francis, 2005). This would still represent a valuable contribution to the literature. Nevertheless, it was concluded that an improved understanding of the underlying factors associated with infant sleep disturbance would be obtained by predetermining the order of entry of the groups of IVs with respect to their presumed causal priority. This would provide additional information which is not achievable via a purely explorative approach.

A stumbling block involved the parental behaviour, cognition, emotional experience, and relationship variables, given that no IV entering the model should be a presumptive cause of a previously entered IV (Cohen et al., 2003). At its most basic level, cognitive-behavioural theory assumes that cognitions precede or determine behaviours and feelings but the association is again, bidirectional, with an emphasis on mutual interaction and influence (J. S. Beck, 2011; Ellis, 2003). To further confuse this issue, the maternal cognitions assessed by the MCISQ appear to be an assortment of both beliefs about infant sleep and thoughts/interpretations in response to infant night-waking behaviours.

It was reasoned that variables measuring the emotional experience/support aspect of the cognitive-behavioural model (depression, stress, co-parenting relationship) ought to be entered separately since they are not exclusively related to sleep-focussed behaviours and cognitions. Rather, these constructs appear to be influenced by the interactions of a wide range of biopsychosocial stressors (e.g., sleep deprivation, social support, life stress) associated with the transition to parenthood (C. T. Beck, 2001, 2008; Milgrom, Martin, & Negri, 1999; Van Egeren, 2004). As such, these factors are likely to emerge prior to parental cognitions and behaviours at 6 and 12 months.

However, the appropriate sequencing of parental cognitions and practices at bedtime and following night-wakings was theoretically ambiguous (i.e., particularly given the nature of the MCISQ items), and it was therefore decided to enter these predictors simultaneously. Cohen et al. (2003) suggest that when such ambiguity occurs, the addition of each set to the prediction of the dependent variable over and above the prediction of the other set would be

127 It is acknowledged that arguments could be made for achieving this in a variety of ways.
128 This does, however, fit well with the theoretical models presented earlier (see Figures 6 & 7).
of interest and should be reported. As an alternative, it was resolved to more fully examine the unique and shared contributions of cognitions and night-time parenting behaviours to infant sleep outcomes at a later point in this study.

A Six Step Hierarchical Strategy

Three separate hierarchical linear regression analyses were conducted. The first two involved the pretest and 6-month variables in the prediction of scores on the newly created 6- and 12-month indices of infant sleep quality. A third analysis incorporated the pretest and 12-month variables as IVs with the 12-month sleep quality index as the DV. The following strategy was employed in determining the most relevant and least dispensable predictors and the order of entry into the regression equations:

Step 1: Three variables (maternal age, gestation period, APGAR score at 1 min) were chosen as the most relevant indicators of demographics, pregnancy, and early infant well-being. Chronologically, these factors occurred first among the groups of variables under consideration and they were therefore deemed to be the first step.

Step 2: Since the measures of room status (location at birth, weeks in own room, concurrent location) were highly inter-related, one variable was included in the analyses. Sleep location from birth was preferred as it appeared to have the highest degree of practical interest. This became the second step of the regression analyses as it occurred upon arrival home from hospital. While the decision of where the child would sleep was probably made prenatally, this evidence was not available and it is seemed counterintuitive to include it before the pregnancy and birthing variables.

Step 3: Group status from the first study was included to control for access to the parent tip sheet. Although knowledge of infant sleep is obtainable from a variety of sources, it was thought prudent to partial out any associated unique variance to assist in comparison with other samples and improve generalisability to other populations. Since the pamphlet was distributed early in the postnatal period, the relevant variable was added at the third step.

Step 4: The fourth step of the hierarchical regression analyses involved infant health and development issues, factors first emerging during the early months. The experience of infantile colic was added, particularly since its status as an enduring influence on parenting behaviour following remission remains somewhat controversial. With respect to infant disposition, the most commonly researched factor is difficulty. The EDS, which comprises scores from three of the five STSI subscales, was consequently included as the
measure of temperament. Since there was a possibility that transient child illness (e.g., bronchiolitis, ear infection) might interfere with development of the sleep-wake rhythm, the relevant variables were also included as a control measure. Numerous studies have associated breastfeeding with infant sleep disturbance. Although the breastfeeding duration variable held the most information, breastfeeding status measured cross-sectionally was more relevant to previous research.

Step 5: The fifth sequential step involved the mood, stress, and relationship variables. The 6- and 12-month assessments of postnatal depression were considered more valid than the pretest, having had a smaller window in the timing of the assessment. Parental stress was included here as an additional indicator of maternal psychological distress. The parenting alliance was also integrated at this stage because of its potential role as a mediator of parenting stress, depression, and adjustment during the postnatal period (Abidin & Brunner, 1995; Hughes, Gordon, & Gaertner, 2004; Simons, Lorenz, Wu, & Conger, 1993).

Step 6: The final step involved maternal cognitions and night-time parenting practices. One variable was included to account for whether or not parents typically intervened in the sleep-initiation process at their infant’s bedtime. Pacifier use at sleep onset was added since little is known about the relationship between pacifiers and infant sleep patterns. Sleep attachment objects are thought to assist with self-soothing and the relevant variable was therefore incorporated. In terms of infant night-waking, however, the estimated delay before responding was jettisoned due to potential reliability issues. The variable assessing whether or not the parent typically uses strategies of a stimulatory nature following night-wakings was utilised. Consistent with recent research involving maternal cognitions (e.g., Johnson & McMahon, 2008) scores on the Setting Limits, Doubt, and Anger subscales of the MCISQ were analysed together. Since Feeding had earlier been shown to be relevant to parents of young infants it was also integrated into the total scale score. Safety, which was found to have a negative relationship with healthy infant sleep patterns, was considered separately. After careful consideration, additional maternal cognitions (i.e., not part of the MCISQ) involving beliefs about the child having a sleep problem and concerns

---

129 As pointed out by Johnson and McMahon (2008), this scale is particularly useful in these kinds of analyses as it does not include items relating directly to sleep (i.e., Rhythmicity).
130 An additional assessment of whether infants were awake or asleep when placed in their cribs at bedtime was omitted because of strong correlations with this variable.
131 Both pacifier use and the introduction of transitional objects were considered part of this group of variables as the literature frequently discusses the introduction of these items as a parental behaviour/approach based on personal opinion or preference.
132 i.e., since it was a subjective “ballpark” estimate by parents.
about sleep behaviours were eliminated as these were judged as an outcome rather than a source of infant sleep disturbance.

As an additional safeguard, all original variables were entered as IVs into a series of stepwise regression analyses133 with the infant sleep quality index scores as the DVs. The probability of F for inclusion in the model was .05 while a threshold of .10 prompted removal. All previously selected variables were endorsed through this process, while just one minor anomaly was uncovered. Birth weight was shown to be a significant predictor of infant sleep at 12 months, and following further trial simultaneous regression analyses, was added to the mother/baby category.

Hierarchical Regression 1: Pretest and 6-Month Variables in the Prediction of 6-Month Infant Sleep Quality

The Pearson correlation coefficients among the variables involved in the first two hierarchical regression analyses (pretest and 6-month predictors in the prediction of scores on the 6-month and 12-month sleep quality index) are shown in Table 18. The majority of bivariate correlations were anticipated and do not require additional emphasis. The relationship between the 6- and 12-month indices of sleep quality was moderate to strong while the most robust link was between the concurrent parenting stress and postnatal depression scores. Of all possible inter-relations between difficult temperament, maternal depression, parental stress, maladaptive cognitions about infant sleep, and an unsupportive co-parenting relationship, only one was less than moderate in magnitude, and all were highly significant and in the expected direction.

Several other significant correlations of small to medium strength were observed. Mothers still breastfeeding at 6 months tended to be older, less inclined to use a pacifier at bedtime, and more likely to respond to infant night-waking with active physical comforting, presumably feeding. Parents whose infants had previously been colicky were significantly more likely to describe them as difficult at 6 months. Maternal concern about SIDS was weakly associated with higher levels of depressive symptomatology.

Following perusal of the correlations, the first hierarchical multiple regression analysis was conducted. These findings are presented in the middle portion of Table 19. As expected, the pregnancy and birthing variables accounted for a very small amount of the

133 These tests were performed as further confirmation only—there is ample literature advising against the use of stepwise regression as the primary means of selecting the strongest predictor variables (e.g., Thompson, 1989, 1995; Zientek, & Thompson, 2006).
Table 18

Bivariate Correlations of 6-Month Hierarchical Regression Analyses Variables

<table>
<thead>
<tr>
<th>Variable</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>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
</tr>
</thead>
</table>
| 1 Sleep quality index (6 months)
| 2 Maternal age                                     | 10   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 3 Gestation                                        | 03   | -07  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 4 APGAR (1 min)                                    | 03   | -01  | 04   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 5 Birth weight                                     | 01   | -18**| 38***| 03   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 6 Initial sleep location                           | -25***| 10  | 01  | 06  | -07  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 7 Study 1 group                                    | -29***| -06 | 03  | 07  | 01   | 09   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 8 Infantile colic                                  | 15** | 01  | 00  | 02  | 02   | -09  | 00   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 9 Illness (0–6 months)?                            | 16** | 01  | 02  | 06  | 01   | -04  | 11*  | 11*  |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 10 Breastfeeding status (6 months)                 | 24***| 03  | -04 | 05  | -06  | 03   | 06   | 01   | -01  |      |      |      |      |      |      |      |      |      |      |      |      |
| 11 Easy-difficult temperament (STSI)               | 29***| 01  | 02  | 07  | -11**| -05  | 01   | 18***| 17**  | 10   |      |      |      |      |      |      |      |      |      |      |      |
| 12 Postnatal depression (EPDS)                     | 22***| -02 | 01  | 00  | 00   | -10  | 00   | 07   | 06   | -06  | 34***|      |      |      |      |      |      |      |      |      |      |
| 13 Parenting stress (PSS)                          | 26***| 14* | -01 | 04  | -02  | -03  | 06   | 08   | 10   | 03   | 41***| 57***|      |      |      |      |      |      |      |      |      |
| 14 Parenting alliance (PAI)                        | -13  | -06 | -11 | 06  | 05   | 10   | 03   | 00   | -11**| 05   | -30***| -37***| -32***|      |      |      |      |      |      |      |      |      |
| 15 Parental assistance at bedtime                  | 30***| -04 | -05 | 07  | -02  | -16**| -19***| 04  | -12**| 05   | 06   | 08   | 06   | -05  |      |      |      |      |      |      |      |      |
| 16 Pacifier at sleep onset                         | 02   | -19***| 01  | -08 | 09   | 01   | -05  | 02   | 01   | -28***| -02 | 06   | -03  | -09  | -08  |      |      |      |      |      |      |
| 17 Sleep attachment object                         | 01   | -06 | 05  | -10 | 04   | -01  | -01  | -02  | 04   | -06  | -03  | -01  | -01  | 03   | -16**| 13*  |      |      |      |      |      |
| 18 Stimulatory response to waking                  | 61***| 13* | -01 | 06  | -03  | -12**| -19***| 10  | 13**  | 32***| 19***| 09   | 17** | -03  | 17** | -15**| 02   |      |      |      |      |
| 19 Maternal cognitions (MCISQ)b                    | 48***| 12* | -02 | 00  | 01   | -15**| -15** | 14  | 01   | 16**  | 35** | 34***| 44***| -23***| 26***| -01  | -03  | 34***|      |      |      |
| 20 Safety (MCISQ)                                   | -15**| -05 | 00  | -01 | -06  | -08  | 08   | 03   | 03   | -10  | -03  | 15** | 06   | -13* | 03   | -03  | 07   | -10  | 24***|      |      |
| 21 Sleep quality index (12 months)b                | 49***| 03  | -07 | 00  | 02   | -22***| -23***| 07  | -01  | 06   | 19**  | 11*  | 12*  | -11* | 34***| 00   | 00   | 26***| 36***| -04  |      |

Note. Decimal points have been omitted. STSI = Short Temperament Scale for Infants; EPDS = Edinburgh Postnatal Depression Scale; PSS = Parental Stress Scale; PAI = Parenting Alliance Inventory; MCISQ = Maternal Cognitions about Infant Sleep Questionnaire.

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

Sleep quality index scores are shown at opposite ends to retain variable numbering consistency with the next correlation table.  

b Excludes the Safety subscale.
Table 19
Hierarchical Regression Analyses of Pretest, Infant Development/Health, and 6-Month Parental
Variables in the Prediction of Infant Sleep Quality at 6 and 12 Months

<table>
<thead>
<tr>
<th>Pretest/6-Month (IVs)</th>
<th>6-Month Sleep Index (DV)</th>
<th>12-Month Sleep Index (DV)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$B$</td>
<td>$SE$</td>
</tr>
<tr>
<td><strong>Step 1: Mother/Baby</strong></td>
<td>$(R^2 = 0.01)$</td>
<td></td>
</tr>
<tr>
<td>Maternal age</td>
<td>0.02</td>
<td>0.01</td>
</tr>
<tr>
<td>Gestation</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>APGAR at 1 min</td>
<td>0.02</td>
<td>0.03</td>
</tr>
<tr>
<td>Birth weight</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td><strong>Step 2: Initial Sleep Location</strong></td>
<td>$(R^2 = 0.08, \Delta R^2 = 0.07)$</td>
<td></td>
</tr>
<tr>
<td>Maternal age</td>
<td>0.03</td>
<td>0.01</td>
</tr>
<tr>
<td>Gestation</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>APGAR at 1 min</td>
<td>0.03</td>
<td>0.03</td>
</tr>
<tr>
<td>Birth weight</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Initial sleep location</td>
<td>-0.49</td>
<td>0.10</td>
</tr>
<tr>
<td><strong>Step 3: Parent Tip Sheet (Study 1)</strong></td>
<td>$(R^2 = 0.15, \Delta R^2 = 0.07)$</td>
<td></td>
</tr>
<tr>
<td>Maternal age</td>
<td>0.03</td>
<td>0.01</td>
</tr>
<tr>
<td>Gestation</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>APGAR at 1 min</td>
<td>0.04</td>
<td>0.03</td>
</tr>
<tr>
<td>Birth weight</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Initial sleep location</td>
<td>-0.44</td>
<td>0.09</td>
</tr>
<tr>
<td>Parent tip sheet (Study 1)</td>
<td>-0.49</td>
<td>0.09</td>
</tr>
<tr>
<td><strong>Step 4: Infant Development/Health</strong></td>
<td>$(R^2 = 0.30, \Delta R^2 = 0.15)$</td>
<td></td>
</tr>
<tr>
<td>Maternal age</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Gestation</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>APGAR at 1 min</td>
<td>0.02</td>
<td>0.03</td>
</tr>
<tr>
<td>Birth weight</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Initial sleep location</td>
<td>-0.39</td>
<td>0.09</td>
</tr>
<tr>
<td>Parent tip sheet (Study 1)</td>
<td>-0.55</td>
<td>0.08</td>
</tr>
<tr>
<td>Infantile colic</td>
<td>0.14</td>
<td>0.10</td>
</tr>
<tr>
<td>Pretest/6-Month (IVs)</td>
<td>6-Month Sleep Index (DV)</td>
<td>12-Month Sleep Index (DV)</td>
</tr>
<tr>
<td>---------------------</td>
<td>--------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td></td>
<td>( B )</td>
<td>( SE_{B} )</td>
</tr>
<tr>
<td><strong>Illness (0–6 months)?</strong></td>
<td>0.33</td>
<td>0.11</td>
</tr>
<tr>
<td><strong>Breastfeeding status (6 months)</strong></td>
<td>0.48</td>
<td>0.10</td>
</tr>
<tr>
<td><strong>Easy-difficult temperament (STSI)</strong></td>
<td>0.36</td>
<td>0.08</td>
</tr>
<tr>
<td><strong>Step 5: Mood/Stress/Relationship</strong></td>
<td>( R^2 = 0.33, \Delta R^2 = 0.03 )</td>
<td>( R^2 = 0.14, \Delta R^2 = 0.00 )</td>
</tr>
<tr>
<td>Maternal age</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Gestation</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>APGAR at 1 min</td>
<td>0.02</td>
<td>0.03</td>
</tr>
<tr>
<td>Birth weight</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Initial sleep location</td>
<td>-0.38</td>
<td>0.08</td>
</tr>
<tr>
<td>Parent tip sheet (Study 1)</td>
<td>-0.57</td>
<td>0.08</td>
</tr>
<tr>
<td>Infantile colic</td>
<td>0.13</td>
<td>0.09</td>
</tr>
<tr>
<td><strong>Illness (0–6 months)?</strong></td>
<td>0.33</td>
<td>0.11</td>
</tr>
<tr>
<td><strong>Breastfeeding status (6 months)</strong></td>
<td>0.50</td>
<td>0.09</td>
</tr>
<tr>
<td><strong>Easy-difficult temperament (STSI)</strong></td>
<td>0.23</td>
<td>0.08</td>
</tr>
<tr>
<td><strong>Postnatal depression (EPDS)</strong></td>
<td>0.02</td>
<td>0.01</td>
</tr>
<tr>
<td><strong>Parenting stress (PSS)</strong></td>
<td>0.02</td>
<td>0.01</td>
</tr>
<tr>
<td><strong>Parenting alliance (PAI)</strong></td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td><strong>Step 6: Cognitions/Strategies</strong></td>
<td>( R^2 = 0.58, \Delta R^2 = 0.25 )</td>
<td>( R^2 = 0.26, \Delta R^2 = 0.12 )</td>
</tr>
<tr>
<td>Maternal age</td>
<td>0.00</td>
<td>0.01</td>
</tr>
<tr>
<td>Gestation</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>APGAR at 1 min</td>
<td>0.01</td>
<td>0.02</td>
</tr>
<tr>
<td>Birth weight</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Initial sleep location</td>
<td>-0.25</td>
<td>0.07</td>
</tr>
<tr>
<td>Parent tip sheet (Study 1)</td>
<td>-0.27</td>
<td>0.07</td>
</tr>
<tr>
<td>Infantile colic</td>
<td>0.04</td>
<td>0.08</td>
</tr>
<tr>
<td><strong>Illness (0–6 months)?</strong></td>
<td>0.29</td>
<td>0.09</td>
</tr>
<tr>
<td><strong>Breastfeeding status (6 months)</strong></td>
<td>0.21</td>
<td>0.08</td>
</tr>
<tr>
<td><strong>Easy-difficult temperament (STSI)</strong></td>
<td>0.09</td>
<td>0.07</td>
</tr>
<tr>
<td><strong>Postnatal depression (EPDS)</strong></td>
<td>0.01</td>
<td>0.01</td>
</tr>
</tbody>
</table>
variance in infant sleep quality index scores at 6 months (1.3%). The only significant predictor was maternal age, with older mothers being more likely to have a child with healthy sleep patterns. When the initial infant sleeping location was incorporated at Step 2, the total variance explained increased by 6.9 to 8.2%. Infants with higher quality sleep were significantly more likely to be sleeping in their own room from birth and have an older mother.

At the third step, allocation of the parent tip sheet accounted for a further 7.0% of the variance in sleep quality over and above that explained by the other variables at this juncture. Mothers receiving the parent tip sheet were advantaged in terms of their infant’s sleep patterns while the previously significant predictors remained so. Inclusion of the infant development and health variables at Step 4 ($\Delta R^2 = 0.148$) effectively doubled the total explained variance to 30.0%. Infantile colic did not add significantly to the model. However, child illness, concurrent breastfeeding, and temperamental difficulty were all associated with poorer infant sleep patterns. The unique variance associated with the provision of written advice rendered this the most important predictor of infant sleep quality among the variables entered thus far. Maternal age no longer made a significant contribution.
At Step 5, the mood, stress, and relationship measures were responsible for an extra 3.2% of variance over and above that explained by the other predictors. Despite the strong zero-order correlation with postnatal depression, parenting stress was the only significant inclusion. To this point, infants with superior sleep were significantly more likely to sleep in their own room, have a mother who received written anticipatory guidance and was less stressed, have avoided major illnesses, and be no longer breastfed. The addition of parental behaviours and cognitions at the final step resulted in a substantial increase of 24.8% in the total explained variance. With all variables entered, the model accounted for 57.9% of the variance in infant sleep patterns. In terms of prevention, the significant predictors of healthy sleep in order of importance were: parental non-stimulatory response to infant night-waking; adaptive maternal cognitions about infant sleep; higher level of concern about SIDS; low parental involvement at initial sleep onset; access to the parent tip sheet; allowing the infant to sleep in his/her own room from birth; non-occurrence of major illness; avoidance of pacifiers at bedtime; and currently not breastfeeding. After statistically controlling for parental behaviours and cognitions, difficult temperament and parental stress were no longer significant predictors of infant sleep quality.

Hierarchical Regression 2: Pretest and 6-Month Variables in the Prediction of 12-Month Infant Sleep Quality

The results of the second hierarchical regression analysis, which investigates the predictive value of the same independent variables on 12-month infant sleep quality, are shown on the right side of Table 19. At Step 1, obstetrics variables were again responsible for only a very small amount of variance in infant sleep patterns, being less than 1%. On this occasion, maternal age did not contribute significantly to the model. The infants’ initial sleep location was introduced at the second step, accounting for an additional 5.0% of variance. At Step 3, provision of the parent tip sheet increased the total explained variance by 4.1%. With all pretest and early postnatal period variables added, the model accounted for 10.0% of the total variability in 12-month infant sleep patterns. The initial sleep location and group status from the first study were the significant contributors.

Step 4 involved the inclusion of the infant development and health variables. Of

---

134 The zero-order correlation between infant safety cognitions and 6-month sleep quality was strengthened (partial $r = -0.24$) by controlling for all other variables. This implied that the true predictive value of Safety was being suppressed by other factors in the model, the likely influence being the other MCISQ subscales.

135 Similarly, the significant results regarding pacifier use at bedtime occurred despite a negligible zero-order correlation with the 6 month index of sleep quality. Perusal of the raw correlations suggests that negative relationships with breastfeeding status and stimulatory response to waking were having some effect here.
these, difficult temperament was the only significant addition to the model where the overall explained variance rose to about 13.8%. In contrast to the first analysis, illness during the first 6 months and 6-month breastfeeding status were not significant predictors at this stage. The impact of adding the variables appraising depression, stress, and co-parenting at the fifth step was negligible. These 6-month measures accounted for less than half of 1% of the variance in 12-month infant sleep quality over and above that explained by the predictors entered earlier. Of the 13 pretest and 6-month predictors entered at this point, the significant contributors to the model were provision of the parent tip sheet, infant sleeping location from birth, and difficult temperament.

The remaining parental behaviour and cognition variables were incorporated at the final step, almost doubling the total explained variance to 26.2%. This is quite reasonable, given that the exploration is effectively a 6-month follow-up of the first analysis, with no concurrent measures included. The significant predictors of poorer infant sleep patterns at 12 months in order of importance were maladaptive maternal sleep-related cognitions, parent-assisted sleep onset, original infant sleep location within the parental bedroom, and having no access to the written anticipatory guidance.

**Hierarchical Regression 3: Pretest and 12-Month Variables in the Prediction of 12-Month Infant Sleep Quality**

Bivariate correlations for the variables included in the third hierarchical regression analysis have been presented in Table 20. Several noteworthy findings are apparent. Similar to the 6-month results, mothers continuing to breastfeed at 12 months tended to be older. A further strong association was observed between symptoms of maternal depression and parenting stress. Difficult infant temperament, postnatal depression, parenting stress, co-parenting discontent, and maladaptive maternal cognitions were weakly to strongly interrelated, with all but one association highly significant.

In addition, infants sleeping in their own bedroom from birth were less likely to be assisted with sleep onset at the beginning of the night and following wakings. Those being actively comforted to sleep at bedtime were also given a pacifier more often, less likely to sleep with a favourite toy or other transitional object, more prone to stimulation following night-wakings, and more likely to have a mother with problematic sleep-related cognitions. Concern about SIDS was associated with higher parenting stress, and consistent with the 6-month findings, was linked with symptoms of postnatal depression.
**Table 20**

*Bivariate Correlations of 12-Month Hierarchical Regression Analyses Variables*

<table>
<thead>
<tr>
<th>Variable</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>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Sleep quality index (12 months)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Maternal age</td>
<td>0.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Gestation</td>
<td>-0.07</td>
<td>-0.07</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 APGAR (1 min)</td>
<td>0.00</td>
<td>-0.01</td>
<td>0.04</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Birth weight</td>
<td>0.02</td>
<td>-0.18 **</td>
<td>0.38 ***</td>
<td>0.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Initial sleep location</td>
<td>-0.22 ***</td>
<td>0.10</td>
<td>0.06</td>
<td>-0.07</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Study 1 group</td>
<td>-0.23 ***</td>
<td>-0.06</td>
<td>0.03</td>
<td>0.07</td>
<td>0.01</td>
<td>0.09</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Infantile colic</td>
<td>0.07</td>
<td>0.01</td>
<td>0.00</td>
<td>0.02</td>
<td>0.02</td>
<td>-0.09</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 Illness (0–6 months)?</td>
<td>0.15 **</td>
<td>0.04</td>
<td>-0.02</td>
<td>-0.02</td>
<td>0.04</td>
<td>-0.11 *</td>
<td>-0.02</td>
<td>0.06</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Breastfeeding status (6 months)</td>
<td>0.18 ***</td>
<td>0.22 ***</td>
<td>0.01</td>
<td>-0.03</td>
<td>-0.08</td>
<td>-0.09</td>
<td>0.02</td>
<td>0.06</td>
<td>0.02</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 Easy-difficult temperamental (STSI)</td>
<td>0.25 ***</td>
<td>0.02</td>
<td>-0.03</td>
<td>0.05</td>
<td>-0.10</td>
<td>-0.01</td>
<td>0.00</td>
<td>0.09</td>
<td>1.4 *</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 Postnatal depression (EPDS)</td>
<td>0.15 **</td>
<td>-0.02</td>
<td>-0.06</td>
<td>0.02</td>
<td>-0.02</td>
<td>0.09</td>
<td>0.03</td>
<td>0.08</td>
<td>0.10</td>
<td>-0.03</td>
<td>1.7 **</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 Parenting stress (PSS)</td>
<td>0.13 *</td>
<td>0.15 **</td>
<td>0.01</td>
<td>0.00</td>
<td>0.00</td>
<td>-0.05</td>
<td>0.06</td>
<td>1.1 **</td>
<td>1.6 **</td>
<td>0.05</td>
<td>0.36 ***</td>
<td>0.51 ***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14 Parenting alliance (PAI)</td>
<td>-0.17 **</td>
<td>-0.09</td>
<td>-0.04</td>
<td>0.05</td>
<td>0.05</td>
<td>0.07</td>
<td>-0.01</td>
<td>0.04</td>
<td>-0.05</td>
<td>-0.08</td>
<td>-0.22 ***</td>
<td>-0.37 ***</td>
<td>-0.39 ***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 Parental assistance at bedtime</td>
<td>0.53 ***</td>
<td>0.05</td>
<td>-0.16 **</td>
<td>0.01</td>
<td>-0.06</td>
<td>-0.24 ***</td>
<td>-0.15 **</td>
<td>0.04</td>
<td>0.09</td>
<td>0.08</td>
<td>0.09</td>
<td>0.05</td>
<td>-0.04</td>
<td>-0.13 *</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 Pacifier at sleep onset</td>
<td>0.01</td>
<td>-0.22 ***</td>
<td>0.02</td>
<td>-0.06</td>
<td>0.08</td>
<td>-0.01</td>
<td>0.02</td>
<td>0.01</td>
<td>0.03</td>
<td>-0.16 **</td>
<td>-0.10 *</td>
<td>1.0</td>
<td>0.02</td>
<td>-0.06</td>
<td>-0.02</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17 Sleep attachment object</td>
<td>-0.18 ***</td>
<td>-0.07</td>
<td>0.06</td>
<td>-0.01</td>
<td>0.07</td>
<td>0.02</td>
<td>0.03</td>
<td>-0.03</td>
<td>0.01</td>
<td>-0.05</td>
<td>-0.01</td>
<td>-0.02</td>
<td>0.03</td>
<td>-0.20 ***</td>
<td>2.1 **</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 Stimulatory response to waking</td>
<td>0.60 ***</td>
<td>0.13 *</td>
<td>-0.05</td>
<td>-0.03</td>
<td>-0.07</td>
<td>-0.21 ***</td>
<td>-1.3 **</td>
<td>1.3 *</td>
<td>1.0</td>
<td>19 ***</td>
<td>15 **</td>
<td>17 **</td>
<td>0.08</td>
<td>-0.18 **</td>
<td>4.3 ***</td>
<td>-1.4 *</td>
<td>-1.3 *</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 Maternal cognitions (MCISQ)†</td>
<td>0.53 ***</td>
<td>0.09</td>
<td>-0.06</td>
<td>0.02</td>
<td>-0.07</td>
<td>-0.15 **</td>
<td>-0.09</td>
<td>1.8 **</td>
<td>1.4 *</td>
<td>19 ***</td>
<td>29 ***</td>
<td>3.6 **</td>
<td>38 ***</td>
<td>-28 ***</td>
<td>36 ***</td>
<td>-0.01</td>
<td>-0.05</td>
<td>4.9 ***</td>
<td></td>
</tr>
<tr>
<td>20 Safety (MCISQ)</td>
<td>-0.01</td>
<td>0.00</td>
<td>-0.01</td>
<td>0.00</td>
<td>0.03</td>
<td>1.2 **</td>
<td>0.07</td>
<td>0.05</td>
<td>0.05</td>
<td>0.34 ***</td>
<td>0.23 ***</td>
<td>-0.14 **</td>
<td>0.00</td>
<td>-0.03</td>
<td>-0.05</td>
<td>0.32 ***</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* Decimal points have been omitted. STSI = Short Temperament Scale for Infants; EPDS = Edinburgh Postnatal Depression Scale; PSS = Parental Stress Scale; PAI = Parenting Alliance Inventory; MCISQ = Maternal Cognitions about Infant Sleep Questionnaire.

† Excludes the Safety subscale.

* * p < .05. ** * p < .01. *** * p < .001.
Following examination of the Pearson correlation coefficients, the third hierarchical regression analysis was conducted. This investigation involved pretest and early postnatal period measures, as well as concurrent assessments in the prediction of 12-month infant sleep quality. The first three steps concerning the early measures were identical to the second analysis, and explained 10.0% of the variability (Table 21). With the inclusion of the 12-month infant development and health variables at the fourth step, the total variability in sleep scores accounted for by the model almost doubled to 19.6%. At this point, the significant independent predictors were difficult temperament, access to the parent tip sheet, breastfeeding status, and initial infant sleeping location. With the exception of child illness during the preceding 6 months, they were identical to those found at the same stage of the first analysis.

Controlling for mood, stress, and relationship differences at the fifth step again added little to the model. These predictors accounted for 1.4% of the variance over and above that explained by those lower in the hierarchy, and none were statistically significant additions. Step 6 involved the introduction of night-time parenting behaviours and maternal cognitions into the regression analysis. The total variability captured by the model increased by 34.8 to 55.8%. The strongest unique predictors of infant sleep outcomes involved active physical comforting and problematic cognitions. The parents of infants with healthy sleep patterns did not intervene in the sleep initiation process at bedtime, avoided assisting their child to reinitiate sleep following awakenings, and reported more adaptive maternal cognitions about infant sleep. Other statistically significant predictors of sleep quality were easy infant temperament, parent access to the written anticipatory guidance, non-use of a pacifier at bedtime, use of an attachment object, maternal concerns about SIDS, a lower birth weight, and cessation of breastfeeding.

**Multiple Linear Regression Series II: Maternal Behaviours and Cognitions**

As highlighted earlier, the pathways to infant sleep disturbance remain clouded despite extensive study. However, there is substantial research linking night-time parenting behaviours with infant sleeping difficulties and an emerging focus on the associated underlying cognitions. It was therefore resolved to conduct a further series of regression analyses in a more finely-grained investigation of the relative influence of the specific parental behaviours and maternal cognition dimensions captured by this project.

Since the causal priority of these factors is intuitively and theoretically ambiguous,
Table 21
Hierarchical Regression Analysis of Pretest, Infant Development/Health, and 12-Month Parental Variables in the Prediction of Infant Sleep Quality at 12 Months

<table>
<thead>
<tr>
<th>Pretest/12-Month (IVs)</th>
<th>12-Month Sleep Index (DV)</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steps 1–3 (for detail see Table 19)</td>
<td>$(R^2 = 0.10, \Delta R^2 = 0.04)$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 4: Infant Development/Health</td>
<td>$(R^2 = 0.20, \Delta R^2 = 0.10)$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maternal age</td>
<td>0.00</td>
<td>0.01</td>
<td>-0.01</td>
<td></td>
</tr>
<tr>
<td>Gestation</td>
<td>-0.01</td>
<td>0.00</td>
<td>-0.09</td>
<td></td>
</tr>
<tr>
<td>APGAR at 1 min</td>
<td>0.01</td>
<td>0.03</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Birth weight</td>
<td>0.00</td>
<td>0.00</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Initial sleep location</td>
<td>-0.31</td>
<td>0.09</td>
<td>-0.17 ***</td>
<td></td>
</tr>
<tr>
<td>Parent tip sheet (Study 1)</td>
<td>-0.39</td>
<td>0.09</td>
<td>-0.21 ***</td>
<td></td>
</tr>
<tr>
<td>Infantile colic</td>
<td>0.03</td>
<td>0.10</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Illness (6–12 months)?</td>
<td>0.19</td>
<td>0.10</td>
<td>0.09</td>
<td></td>
</tr>
<tr>
<td>Breastfeeding status (12 months)</td>
<td>0.35</td>
<td>0.10</td>
<td>0.18 ***</td>
<td></td>
</tr>
<tr>
<td>Easy-difficult temperament (STSI)</td>
<td>0.38</td>
<td>0.08</td>
<td>0.23 ***</td>
<td></td>
</tr>
<tr>
<td>Step 5: Mood/Stress/Relationship</td>
<td>$(R^2 = 0.21, \Delta R^2 = 0.01)$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maternal age</td>
<td>0.00</td>
<td>0.01</td>
<td>-0.01</td>
<td></td>
</tr>
<tr>
<td>Gestation</td>
<td>-0.01</td>
<td>0.00</td>
<td>-0.09</td>
<td></td>
</tr>
<tr>
<td>APGAR at 1 min</td>
<td>0.02</td>
<td>0.03</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Birth weight</td>
<td>0.00</td>
<td>0.00</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Initial sleep location</td>
<td>-0.29</td>
<td>0.09</td>
<td>-0.16 **</td>
<td></td>
</tr>
<tr>
<td>Parent tip sheet (Study 1)</td>
<td>-0.40</td>
<td>0.09</td>
<td>-0.22 ***</td>
<td></td>
</tr>
<tr>
<td>Infantile colic</td>
<td>0.04</td>
<td>0.10</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Illness (6–12 months)?</td>
<td>0.19</td>
<td>0.10</td>
<td>0.09</td>
<td></td>
</tr>
<tr>
<td>Breastfeeding status (12 months)</td>
<td>0.35</td>
<td>0.10</td>
<td>0.18 ***</td>
<td></td>
</tr>
<tr>
<td>Easy-difficult temperament (STSI)</td>
<td>0.34</td>
<td>0.08</td>
<td>0.21 ***</td>
<td></td>
</tr>
<tr>
<td>Postnatal depression (EPDS)</td>
<td>0.02</td>
<td>0.01</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>Parenting stress (PSS)</td>
<td>0.00</td>
<td>0.01</td>
<td>-0.03</td>
<td></td>
</tr>
</tbody>
</table>
## Table 1: Hierarchical Regression Analysis of 12-Month Sleep Index

<table>
<thead>
<tr>
<th>Pretest/12-Month (IVs)</th>
<th>12-Month Sleep Index (DV)</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Parenting alliance (PAI)</em></td>
<td>-0.01</td>
<td>0.00</td>
<td>-0.08</td>
<td></td>
</tr>
</tbody>
</table>

**Step 6: Cognitions/Strategies**  
(R² = 0.56, ΔR² = 0.35)

| Maternal age | -0.01 | 0.01  | -0.05|
| Gestation    | 0.00  | 0.00  | -0.02|
| APGAR at 1 min | 0.01 | 0.02  | 0.01 |
| Birth weight | 0.00  | 0.00  | 0.09 * |
| Initial sleep location | -0.04 | 0.07  | -0.02 |
| Parent tip sheet (Study 1) | -0.21 | 0.07  | -0.12 ** |
| Infantile colic | -0.09 | 0.08  | -0.04 |
| Illness (6–12 months)? | 0.09  | 0.08  | 0.04 |
| Breastfeeding status (12 months) | 0.17  | 0.08  | 0.08 * |
| Easy-difficult temperament (STSI) | 0.20  | 0.07  | 0.13 ** |
| Postnatal depression (EPDS) | 0.00  | 0.01  | 0.00 |
| Parenting stress (PSS) | 0.00  | 0.01  | 0.02 |
| Parenting alliance (PAI) | 0.00  | 0.00  | 0.01 |

*Parental assistance at bedtime*  
0.48 0.09 0.24 ***

*Pacifier at sleep onset*  
0.18 0.07 0.10 *

*Sleep attachment object*  
-0.19 0.07 -0.10 *

*Stimulatory response to waking*  
0.68 0.09 0.36 ***

*Maternal cognitions (MCISQ)*  
0.02 0.00 0.22 ***

*Safety (MCISQ)*  
-0.04 0.02 -0.09 *

---

Note: For data on Steps 1–3, refer to Hierarchical Regression Analysis 2  
(Table 19). Variables added at each step are shown in italics. IV = Independent Variable; DV = Dependent Variable; STSI = Short Temperament Scale for Infants; EPDS = Edinburgh Postnatal Depression Scale; PSS = Parental Stress Scale; PAI = Parenting Alliance Inventory; MCISQ = Maternal Cognitions about Infant Sleep Questionnaire.

* Excludes the Safety subscale which has been analysed separately.

* p < .05.  ** p < .01.  *** p < .001.
each predictor was entered simultaneously into the regression equation on each occasion. The idea was to elucidate the unique impact of bedtime routines, night-waking strategies, and maternal cognitions on infant sleep disturbances, irrespective of other less powerful influences. The first two analyses investigated 6-month parental bedtime behaviours, night-waking responses, and cognitions in the prediction of infant sleep quality at 6 and 12 months.

To begin, Pearson correlation coefficients were computed for each of the relevant variables, with the results shown in Table 22. Naturally, these associations were broadly consistent with the raw sleep measure data presented earlier (see Table 17). The strongest relationships with the infant sleep quality index at 6 and 12 months involved highly stimulatory parental behaviours at bedtime and during the night, and maladaptive maternal cognitions about limit-setting, doubt, and feeding issues. Safety items were negatively correlated with problematic sleep, but positively related to three other dimensions of the MCISQ. Of the 10 possible correlations between the MCISQ subscales, only Anger and Safety were not significantly associated.

Some other moderate correlations provide insight into the overall picture of parenting strategies and behaviours. For example, parents who rocked or fed their infant to sleep at bedtime tended to use the same approach following night-wakings. Caregivers who were present at bedtime sleep onset and those who incorporated music into the nightly settling routine were likely to use a similar strategy in response to wakings during the night. Parents who acknowledged bringing the child to their own bed following awakenings were significantly more prone to feeding the child nocturnally. Mothers who responded with feeding during the night also tended to change the baby’s nappy. Those offering reassurance to their waking infant were also inclined to rearrange the covers before leaving the room.

Two exploratory multiple regression models with the 6 and 12 months sleep indices as the DVs and all IVs entered simultaneously were then produced. Despite moderate correlations among some variables, there were no breaches of multicollinearity conventions. The results of these analyses (i.e., Simultaneous Regression 1 and 2), including the total shared variance for each category of variable, are detailed in Table 23.

**Simultaneous Regression 1: 6-Month Parenting Behaviours and Cognitions in the Prediction of 6-Month Infant Sleep Quality**

Parental responses to night-waking were associated with the most shared variance in infant sleep patterns at 6 months. The coefficient of multiple determination was 0.583, indicating that the model explained 58.3% of the variance in infant sleep quality. Among
| Variable                                      | 1     | 2     | 3     | 4     | 5     | 6     | 7     | 8     | 9     | 10    | 11    | 12    | 13    | 14    | 15    | 16    | 17    | 18    | 19    | 20    |
|----------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1 Sleep quality index (6 months)*            |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 2 Fed to sleep (B)                           | 30*** |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 3 Rocked to sleep (B)                        | 19*** | 21*** |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 4 Parental presence until asleep (B)         | 12*  -02 | 05 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 5 Play music/musical toy (B)                 | -05 -03 | 03 | 05 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 6 Reassure & leave (N)                       | -04  02 | 03 | -02 -05 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 7 Feed the child (N)                         | 60*** 22*** | 07 | 05 | -10 | -01 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 8 Change nappy (N)                           | 20*** 14** 14** | 07 | -04 | 14** | 34*** |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 9 Hold or rock (N)                           | 26*** 30*** 33*** -03 -09 | 13*** | 21*** | 25*** |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 10 Parental presence until asleep (N)        | 21*** 07 | 06 | 28*** -06 | 04 | 14** | 06 | 16** |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 11 Replace covers (N)                        | -02 -01 | -11* | 01 | 00 | 34*** -10 | -01 | 00 | 07 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 12 Medicine/teething gel (N)                 | 14** | 04 | 02 | 02 | -10 | 24*** | 10* | 14** | 17** | 03 | 09 |       |       |       |       |       |       |       |       |       |       |
| 13 Play music/musical toy (N)                | 05 -09 | 00 | -06 | 33*** | 07 | 05 | 00 | 02 | 15** | 13* | 01 |       |       |       |       |       |       |       |       |       |       |
| 14 Give/replace pacifier (N)                 | 05 -18*** -04 -04 | 09 | 06 | -11* -11* | -05 | -05 | 24*** | 07 | -01 |       |       |       |       |       |       |       |       |       |       |       |       |
| 15 Take to parental bed (N)                  | 42*** 22*** 16** | 02 | -02 | -08 | 26*** 18*** | 20*** | 14** -08 | 01 | -02 | -04 |       |       |       |       |       |       |       |       |       |       |
| 16 Setting Limits (MCISQ)                    | 35*** 23*** 14** | 05 | 01 | -10 | 22*** | 09 | 22*** | 05 | -01 | 02 | -06 | 08 | 22*** |       |       |       |       |       |       |
| 17 Anger (MCISQ)                              | 24*** | 05 | 04 | 02 | -04 | 00 | 13* | -01 | 05 | 00 | 00 | 10 | 06 | -01 | 00 | 00 | 16** |       |       |       |
| 18 Doubt (MCISQ)                              | 36*** 22*** 20*** | 08 | -04 | 00 | 18*** | 12* | 20*** | 09 | -09 | 05 | -02 | -02 | 16** | 41*** | 37*** |       |       |       |       |
| 19 Feeding (MCISQ)                            | 40*** 21*** 07 | 00 | -06 | -08 | 35*** | 11* | 12* | 06 | -16** | 03 | -05 | -10 | 12* | 34*** | 25*** | 45*** |       |       |       |
| 20 Safety (MCISQ)                             | -15** | 02 | 01 | -04 | 07 | 09 | -13* | -03 | -07 | -04 | 09 | -08 | 08 | -04 | -06 | 15** | 08 | 27*** | 18*** |
| 21 Sleep quality index (12 months)*          | 49*** | 38*** | 23*** | 03 | -01 | -07 | 26*** | 13* | 26*** | 18*** | -04 | 00 | 01 | -01 | 32*** | 35*** | 10 | 30*** | 21*** -04 |       |

**Note.** Decimal points have been omitted. B = At bedtime; N = During the night; MCISQ = Maternal Cognitions about Infant Sleep Questionnaire.

*Sleep quality index scores are shown at opposite ends to retain variable numbering consistency with the next correlation table.

*p < .05.  **p < .01.  ***p < .001.
Table 23

Multiple Regression Analyses of 6-Month Parenting Behaviour and Cognition Variables in the Prediction of Infant Sleep Quality at 6 and 12 Months

<table>
<thead>
<tr>
<th>Pretest/6-Month (IVs)</th>
<th>6-Month Sleep Index (DV)(^a)</th>
<th>12-Month Sleep Index (DV)(^b)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(B)</td>
<td>(SE)</td>
</tr>
<tr>
<td>Bedtime Parenting Strategies</td>
<td>(r^2 = 0.13)</td>
<td>(r^2 = 0.17)</td>
</tr>
<tr>
<td>Feed until asleep (B)</td>
<td>0.22</td>
<td>0.08</td>
</tr>
<tr>
<td>Hold/rock to sleep (B)</td>
<td>0.18</td>
<td>0.11</td>
</tr>
<tr>
<td>Parental presence until asleep (B)</td>
<td>0.24</td>
<td>0.13</td>
</tr>
<tr>
<td>Play music/musical toy (B)</td>
<td>-0.03</td>
<td>0.10</td>
</tr>
<tr>
<td>Parental Responses to Night-Waking</td>
<td>(r^2 = 0.47)</td>
<td>(r^2 = 0.18)</td>
</tr>
<tr>
<td>Reassure &amp; leave (N)</td>
<td>-0.06</td>
<td>0.08</td>
</tr>
<tr>
<td>Feed the child (N)</td>
<td>0.74</td>
<td>0.08</td>
</tr>
<tr>
<td>Change nappy (N)</td>
<td>-0.10</td>
<td>0.09</td>
</tr>
<tr>
<td>Hold/rock to sleep (N)</td>
<td>0.02</td>
<td>0.13</td>
</tr>
<tr>
<td>Parental presence until asleep (N)</td>
<td>0.18</td>
<td>0.14</td>
</tr>
<tr>
<td>Replace covers (N)</td>
<td>0.12</td>
<td>0.08</td>
</tr>
<tr>
<td>Medicine/teething gel (N)</td>
<td>0.21</td>
<td>0.15</td>
</tr>
<tr>
<td>Play music/musical toy (N)</td>
<td>0.28</td>
<td>0.17</td>
</tr>
<tr>
<td>Give/replace pacifier (N)</td>
<td>0.23</td>
<td>0.07</td>
</tr>
<tr>
<td>Take to parents’ bed (N)</td>
<td>0.70</td>
<td>0.12</td>
</tr>
<tr>
<td>Maternal Cognitions about Infant Sleep</td>
<td>(r^2 = 0.32)</td>
<td>(r^2 = 0.17)</td>
</tr>
<tr>
<td>Setting Limits (MCISQ)</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Anger (MCISQ)</td>
<td>0.02</td>
<td>0.01</td>
</tr>
<tr>
<td>Doubt (MCISQ)</td>
<td>0.04</td>
<td>0.01</td>
</tr>
<tr>
<td>Feeding (MCISQ)</td>
<td>0.04</td>
<td>0.01</td>
</tr>
<tr>
<td>Safety (MCISQ)</td>
<td>-0.06</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Note. All Independent Variables (IVs) entered simultaneously. \(r^2\) = total variance (i.e., unique and shared) associated with each category of variables. DV = Dependent Variable; B = At Bedtime; N = During the Night; MCISQ = Maternal Cognitions about Infant Sleep Questionnaire.

\(aR^2 = 0.583. \ bR^2 = 0.310.\)

*\(p < .05. **p < .01. ***p < .001.\)
these variables, the highly stimulatory behaviours of initiating feeding and removing the child to the parental bed were the two most important predictors of poor infant sleep in the model. Concern about SIDS was the third most valuable predictor; as reported in the first hierarchical analysis, this was despite a relatively weak zero-order correlation with the 6-month infant sleep quality index.  

A night-waking strategy of providing or replacing a pacifier also added significantly to the model (partial $r = 0.17$), despite the zero-order correlation indicating no significant relationship with infant sleep patterns. Other significant predictors were feeding the infant to sleep at bedtime, and maternal cognitions about anger. A moderate relationship between cognitions about limit-setting and infant sleep patterns among the raw correlations disappeared once the influence of the other independent variables had been statistically controlled. Similarly, rocking the child back to sleep and nappy changes during the night did not add significantly to the model.

Simultaneous Regression 2: 6-Month Parenting Behaviours and Cognitions in the Prediction of 12-Month Infant Sleep Quality

The second multiple regression analysis incorporated the 12-month infant sleep quality index as the dependent variable. As with the second hierarchical analysis, this was effectively a follow-up, assessing the impact of the same predictors 6 months later. Six-month parental behaviours and cognitions accounted for 31.0% of the total variability in 12-month infant sleep patterns. In contrast to the preceding simultaneous analysis, the three sets of independent variables were responsible for similar amounts of variance.

The strongest individual predictors of 12-month sleep outcomes were feeding the child to sleep at bedtime and maternal cognitions about limit-setting at 6 months. Co-sleeping, doubts about parenting competence, and a night-waking response of waiting with the child until asleep were also significant predictors of disturbed infant sleep patterns. With all other variables statistically controlled, several variables which had been associated with infant sleep outcomes via the raw correlations no longer exerted a significant influence.

136 The partial correlation was 0.22 suggesting that the relationship between the variables in the model was suppressing the true effect of Safety on infant sleep patterns. The pattern of raw correlations suggested that was due to the influence of the other MCISQ subscales (particularly Doubt), which had a positive relationship with both the sleep quality index and the Safety subscale. Moreover, Feeding and Doubt on the maternal cognitions measure were the next two most important predictors of 6 month infant sleep patterns.

137 Again, this suggested that the non-significant raw correlation was due to the suppression effects of other predictors. A negative association between pacifier use and some of the stimulatory parental strategies (i.e., bedtime feeding, night-feeding, nappy changing) and the positive relationship between these parental behaviours and poor infant sleep appeared to be the rationale.
Holding or rocking the child to sleep at bedtime; feeding, nappy changing, and holding or rocking during the night; and unhelpful cognitions about feeding at 6 months did not significantly add to the prediction of infant sleep disturbance at 12 months.

**Simultaneous Regression 3: 12-Month Parenting Behaviours and Cognitions in the prediction of 12-Month Infant Sleep Quality**

The final multiple regression analysis was concerned with 12-month assessments of night-time parenting behaviours and sleep-related cognitions in the prediction of concomitant scores on the index of infant sleep quality. Pearson correlation coefficients for the each pair of variables included in the model were firstly computed and are presented in Table 24.

Consistent with earlier results, the strongest relationships with 12-month infant sleep quality were highly stimulatory approaches such as feeding the child to sleep in the early evening and nocturnally, and parental co-sleeping. Maternal cognitions were also moderately to strongly associated with sleeping patterns on four of the five subscales. Parents again tended to utilise the same strategies to induce sleep in their infant following wakings during the night as they had employed at bedtime. Mothers who reported unhelpful cognitions about limit-setting had the most difficulty with problematic feeding practices and resisting the inclination to remove the child to the parental bed. Maladaptive cognitions about feeding were moderately related to bedtime feeding and strongly correlated with night-feeding. On this occasion, all subscales of the MCISQ were positively and significantly associated.

Following appraisal of the bivariate correlations, the final multiple regression analysis was performed. Table 25 presents the outcome of this procedure, including the total shared variance for each category of predictors. The proportion of explained variability in infant sleep scores (55.1%) was similar to the 6-month concurrent outcome. Parental response to night-waking was the most important category of predictors, being responsible for about twice the total variance in sleep patterns compared to that explained by bedtime strategies. The best predictor of poor infant sleep quality at 12 months was removal of the child to the parental bed following awakenings.

Feeding the child during the night and problematic maternal cognitions about setting appropriate limits also added significant amounts of unique variance to the model. Consistent with the earlier results, maternal cognitions about SIDS predicted better 12-month-old infant sleep patterns, despite having a structure coefficient of close to zero. Other statistically valid predictors of sleep problems were holding or rocking the child in the evening and after night-waking, using a form of music at bedtime, and maternal cognitions involving anger. With the
Table 24

Bivariate Correlations of 12-Month Parenting Behaviour and Cognition Variables

<table>
<thead>
<tr>
<th>Variable</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>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Sleep quality index (12 months)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Fed to sleep (B)</td>
<td>38***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Rocked to sleep (B)</td>
<td>28***</td>
<td>26***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Parental presence until asleep (B)</td>
<td>27***</td>
<td>17**</td>
<td>05</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Play music/musical toy (B)</td>
<td>14*</td>
<td>09</td>
<td>02</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Reassure &amp; leave (N)</td>
<td>03</td>
<td>-03</td>
<td>03</td>
<td>-03</td>
<td>-03</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Feed the child (N)</td>
<td>41***</td>
<td>32***</td>
<td>11*</td>
<td>10</td>
<td>-02</td>
<td>02</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Change nappy (N)</td>
<td>11*</td>
<td>24***</td>
<td>07</td>
<td>11*</td>
<td>01</td>
<td>19***</td>
<td>28***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 Hold or rock (N)</td>
<td>26***</td>
<td>18***</td>
<td>31***</td>
<td>19***</td>
<td>-01</td>
<td>10</td>
<td>13*</td>
<td>08</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Parental presence until asleep (N)</td>
<td>28***</td>
<td>17**</td>
<td>09</td>
<td>41***</td>
<td>11*</td>
<td>-05</td>
<td>02</td>
<td>02</td>
<td>27***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 Replace covers (N)</td>
<td>15**</td>
<td>02</td>
<td>00</td>
<td>04</td>
<td>06</td>
<td>34***</td>
<td>05</td>
<td>07</td>
<td>11*</td>
<td>23***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 Medicine/teething gel (N)</td>
<td>05</td>
<td>-08</td>
<td>-05</td>
<td>-02</td>
<td>05</td>
<td>21***</td>
<td>06</td>
<td>12*</td>
<td>04</td>
<td>02</td>
<td>18***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 Play music/musical toy (N)</td>
<td>03</td>
<td>-02</td>
<td>-03</td>
<td>-02</td>
<td>36***</td>
<td>03</td>
<td>11*</td>
<td>10</td>
<td>04</td>
<td>08</td>
<td>13*</td>
<td>15**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14 Give/replace pacifier (N)</td>
<td>05</td>
<td>-08</td>
<td>00</td>
<td>01</td>
<td>22***</td>
<td>08</td>
<td>-13*</td>
<td>-06</td>
<td>-03</td>
<td>-03</td>
<td>25***</td>
<td>10</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 Take to parental bed (N)</td>
<td>54***</td>
<td>26***</td>
<td>17**</td>
<td>20***</td>
<td>09</td>
<td>04</td>
<td>20***</td>
<td>13*</td>
<td>11*</td>
<td>17**</td>
<td>04</td>
<td>01</td>
<td>02</td>
<td>02</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 Setting Limits (MCISQ)</td>
<td>49***</td>
<td>31***</td>
<td>21***</td>
<td>20***</td>
<td>08</td>
<td>-03</td>
<td>29***</td>
<td>10</td>
<td>09</td>
<td>19***</td>
<td>08</td>
<td>04</td>
<td>02</td>
<td>16**</td>
<td>31***</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17 Anger (MCISQ)</td>
<td>28***</td>
<td>15**</td>
<td>08</td>
<td>11*</td>
<td>03</td>
<td>01</td>
<td>18***</td>
<td>05</td>
<td>08</td>
<td>21***</td>
<td>06</td>
<td>19***</td>
<td>11*</td>
<td>01</td>
<td>19***</td>
<td>20***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 Doubt (MCISQ)</td>
<td>34***</td>
<td>26***</td>
<td>22***</td>
<td>14**</td>
<td>04</td>
<td>14*</td>
<td>18***</td>
<td>22***</td>
<td>12*</td>
<td>15**</td>
<td>09</td>
<td>02</td>
<td>03</td>
<td>04</td>
<td>24***</td>
<td>46***</td>
<td>35***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19 Feeding (MCISQ)</td>
<td>33***</td>
<td>30***</td>
<td>10</td>
<td>06</td>
<td>00</td>
<td>-05</td>
<td>54***</td>
<td>25***</td>
<td>08</td>
<td>07</td>
<td>-01</td>
<td>05</td>
<td>06</td>
<td>-08</td>
<td>13*</td>
<td>35***</td>
<td>29***</td>
<td>46***</td>
<td></td>
</tr>
<tr>
<td>20 Safety (MCISQ)</td>
<td>-01</td>
<td>01</td>
<td>-01</td>
<td>-04</td>
<td>05</td>
<td>03</td>
<td>03</td>
<td>08</td>
<td>03</td>
<td>00</td>
<td>-07</td>
<td>13*</td>
<td>01</td>
<td>-01</td>
<td>05</td>
<td>19***</td>
<td>23***</td>
<td>36***</td>
<td>24***</td>
</tr>
</tbody>
</table>

Note.  Decimal points have been omitted.  B = At bedtime; N = During the night; MCISQ = Maternal Cognitions about Infant Sleep Questionnaire.

*p < .05.  **p < .01.  ***p < .001.
Table 25
Multiple Regression Analysis of 12-Month Parenting Behaviour and Cognition Variables in the Prediction of Concurrent Infant Sleep Quality

<table>
<thead>
<tr>
<th>12-Month (IVs)</th>
<th>12-Month Sleep Index (DV)(^a)</th>
<th>(B)</th>
<th>(SE,B)</th>
<th>(\beta)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bedtime Parenting Strategies ((r^2 = 0.23))</td>
<td>Feed until asleep (B)</td>
<td>0.17</td>
<td>0.11</td>
<td>0.07</td>
</tr>
<tr>
<td></td>
<td>Hold/rock to sleep (B)</td>
<td>0.25</td>
<td>0.12</td>
<td>0.08 *</td>
</tr>
<tr>
<td></td>
<td>Parental presence until asleep (B)</td>
<td>0.14</td>
<td>0.13</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>Play music/musical toy (B)</td>
<td>0.32</td>
<td>0.15</td>
<td>0.09 *</td>
</tr>
<tr>
<td>Parental Responses to Night-Waking ((r^2 = 0.46))</td>
<td>Reassure &amp; leave (N)</td>
<td>0.00</td>
<td>0.08</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>Feed the child (N)</td>
<td>0.47</td>
<td>0.10</td>
<td>0.21 ***</td>
</tr>
<tr>
<td></td>
<td>Change nappy (N)</td>
<td>-0.19</td>
<td>0.11</td>
<td>-0.07</td>
</tr>
<tr>
<td></td>
<td>Hold/rock to sleep (N)</td>
<td>0.27</td>
<td>0.11</td>
<td>0.10 *</td>
</tr>
<tr>
<td></td>
<td>Parental presence until asleep (N)</td>
<td>0.22</td>
<td>0.14</td>
<td>0.07</td>
</tr>
<tr>
<td></td>
<td>Replace covers (N)</td>
<td>0.11</td>
<td>0.08</td>
<td>0.06</td>
</tr>
<tr>
<td></td>
<td>Medicine/teething gel (N)</td>
<td>0.07</td>
<td>0.11</td>
<td>0.03</td>
</tr>
<tr>
<td></td>
<td>Play music/musical toy (N)</td>
<td>-0.27</td>
<td>0.18</td>
<td>-0.06</td>
</tr>
<tr>
<td></td>
<td>Give/replace pacifier (N)</td>
<td>0.02</td>
<td>0.08</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>Take to parents’ bed (N)</td>
<td>0.86</td>
<td>0.10</td>
<td>0.34 ***</td>
</tr>
<tr>
<td>Maternal Cognitions about Infant Sleep ((r^2 = 0.32))</td>
<td>Setting limits (MCISQ)</td>
<td>0.04</td>
<td>0.01</td>
<td>0.20 ***</td>
</tr>
<tr>
<td></td>
<td>Anger (MCISQ)</td>
<td>0.03</td>
<td>0.01</td>
<td>0.08 *</td>
</tr>
<tr>
<td></td>
<td>Doubt (MCISQ)</td>
<td>0.02</td>
<td>0.01</td>
<td>0.06</td>
</tr>
<tr>
<td></td>
<td>Feeding (MCISQ)</td>
<td>0.02</td>
<td>0.02</td>
<td>0.06</td>
</tr>
<tr>
<td></td>
<td>Safety (MCISQ)</td>
<td>-0.05</td>
<td>0.02</td>
<td>-0.13 **</td>
</tr>
</tbody>
</table>

Note. All Independent Variables (IVs) entered simultaneously. \(r^2\) = total variance (i.e., unique and shared) associated with each category. DV = Dependent Variable; B = At Bedtime; N = During the Night; MCISQ = Maternal Cognitions about Infant Sleep Questionnaire.

\(^a\) \(R^2 = 0.551.\)

\(^*\) \(p < .05.\) \(^{**}\) \(p < .01.\) \(^{***}\) \(p < .001.\)
effect of all other variables statistically controlled, parental presence following wakings and MCISQ Doubt and Feeding were no longer significantly associated with infant sleep outcomes. Thus, as a consequence of their relationship with other measures, these variables are arbitrarily denied some predictive credit (Zientek & Thompson, 2006).

**Commonality Analyses: Maternal Behaviours and Cognitions**

An aim of this second study was to gain a deeper understanding of the relative influence of bedtime strategies, responses to night-waking, and maternal cognitions in the prediction of infant sleep disturbance. While the previous analyses provides information about the unique influences of the individual parental behaviours/strategies and types of cognitions on infant sleep outcomes, further clarification about how the three categories of IVs combine to influence infant sleep behaviour is required. This is important because studies have regularly investigated one of these three broad dimensions of influence with little appreciation of its relative contribution to infant sleep quality.

In regression analyses, the unique variance rarely sums to the total explained variance and, as is the case with the current study, the remaining proportion is large and difficult to interpret with respect to the effects of the predictors (Seibold & McPhee, 1979). As a means of disentangling these relationships, three commonality analyses were conducted. Commonality analysis is concerned with further decomposition of the coefficient of multiple determination in an attempt to understand the relative predictive power of the regressor variables, both individually and in combination. Originally suggested by Kempthorne (1957), this procedure has been advocated by a steady stream of researchers and statisticians since that time (e.g., Amado, 1999; Daniel, 1989; Mood, 1969, 1971; Petrocelli, 2003; Rowell, 1991; Seibold & McPhee, 1979; Thompson, 1985; Zientek & Thompson, 2006).

Commonality analysis involves not only ascertaining how much of the variance in the dependent variable is unique to each predictor, but also identifies and partials out the explanatory power common to the other variables in the model (Seibold & McPhee, 1979; Thompson, 1985). Since all possible orders of entry of the predictors into the model are considered, the number of unique and common components is exponentially determined. Therefore, investigations with more than five predictors become not only arduous, but problematical to report and interpret (Schneider, 2008). For this reason, Mood (1971) recommends grouping like variables into meaningful subsets, a recommendation which fits well with the circumstances of the present study.
Commonalty Analysis I: 6-Month Predictors and Concurrent Infant Sleep Quality

The first commonality procedure, investigates the relationship between bedtime routines, caregiving responses during the night, and maternal sleep-related cognitions in the prediction of 6-month infant sleep patterns. It utilises the variables involved in the first simultaneous regression analyses (see Table 23) and examines their unique and shared explanatory power at the level of these three categories. The seven commonality partitions of the total explained variance are presented in Table 26. The results indicate that in this sample, there was very little unique or shared variability attributable to bedtime parenting practices. For these data, the unique contributions of caregiver responses to night-waking and maternal cognitions about infant sleep accounted for more than half of the total variance explained by the predictors (30.5%). Moreover, the addition of the variance shared between these categories takes the total to 45.8%, or 78.6% of the total variability accounted for by the model.

Table 26

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Unique to BP</td>
<td>1.7%</td>
<td></td>
<td></td>
<td>1.7%</td>
</tr>
<tr>
<td>Unique to NP</td>
<td></td>
<td>22.7%</td>
<td></td>
<td>22.7%</td>
</tr>
<tr>
<td>Unique to MC</td>
<td></td>
<td></td>
<td>7.8%</td>
<td>7.8%</td>
</tr>
<tr>
<td>Common to BP &amp; NP</td>
<td>2.4%</td>
<td>2.4%</td>
<td></td>
<td>2.4%</td>
</tr>
<tr>
<td>Common to BP &amp; MC</td>
<td>1.5%</td>
<td></td>
<td>1.5%</td>
<td>1.5%</td>
</tr>
<tr>
<td>Common to NP &amp; MC</td>
<td></td>
<td>15.3%</td>
<td>15.3%</td>
<td>15.3%</td>
</tr>
<tr>
<td>Common to BP, NP, &amp; MC</td>
<td>7.0%</td>
<td>7.0%</td>
<td>7.0%</td>
<td>7.0%</td>
</tr>
<tr>
<td>Total ($r^2$)</td>
<td>12.6%</td>
<td>47.4%</td>
<td>31.6%</td>
<td>58.3%</td>
</tr>
<tr>
<td>Total ($R^2$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. BP = Bedtime Practices; NP = Night-waking Practices; MC = Maternal Cognitions. Total unique variance = 32.1%. Total common variance = 26.2%. Computation anomalies are due to rounding.
Commonality Analysis II: 6-Month Predictors and 12-Month Infant Sleep Quality

The next exercise involved partitioning the variance explained by the second regression analysis in this series. This commonality procedure, which incorporated the same 6-month variables in the prediction of 12-month infant sleep quality, showed quite a different pattern of results. On this occasion, each of the three categories appeared to play a relatively equal role. Similar to the first analysis, half of the total variance explained by the predictors was unique to the three categories, although in this instance, the percentages were far more evenly dispersed. These findings are detailed in Table 27. Overall, active soothing at bedtime and following night-wakings, and concomitant maladaptive maternal cognitions about infant sleep at 6 months, appear to have similar relative contributions to the prediction of problematic infant sleep at 12 months.

Table 27
Commonality Analysis of 6-Month Parenting Behaviour and Cognition Variables in the Prediction of 12-Month Infant Sleep Quality

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Unique to BP</td>
<td>5.7%</td>
<td>5.4%</td>
<td>4.5%</td>
<td>16.7%</td>
</tr>
<tr>
<td>Unique to NP</td>
<td></td>
<td>5.4%</td>
<td>4.5%</td>
<td>18.4%</td>
</tr>
<tr>
<td>Unique to MC</td>
<td></td>
<td></td>
<td>4.5%</td>
<td>16.6%</td>
</tr>
<tr>
<td>Common to BP &amp; NP</td>
<td>3.2%</td>
<td>3.2%</td>
<td>4.3%</td>
<td>3.2%</td>
</tr>
<tr>
<td>Common to BP &amp; MC</td>
<td>2.3%</td>
<td></td>
<td>4.3%</td>
<td>2.3%</td>
</tr>
<tr>
<td>Common to NP &amp; MC</td>
<td></td>
<td></td>
<td>4.3%</td>
<td>4.3%</td>
</tr>
<tr>
<td>Common to BP, NP, &amp; MC</td>
<td>5.5%</td>
<td>5.5%</td>
<td>5.5%</td>
<td>5.5%</td>
</tr>
<tr>
<td>Total ($r^2$)</td>
<td>16.7%</td>
<td>18.4%</td>
<td>16.6%</td>
<td>31.0%</td>
</tr>
<tr>
<td>Total ($R^2$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. BP = Bedtime Practices; NP = Night-waking Practices; MC = Maternal Cognitions. Total unique variance = 15.7%. Total common variance = 15.3%. Computation anomalies are due to rounding.
Commonality Analysis III: 12-Month Predictors and Concurrent Infant Sleep Quality

Attention then moved to the final analysis, investigating the seven commonality partitions obtainable from the 12-month simultaneous regression model (see Table 25 for detail). These results have been presented in Table 28 and bear some resemblance to the 6-month concurrent findings. Although a much higher percentage of variance was shared between the three categories, night-waking responses and maternal cognitions again accounted for the majority of unique variance. In fact, 91.4% of the bedtime-related variance in infant sleep patterns was shared with the other two categories. Conversely, more than a quarter of the total variance explained by the model was unique to category involving parental night-waking behaviours.

Table 28
Commonality Analysis of 12-Month Parenting Behaviour and Cognition Variables in the Prediction of Concurrent Infant Sleep Quality

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Unique to BP</td>
<td>1.9%</td>
<td></td>
<td></td>
<td>1.9%</td>
</tr>
<tr>
<td>Unique to NP</td>
<td></td>
<td>15.8%</td>
<td></td>
<td>15.8%</td>
</tr>
<tr>
<td>Unique to MC</td>
<td></td>
<td></td>
<td>5.6%</td>
<td>5.6%</td>
</tr>
<tr>
<td>Common to BP &amp; NP</td>
<td>5.0%</td>
<td>5.0%</td>
<td></td>
<td>5.0%</td>
</tr>
<tr>
<td>Common to BP &amp; MC</td>
<td>2.0%</td>
<td></td>
<td>2.0%</td>
<td>2.0%</td>
</tr>
<tr>
<td>Common to NP &amp; MC</td>
<td></td>
<td>11.0%</td>
<td>11.0%</td>
<td>11.0%</td>
</tr>
<tr>
<td>Common to BP, NP, &amp; MC</td>
<td>13.7%</td>
<td>13.7%</td>
<td>13.7%</td>
<td>13.7%</td>
</tr>
<tr>
<td>Total ($r^2$)</td>
<td>22.7%</td>
<td>45.5%</td>
<td>32.3%</td>
<td>55.1%</td>
</tr>
<tr>
<td>Total ($R^2$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. BP = Bedtime Practices; NP = Night-waking Practices; MC = Maternal Cognitions. Total unique variance = 23.4%. Total common variance = 31.7%. Computation anomalies are due to rounding.


DISCUSSION

Examination of the developmental pathways linked with any disorder is an important aspect in its prevention (IOM, 1994). Consequently, the aim of this study was to elucidate some of the risk and protective factors thought to be associated with infant sleep disturbance. The study design has incorporated a wide range of variables of theoretical interest and investigated their relationship with infant sleep problems concurrently, and up to 12 months later. An additional focus has been to examine sleep-related parental thinking, feeling, and behaving, including how these factors might be linked to disturbed infant sleep.

Despite a sizeable paediatric sleep research base, the majority of work to date has focussed on a specific area or small number of relevant variables. These works have contributed much to our understanding of infant sleep, but linkages between the various factors remain unclear. Further, the more comprehensive transactional models developed by prominent theorists have typically involved bidirectional relationships whereby systemic influences affect infant sleep and infant sleep organisation affects the system (e.g., Anders et al., 1998; Sadeh et al., 2010; Touchette et al., 2009). In terms of the nature of these inter-relationships and particularly the relative influence of each factor, however, we are little the wiser for having consulted these diagrams.

Nevertheless, taking the next step and identifying the likely causal pathways is a difficult task, particularly in cross-sectional research of this nature. Perhaps the most accurate reflection is that this study has softly illuminated some of the pathways to infant sleep disturbance while providing some food for thought. An extensive range of factors have been investigated and weighed against each other in terms of their relative predictive value. In general, the strongest predictors of infant sleep patterns were concurrently measured variables—only a few were significantly associated with infant sleep 6 or 12 months later. Moreover, in the case of the majority of these longer term connections, it is likely to be the stability of maladaptive parental cognitions and night-time practices that lead to their importance as predictors of problematic sleep over the medium term.

The interpretation of infant sleep behaviours varies according to many factors, including the parents’ cultural background and their own experience of having been parented. It would be pointless to identify “disordered” infant sleep if the definition is out of step with the beliefs, values, expectations, and attitudes of the community. In addition, what one person deems problematic night-waking may be regarded by another as part of normal development (Richman, 1987). Fortunately, the results of this study show a moderate to
strong concordance between participants’ perceptions of the health of their child’s sleep and scores on the SBS and the ISQ at 6 and 12 months. Mothers of infants scoring higher on these measures were significantly more likely to be concerned about their child’s sleep patterns and behaviours, and to perceive their child as having a sleep problem. This is suggestive of a tangible link between the theoretical underpinnings of the two measures of infant sleep behaviour, and the reality of night-time parenting in a Western culture.

Demography, Obstetrics, and Anticipatory Guidance

Demographic, Pregnancy and Birthing

There were few meaningful relationships between any of the demographic or obstetric variables and child sleep patterns. Maternal age was not related to infant sleep and there has been no evidence of this being the case in any research to date. Marital status was negatively associated with ISQ scores at 6 months, and remained a significant predictor of infant sleep quality until the development and health variables were added at the fourth step of the first hierarchical regression analysis. Given that 78% of the sample was married and that the relationships were quite weak, these results may be indicative of an anomaly within the sample population. Findings are consistent with the notion that infant sleep disturbance is non-discriminatory in its effect on Australian families.

Similarly, it would appear that pregnancy and birthing variables are among the weakest predictors of infant sleep within the first 12 months of life. This outcome is in contrast to previous findings of links between the length of labour and the baby’s state at delivery (Bernal, 1973); obstetric problems during pregnancy, labour, and delivery (Blurton Jones, Rossetti Ferreira, Farquar Brown, & Macdonald, 1978); and adverse perinatal events (Richman, 1981); and later night-waking. However, no research since the early 1980s has reported significant associations in this area.

The current study outcome is consistent with the work of Anders and Keener (1985), Van Tassel (1985), and Pollock (1992) who dismissed perinatal factors, including prematurity, as risk factors for infant sleep disturbance. The only exception was a significant positive relationship between weight at birth and 12-month infant sleep quality, once all variables had been entered into the hierarchical regression model. However, the strength of the relationship was weak, with birth weight accounting for 0.6% of unique variance in sleep patterns. Given that this connection is counterintuitive and has not been found previously among normal healthy babies, it may be a chance finding.
Infant Health and Development

Outcomes in relation to infant development and health were intriguing. On the first hierarchical regression analysis, this group accounted for approximately 15% of the variance over and above that explained by the demographic, pregnancy and birthing, sleep location, and parent tip sheet variables at 6 months. In the context of the overall study, this was a sizeable magnitude of influence. It is worth pointing out that these variables had few long-term effects, being responsible for just 4% of additional variance when used to predict 12-month infant sleep quality.

Infantile Colic

Of the four developmental and health variables added at 6 months, only colic failed to significantly improve the model. In fact, the experience of infantile colic was not a significant predictor at any point of any analysis. This is in contrast to previous observations of colic as a prodromal factor in the development of persistent infant sleep disturbance (Rautava et al., 1995; Ståhlberg, 1984). Nor did these results support the notion that parenting styles and practices may be adversely and permanently shaped by extreme infant crying behaviour such that parents have difficulty establishing and maintaining regular sleep schedules going forward (AASM, 2001; France & Blampied, 1999; Weissbluth, 1987). It is possible that ongoing colic-related sleep problems occur only in clinical samples where family distress is more extensive (St James-Roberts et al., 1997; Räihä, Lehtonen, Korhonen, & Korvenranta, 1996) and/or in a small subgroup of infants who exhibit excessive crying which endures beyond 3 months (Clifford et al., 2002b; Wurmser, Laubereau, Hermann, Papoušek, & von Kries, 2001).

Child Illness

An unforeseen outcome was the relationship between the experience of infant illness and sleep behaviour. It had been anticipated that most child illnesses would be transient and ultimately have little effect on the development of sleep-wake patterns. There were some weak but significant correlations suggesting that the infants who had been ill during the previous 6 months were more prone to unsettled sleep at 6 and 12 months. Surprisingly, illness in the first six months of life was a significant predictor of sleep patterns at 6 months after controlling for the effect of all other variables in the model. There is a dearth of relevant research, particularly involving children under 12 months.
In a large Canadian study, Touchette et al. (2005) found little evidence that a child’s prevailing health status was related to fragmented sleep. Similar non-significant findings were reported by Goodlin-Jones et al. (2001) in relation to a current infant health description and self-soothing behaviours. It would therefore seem illogical to link any past experience of illness with infant sleep patterns. According to France and Blampied (1999), however, child illness may lead to changes in parent-child interactions and secondary sleep disturbance in a previously well-settled child. Fluctuations in parenting styles or sleep ecology may be transient or persistent, depending on the parents and circumstances (Weissbluth, 2005).

Bowlby (1970) stressed that it is normal for both adults and children to experience a heightened sense of insecurity and intensification of attachment behaviours during times of physical illness. Ball (2002) found that parents often began co-sleeping with their unwell child. Similarly, present findings suggest that sleep consolidation is affected by illness experience in some children. It is possible that the sense of vulnerability associated with a seemingly fragile and helpless neonate or infant battling a pervasive illness such as bronchiolitis may permanently shape the practices of first-time parents as others have proposed. This suggests that preventive measures ought to include specific advice about the need to readjust night-time parenting strategies once an ill child has regained full health. Alternatively, overly attentive and indulgent parents may simply have been more cognisant of previous child illnesses when completing the questionnaire.

**Infant Temperament**

There was evidence of a relationship between some dimensions of temperament and infant sleep problems. Among the raw correlations, there were low to moderate significant correlations between the STSI Irritability and Rhythmicity subscales and the two sleep measures at 6 and 12 months. Infants rated as more irritable and less rhythmical by their caregivers exhibited more disturbed sleep. A number of studies have reported comparable links between infant temperament and sleep behaviour (Carey, 1974; Keener et al., 1988; Novosad et al., 1999; Scher, Epstein, Sadeh, Tirosh, & Lavie, 1992), including the original STSI validation study (Sanson et al., 1987). Ratings of STSI Rhythmicity appear to have an overarching link with the infant sleep consolidation process, including synchronicity with regularly occurring environmental cues.

The EDS was preferred for the hierarchical regression analyses because the relevant items are more independent from the process of sleep-wake state organisation, while representing the most commonly studied temperament dimension within the paediatric sleep
literature. There were small significant zero-order correlations between parental ratings of difficult temperament and sleep quality at each time of measurement. Six-month infant difficulty also predicted 12-month sleep patterns, but again, the magnitude was small. The significant relationships remained after controlling for maternal age and birthing variables, the infants’ initial sleep location, access to the parent tip sheet, and the maternal mood, stress, and relationship variables. Once the parent cognition and behaviour variables were added to the model, 6-month ratings of infant difficulty no longer significantly predicted infant sleep disturbance at 6 or 12 months. However, the concurrent measure of difficult temperament did remain as a significant predictor of 12-month sleep patterns with all variables included.

While this is a noteworthy outcome, it was interesting that the 6-month difficulty rating was not also predictive of 12-month sleep quality. Assuming that temperament is a relatively stable characteristic, and the measure was reliable and valid at each time of administration, a similar result would be anticipated. A raw correlation of 0.57 between the two administrations of the EDS indicates that either: the test-retest reliability of the STSI is somewhat below expectation; the scale is less suitable for 12-month-old children; maternal reports of temperamental characteristics are modified over the second six months during a period of rapid infant development; maternal perceptions of temperament are influenced by concurrent sleep behaviours; or that a combination of these issues has impacted the results.

Notwithstanding this anomaly, the results suggest that difficult temperament is an important predictor of infant sleep quality at 12 months. This influence remains, over and above the variance attributable to all factors under consideration. While these findings lack clarity, at worst they would seem to implicate temperament in the development of 12-month infant sleep disturbance or alternatively, problematic sleep in the perception of difficult temperament at 12 months. Both possibilities are consistent with the theoretical model presented earlier (see Figure 7). Interestingly, Morrell and Steele’s (2003) data suggested that the combination of a fussy-difficult temperament and problematic maternal cognitions led to the use of active physical comforting, which in turn predicted infant sleep problems.

**Parent Cognitions, Strategies, and Behaviours**

**Written Anticipatory Guidance**

The provision of written anticipatory guidance was a consistent predictor of infant sleep patterns throughout many of the analyses. However, this study was not aimed at enhancing the findings of the previous chapter; the parent tip sheet was a “nuisance variable”
that was “controlled for” rather than studied. Nevertheless, it was pleasing that Baby Sleep appeared to hold its own as an independent predictor of infant sleep at 6 and 12 months among a large selection of potential risk and protective factors. In reality, this suggests that the tip sheet may share variance with excluded study variables and/or contain helpful advice over and above that captured by the variables included in the regression analyses.

For example, the written advice contains a section on emphasising the difference between night and day from the first week, and another on the importance of developing a regular routine. These parental behaviours were not specifically assessed and may account for some of the unique variance attributable to the tip sheet. Additionally, the totality of the written advice may have contributed to other unaccounted-for factors such as improved parenting self-efficacy.\textsuperscript{138} When an intervention as unobtrusive as written advice can have a positive effect on infant sleep outcomes and, by association, on infant development and family life, it bodes well for the likely success of well-planned preventive efforts aimed at shaping early parental beliefs and behaviours.

**Infant Sleep Location**

Perhaps the most surprising results involved the sleep location of infants, particularly upon arrival home from hospital. Infants sleeping in their own bedroom from birth were significantly more likely to exhibit healthy sleep patterns at 6 and 12 months. In the first two hierarchical regression analyses, the initial sleep setting accounted for 7% of the variance in 6-month sleep patterns and 5% of 12-month variability. Further, it remained a significant predictor of 6- and 12-month sleep outcomes after controlling for all other pretest and 6-month variables. In the final hierarchical analysis, the earliest sleep location of the infant added significantly to the model throughout the first five stages before effectively being swamped by the influence of the 12-month (concurrent) parental cognitions and behaviours at the final step.

Co-sleeping aside, the infant’s main sleep setting has seldom been investigated as a possible correlational or predictive variable within the paediatric sleep literature. As a result, it has rarely been mentioned in books and articles about infant sleep to date. Among the small amount of relevant research, Paret (1983) reported no differences in the sleeping location of night-waking and non-waking children in a sample of 9-month-olds. However, Scott and Richards (1990a) and Sadeh (2004) found that night-waking was more likely to be

\textsuperscript{138} Alternatively, this scenario might be conceptualised as evidence of the Hawthorne Effect (McCarney et al., 2007; Roethlisberger & Dickson, 1939).
reported if a baby slept within the parental bedroom at night. Similarly, Burnham et al. (2002a) found that the location of the infant’s crib at 3, 6, 9, and 12 months of age predicted self-soothing behaviours in 12-month-old children. Interestingly, Mindell, Sadeh, Kohyama et al. (2010) uncovered a relationship between sleep setting and infant sleep outcomes, but was mediated by other factors such as parental presence at sleep onset.

The results of the current study suggest that positioning an infant’s crib within the parental bedroom may be a risk factor for infant sleep disturbance. Conversely, having the infant sleep in his/her own bedroom may have a protective effect. The inference is that increased distance reduces the opportunity for overly solicitous caretaking involvement, leading to earlier development of self-soothing skills and improved sleeping patterns (Burnham et al., 2002a; Lee & Gay, 2011; Scott & Richards, 1990a). Alternatively, parents who prefer to have their infant sleeping close by may be characteristically more prone to strategies involving active physical comforting. These findings have implications for future preventive interventions, although the propriety of this advice is clouded by the suggestion that infants sleeping in close proximity to their mothers are at decreased risk of SIDS (American Academy of Pediatrics [AAP], 2005). This complex issue will be considered further in the General Discussion.

Breastfeeding

Predictably, whether or not participant mothers were currently breastfeeding correlated significantly with the sleep measures at 6 and 12 months. Moreover, the number of months spent breastfeeding and use of breastmilk as the exclusive milk type during the first 6 months was associated with less consolidated infant sleep. In the hierarchical regression analyses, concurrent breastfeeding status was a significant predictor of infant sleep quality at each age, after all other variables had been added to the model. There were no significant longer-term relationships between 6-month breastfeeding and 12-month sleep patterns in any of the analyses. Findings that infants being currently breastfed were more likely to be sleep-disturbed, are supportive of previous research with 5- to 12-month-old infants (Burnham et al., 2002a; Carey, 1975; Hiscock & Wake, 2001; Touchette et al., 2005).

In fact, breastfeeding has been considered “problematic” in the paediatric sleep literature since it unexpectedly emerged as a night-waking factor in a report by Carey (1975). The consensus seems to be that breastmilk, as opposed to formula, is more easily digested and necessitates more frequent feedings (Burness, 1979; Hiscock, 2010; Mindell & Owens, 2010). Breastfed babies are also more likely to be fed to sleep, presumably because it is a
more convenient and expedient way to resettle an infant during the night than the preparation of a bottle (Hiscock, 2010; Touchette et al., 2005). As a result, breastfed babies may develop a closer temporal association between demand and response, leading to problems sustaining sleep (Touchette et al., 2005).

However, there is no suggestion that the well-established benefits of breastfeeding might be outweighed by the costs (Department of Health and Ageing [DoHA], 2009; Evenhouse & Reilly, 2005; House of Representatives Standing Committee on Health and Ageing [HoR], 2007; Quinn et al., 2001; Schulze & Carlisle, 2010). Rather, parents need to be aware that as an ongoing resettling strategy, nocturnal feeding is associated with poor sleep consolidation. Indeed, Pinilla and Birch (1993) have shown that poor sleep associations may be prevented in breastfed infants by systematically delaying the night-time feeding response.

Maternal Cognitions and Parent Behaviours

This study provides good evidence of a link between problematic maternal cognitions, intrusive night-time parenting, and infant sleep disturbance. Dysfunctional parent beliefs and thoughts and stimulatory practices at bedtime and following night-wakings were the most strongly and consistently implicated influences throughout the various analyses. At 6 months, parent cognitive and behavioural variables were responsible for almost 25% of the explained variance in infant sleep scores over and above that of all other variables in the model, underscoring their importance as explanatory factors for problematic childhood sleep. At 12 months the relationship was even stronger. As a group, measures relating to cognitions and parenting practices accounted for almost 35% of the unique variance in infant sleep. Further compelling evidence emerged when the variables comprising these categories were considered separately. In the second series of multiple regression analyses, parent sleep-related cognition and behaviour variables accounted for relatively large proportions of the total variance in infant sleep quality, in and of themselves. As an explanation for infant sleep patterns, these factors appear to accommodate much of the influence.

The results of the commonality analyses provide further insight into their relative influence on infant sleep patterns. In general, the most prominent category of variables was parent stimulatory responses to infant night-waking, providing over two-thirds of the unique variance, and being party to more than 80% of the total variance in concurrent infant sleep quality at 6 and 12 months. Moreover, maternal cognitions were responsible for a sizeable degree of unique influence while sharing much in common with night-time parenting.
behaviours. Perhaps the most interesting finding was the comparatively lesser role of bedtime routines and practices in the prediction of infant sleep behaviour. However, these same stimulatory behaviours at 6 months seemed to return to approximately equal prominence in the prediction of sleep problems at 12 months. A connection between feeding the child to sleep at bedtime and later infant sleep problems may be the main reason for the increased prominence of the bedtime routines grouping in this second analysis. In terms of prevention, these findings highlight the importance of encouraging the development healthy sleep-related cognitions, challenging maladaptive beliefs and thoughts about infant sleep, and providing parents with practical strategies aimed at establishing healthy bedtime routines and reducing interactive behaviours during the night.

Overall, findings are a strong endorsement of the focus on night-time parenting practices and sleep-related cognitions in the paediatric sleep literature. In fact, since Ferber (1985b) clearly articulated the role of parent-child interactions in the development and maintenance of infant sleep problems, they have been the most extensively researched risk and protective factors and are believed to have the most immediate and direct link to infant sleep outcomes (Sadeh et al., 2010). Further, behavioural treatments aimed at limiting excessive parent involvement during sleep initiation and following night-wakings have repeatedly demonstrated rapid improvement and high success rates (France & Hudson, 1993; Mindell et al., 2006; Ramchandani et al., 2000; Sadeh, 2005).

Sadeh et al. (2010) have additionally emphasised the pivotal role of cognitive processes in driving these night-time parenting practices. This philosophy is predicated not just on cognitive-behavioural theory, but also on a small, growing body of research investigating the relationship between maternal cognitions about infant sleep and childhood sleep disturbance (Johnson & McMahon, 2008; Morrell, 1999b; Sadeh et al., 2007). While the cross-sectional design of the SNSP does not allow causal inferences to be drawn, the results are consistent with Sadeh et al.’s (2010) theoretical perspective.

Sleep-related parent cognitions and behaviours are also the foundation of France and Blampied’s (1999) theory, which underpins the current program of research. Consistent with the position of these authors, the strongest relationships with the indices of poor infant sleep were highly stimulatory night-time parenting practices. France and Blampied argue that while infant sleep patterns are influenced by a variety of factors, caregiving routines are the foremost risk factor in childhood sleep disturbance. Specifically, the parents of sleep-disturbed infants tend to use more varied and stimulating management techniques, leading to problems with sleep regulation and consolidation. The results of the present study strongly
support this contention. It would appear that parents who use active physical comforting at bedtime (especially rocking/holding and feeding the child to sleep), and in response to night-waking (particularly feeding and removing the child to the parental bed), tend to have infants with poorer sleep patterns.

Findings additionally bear witness to the contention that the parents of sleep-disturbed infants are characterised by a low latency of response to nocturnal signalling (France & Blampied, 1999). There were significant negative raw correlations between parents’ reported attending delay and inferior sleep patterns on both the sleep diary and parent questionnaire at 6 and 12 months. Parents of children with good sleep patterns were less likely to attend immediately to their night-waking infant, and more likely to wait longer before responding. Evidence from the raw correlations supported the other submission of France and Blampied, that the parents of sleep-disturbed infants also utilise a wider range of stimulatory responses.

A number of research projects have recently identified important linkages between maternal sleep-related cognitions and childhood sleeping patterns (Johnson & McMahon, 2008; Morrell, 1999b; Morrell & Cortina-Borja, 2002; Morrell & Steele, 2003; Sadeh et al., 2007; Tikotzky & Sadeh, 2009; Tikotzky & Shaashua, 2012; Tikotzky et al., 2010). However, with the exception of Tikotzky and Sadeh (2009), all of this research has involved parents of children more than 12 months. Moreover, aside from Morrell’s (1999b) initial work, only two studies, Sadeh et al. (2007) and Tikotzky et al. (2010) have reported relationships between the MCISQ subscales and infant sleep disturbance. Both found maternal cognitions about setting limits to be the only dimension associated with infant sleep problems. The current study is the first to explore the use of Morrell’s (1999b) scale among a sample of children in the first year of life.

Consistent with previous investigations, strong links were found between problematic maternal cognitions and infant sleep disturbance. The first series of hierarchical regression analyses established that parental behaviours and cognitions were far and away the most important predictors of problematic sleeping at 6 and 12 months. When these variables were entered simultaneously into a regression equation predicting infant sleep quality, the maternal cognition dimensions accounted for a significant proportion of the variance on each occasion. As a group, maternal sleep-related cognitions were associated with considerably more shared and unique variance in concomitant sleep scores than parental bedtime interactions, which have frequently been described as a major precipitating factor in infant sleep disturbance

139 Sadeh et al.’s (2007) study included children from 5 months but the mean age was in excess of 12 months.
(Adair et al., 1991; Burnham et al., 2002a; Ferber & Boyle, 1983b; Johnson & McMahon, 2008; Mindell, Meltzer, et al., 2009; Morrell & Cortina-Borja, 2002).

This is also the first research to fully investigate and support Morrell’s (1999b) significant results. The pattern of raw correlations suggested that mothers of sleep-disturbed children were more likely to report maladaptive cognitions involving limit-setting, doubts about parenting competence, and anger at the perceived demandingness of their infant. These statistics were significant at both 6 and 12 months, and suggest that additional preventive emphasis on correcting potential problematic cognitions in these domains may lead to more effective parenting and improved infant sleep outcomes.

In contrast with Morrell’s (1999b) findings among parents of toddlers, maternal cognitions about feeding were also associated with problematic sleep at both data collection points. Mothers of sleep-disturbed infants were significantly more likely to endorse feeding as a soothing strategy and/or acknowledge concerns about child hunger during the night. Clearly, some first-time mothers of infants under 12 months harbour problematic cognitions about feeding issues which are in turn associated with impaired infant sleep. Ferber (1985b, 2006) has devoted considerable attention to the challenging of maladaptive beliefs and thoughts about nocturnal feeding schedules in both editions of his popular book. However, this is the first time some of the underlying cognitions, long theorised to be associated with the problematic night-time feeding of infants, have been exposed empirically.

As mentioned, contemporary researchers have focussed on older children and with the exception of Setting Limits, have all but abandoned the dimensions of sleep-related maternal cognition. In fact, Tikotzky and Sadeh (2009) discarded the MCISQ completely in a rare study of children under 12 months, preferring their own measure which used vignettes to assess parental cognitions about infant distress upon awakening, and limit-setting. In doing so, these researchers may have overlooked some of the important pathways to infant sleep disturbance during the first year of life, particularly with regard to the underlying factors associated with habitual night-time feeding. A reminder that Morrell (1999b) did feel that issues relating to feeding and SIDS may be more salient among mothers of younger children.

Incidentally, a significant but weak negative association between MCISQ Safety and scores on the infant sleep diary as well as the combined sleep score were observed among the bivariate correlations at 6 months. This result indicated that, contrary to the theory underpinning this measure and recent findings by Hiscock et al. (2014), maladaptive

140 In this study, safety cognitions were significantly lower among intervention parents at 6 (but not 4) months.
thoughts about SIDS were associated with improved sleep in infants. By way of explanation, it would seem that mothers of poor sleepers who are regularly attending to their child during the night would have fewer concerns about their child’s well-being. This possibility has previously been raised by Paret (1983) who suggested that mothers with difficulties separating from their child may feel reassured by night-waking because they are alive and unharmed. Alternatively, the two statements comprising this subscale\(^{141}\) may simply reflect of higher levels of neuroticism, a factor which has been previously associated with childhood sleep disturbances (Gelman et al., 1998). If this were the case though, it might be reasoned that these “neurotic” parents would be more prone to stimulating over-attentiveness, which was not the case.

Notably, the MCISQ dimensions do seem representative of a cohesive theme (i.e., self-efficacy in night-time parenting responses and interactions) and they are scored in a common direction (i.e., higher scores reflect a more unpleasant emotional experience). However, when Morrell (1999b) hypothesised that fears about SIDS would be more salient in mothers of younger children, he was presumably expecting these cognitions to be associated with poor sleep. While Safety is correlated positively with the other scale dimensions, it has an opposing relationship with infant sleep behaviours, the construct underpinning the instrument. By extension, this implies that beliefs and thoughts about SIDS do not belong within Morrell’s concept of problematic cognitions about child sleep. Thus, the position of the Safety subscale as a functional component of the MCISQ remains tentative. Rather, it may be a separate issue that mothers think about in different ways, and which is often influenced by the amount of regular contact with the child during the night. This facet of Morrell’s theory will be examined further among parents of infants with extreme sleeping behaviours in the final study of this series.

**Pacifier Use**

Pacifiers have received little attention in the paediatric sleep literature to date, with available studies failing to find an association with sleeping behaviour (R. Morley, C. J. Morley, P. J. Lucas, & A. Lucas, 1989; Morrell & Cortina-Borja, 2002; Paret, 1983).\(^{142}\) The initial correlational data in the present study supported these findings, with pacifier use having negligible concurrent and predictive relationships with infant sleep disturbance.

---

\(^{141}\) These are: “When my child cries at night, I think something awful might have happened to him/her” and “My child might die unexpectedly in his/her sleep”.

\(^{142}\) The majority of research on pacifier use has considered questions about SIDS, the length of breastfeeding, otitis media, and dental problems.
However, when the shared influence of other variables was removed during the hierarchical regression analyses, pacifier use at the infant’s bedtime was a significant predictor of concomitant poor infant sleep quality at 6 and 12 months.

Close inspection of the data suggested that the true direct relationship between pacifier use at bedtime and infant sleep behaviour may have been suppressed by the effect of breastfeeding and night-waking responses involving stimulation. In other words, pacifier use has a unique negative impact on infant sleep patterns but parents utilising these objects at bedtime tend to breastfeed for a shorter period and are less likely to respond to infant night-waking with active physical comforting. It should be noted that pacifier use at sleep onset was not included in the simultaneous regression analyses of parent behaviours and cognitions because it did not add value to any of the models. Taken together, these results suggest that the overall effect of pacifiers may be harmful in terms of infant sleep patterns, unless it is used as an alternative to a maladaptive strategy, such as active physical comforting during the night. Regardless, it would appear that the precise nature of the association between pacifier utilisation and paediatric sleep problems is again, not straightforward, and requires further carefully-designed research.

Use of Transitional Objects

While infant attachment to soft toys, special blankets, or favourite objects have been frequently discussed and researched, only a limited number of studies have investigated their utility in adaptively influencing infant sleep patterns. Current findings offer partial clarification of this issue. There was no relationship between the regular use of transitional objects at 6 months and infant sleep behaviour at 6 or 12 months. There was, however, a weak but highly significant negative relationship at 12 months between the relevant concurrent measures. Infants utilising attachment objects at the time of their first birthday were significantly more likely to demonstrate healthy sleep patterns, whether measured by the infant sleep diary or parental questionnaire. Importantly, this finding remained significant after controlling for a large number of other variables thought to be associated with infant sleep problems at 12 months.

143 This statement is supported by the following unreported supplementary analyses. Infants utilising pacifiers at bedtime at 6 months were breastfed for an average of 7.5 months compared to 9.6 months among non-pacifier users \((F(1, 341) = 30.40, p < .001, \eta^2 = .082)\). In addition, compared to non-pacifier users \((n = 175)\), parents employing bedtime pacifiers \((n = 179)\) at 6 months were significantly less likely to respond to infant night-waking with stimulation \((F(1, 352) = 8.03, p < .01, \eta^2 = .022)\). The same pattern was evident at 12 months, with parents employing pacifiers at bedtime \((n = 163)\) significantly less prone to night-time interventions involving active physical comforting \((F(1, 352) = 7.24, p < .01, \eta^2 = .020)\) than were those not using pacifiers \((n = 191)\).
Presumably, the use of sleep aids is reflective of increasing self-soothing behaviours as infants develop. These results are consistent with previous relatively weak findings (Anders et al., 1992; Paret, 1983) and in contrast to earlier non-significant results (Burnham et al., 2002b). There is little doubt though, that this relationship is complex and the outcome probably underestimates the value of transitional objects due to the impact of other maladaptive parenting behaviours. For example, some infants may have been provided with a sleep aid, such as a soft toy (adaptive), but also offered nocturnal feeds over the first 12 months (maladaptive), confounding the results. Full analysis of the parental practices accompanying the use of transitional objects is a matter for later inquiry.

**Parental Mood, Stress, and Relationship**

**Postnatal Depression and Parenting Stress**

Evidence for a relationship between postnatal depression and infant sleep patterns was limited. There were several significant but weak concurrent correlations at 6 and 12 months and, consistent with previous research, these were mainly associated with the retrospective reporting of infant sleep patterns (Gress et al., 2010). In the hierarchical regression analyses, little unique variance in child sleep outcomes was attributable to postnatal depression symptomatology. Results suggest that depression following the birth of a child does not greatly influence, and nor is it seriously impacted by, the infant’s sleep behaviours. These findings offer scant support for previous research linking childhood sleep disturbance to maternal depression (Armitage et al., 2009; Armstrong et al., 1998; Gelman & King, 2001; Lozoff et al., 1985; Richman, 1981; Thunström, 1999) and symptoms of sleep deprivation resembling postnatal depression (Armstrong, Van Haeringen, Dadds, & Cash, 1998; Hiscock & Wake, 2001). It should be noted, however, that in the context of an enormous literature concerned with maternal depression, infant sleep problems have seldom been considered.

For example, meta-analyses by C. T. Beck (1996b; 2001) revealed that psychosocial factors have generally figured prominently as predictors of postnatal depression. Critically, sleep issues involving mothers or their babies did not feature among 13 identified significant predictors. This absence may represent a major flaw in postnatal depression research and an inadequate awareness of the possible role of sleep deprivation as a ubiquitous explanatory factor (Errante, 1985; Fisher et al., 2002), particularly in clinical samples. Nonetheless, findings from the present community-based study suggest that infant sleep disturbance may have a relatively minor contributory role. Alternatively, its impact may be difficult to
identify among a myriad of confounding factors.

An additional qualitative metasynthesis by C. T. Beck (2002) identified several overarching themes in the postnatal depression literature involving unrealistic expectations of motherhood and pervasive loss. These themes appear to have some relevance to infant sleep disturbance. Pervasive societal myths equating the transition to motherhood with unremitting fulfilment and happiness (Nicolson, 1990) fly in the face of the parenting of, for example, a temperamentally difficult child with severe sleep disturbance. It may be that a number of mothers in the current study developed postnatal depression in exactly this way, but the effect was stifled by mothers with elevated depression scores associated with other predictors identified by C. T. Beck (2001), such as low self-esteem, life stress, or poor social support.

The strong raw correlations between the concurrent postnatal depression and parenting stress scores were very similar to those found in previous reports (e.g., Leigh & Milgrom, 2008) and support several studies suggesting that postnataally depressed women also tend to be highly stressed (Leigh and Milgrom, 2008; Milgrom et al., 1999, 2008; Milgrom & McCloud, 1996). While both syndromes are indicative of acute psychological distress during the postnatal period, they are conceptually distinct with divergent recovery pathways. Specifically, there is evidence that high levels of parenting stress tend to persist, often for several years, despite the successful treatment of depression symptomatology early in the postnatal period (Milgrom et al., 2006; Milgrom & McCloud, 1996).

Despite significant correlations with infant sleep quality at 6 and 12 months, the addition of the depression and stress variables, together with ratings of the parenting alliance, added only a small amount of variance at the fifth step of each hierarchical model. In fact, the mood, stress, and relationship variables added just 3.2% of additional variance at 6 months, and 1.4% at 12 months. The only significant predictor of infant sleep patterns was parenting stress at Step 5 in the 6-month analysis. However, any statistical allusions evaporated once the parental cognition and behaviour variables had been included at the final step. Findings suggested that in terms of predictability, these variables have a relatively inconsequential unique association with infant sleep outcomes in the first 12 months of life. Again, one reason for this may be that the transition to parenthood is highly complex, with multiple sources of tension, including daily parenting hassles and cumulative life stress (Crnic, Gaze, & Hoffman, 2005). It is likely that many of the predictors of postnatal depression identified by C. T. Beck (2001) are also implicated, given the strong inter-relations between parenting stress and maternal depression in the empirical literature (e.g., Leigh & Milgrom, 2008). Multiple causal pathways make it difficult to disentangle any links...
between parenting stress and childhood sleep problems in a cross-sectional study of this nature. In addition, high stress may be more prevalent among parents of children referred for clinical treatment of sleeping problems (Byers et al., 2011).

The lack of a unique predictive relationship in the current study does not necessarily mean that the depression and stress associated with the parenting role are unworthy of focus in preventive interventions for infant sleep disturbance. Zero-order correlations for both measures showed a pattern of highly significant relationships with the diary, questionnaire, and sleep quality index at 6 months. Further, there was some evidence of a relationship between infant sleep problems at 6 months and later symptoms of maternal depression and stress. Severe and prolonged distress hinders information-processing functions resulting in poorly planned behavioural responses and an inability to respond constructively and sensitively to the demands of parenting (Deater-Deckard, 1998; Gelfand et al., 1992). In turn, highly depressed and stressed parents may struggle to focus on parenting information or programs during the postnatal period without first having had their psychosocial needs addressed.

**Parenting Alliance**

Consistent with previous findings regarding social support and the marital relationship as predictors of depressive symptoms (C. T. Beck, 2001; Hughes et al., 2004), parenting alliance was most strongly associated with maternal depression. Similarly, significant correlations were noted with the measure of parental stress, a finding also in concert with past research (Abidin & Brunner, 1995; Florsheim, Moore, Zollinger, MacDonald, & Sumida, 1999). Given that the parenting alliance involves the ability to coordinate shared parental responsibilities and is a reflection of the father’s level of involvement in childcare activities (Abidin, 1992; Futris & Schoppe-Sullivan, 2007; McBride & Rane, 1998), it is logical that mothers reporting a stronger alliance would feel less overwhelmed.

Significant small to moderate associations between the parenting alliance and maternal cognitions at both times of measurement suggest that mothers perceiving a high level of couple support and coordination in working together to meet the needs of the child also have more adaptive beliefs and thoughts about infant sleep. Considering the critical role that maternal cognitions play in infant sleep disturbance, this is an interesting finding. It raises the possibility that a healthy co-parenting relationship may be associated with infant sleep patterns via reciprocated validation and reinforcement of adaptive sleep-related cognitions.
Finally, the parenting alliance was associated significantly with infant temperament, by way of infant difficultness. Infants who are perceived as difficult to manage may elicit partner conflict, which ultimately threatens mutual acknowledgment, respect, and value in the parenting role. For example, Pedersen, Huffman, del Carmen, and Bryan (1996) found that mothers who rated cry recordings prenatally as more aversive, described their 3-month-old infants as more fussy/difficult and unpredictable postnataally, and their marital relationships more negatively. Overall, results suggest that perceptions of the co-parenting relationship are in some way connected to discernment of the child’s innate characteristics, cognitions about infant sleep, and affective experience. However, there was little evidence of a direct relationship between parenting alliance and infant sleep.

It is difficult to determine whether a significant but weak negative concurrent association with the ISQ at 6 and 12 months and a similar relationship between infant sleep behaviour at 6 months and co-parenting at 12 months are meaningful findings. Evidence against premature dismissal of the parenting alliance as a valid predictor of paediatric sleep disturbance, at least in some children, emerges from consideration of its apparent inter-relations with maternal depression and stress. Nevertheless, the entry of these measures of well-being and/or functioning together into the hierarchical model was uneventful on each occasion in this community study. The only plausible conclusion is that the three factors had little unique impact on infant sleep behaviours and conversely, infant sleep problems did not greatly affect levels of maternal depression, parenting stress, or the co-parenting relationship.

There are no previous studies investigating the links between co-parenting and infant sleep. Apart from the aforementioned research assessing prenatal crying aversivity (Pedersen et al., 1996), the only related research involves investigations into marital dysfunction and dissatisfaction associated with parental fatigue, sleep deprivation, and insomnia during the postnatal period (Medina et al., 2009; Meijer & van den Wittenboer, 2007). Although the co-parenting construct is conceptually distinct from marriage satisfaction, some insight may still be drawn from these studies. For example, it is conceivable that the relationship between parenting alliance and infant sleep disturbance is non-linear and/or more relevant in clinical samples. It may be that certain combinations of factors such as infant difficultness, maternal cognitions about infant sleep, and maternal depression contribute over time to a deteriorating parenting alliance in the face of chronic infant sleep problems. It is also possible that only extreme or persistent cases of infant sleep disturbance and consequential fragmented adult sleep seriously impact the co-parenting relationship.
CONCLUDING COMMENTS

Knowledge of the risk and protective factors associated with disturbed infant sleep is pivotal for its prevention. Previous research has variously examined the relationship between infant sleep problems and areas such as pregnancy and birthing, breastfeeding, maternal stress and depression, temperament, infant self-soothing, transitional objects, co-sleeping, parental behaviours, and maternal cognitions, but few have had more than one or two specific areas of focus. The current investigation of a multitude of factors has allowed comparison of the various levels of association that each shares with paediatric sleeping concerns. An important caveat is the difficulty in teasing apart the direction of effects in a cross-sectional investigation. It is possible that some of the relationships discussed occur inversely to the presumed direction and/or are related via a different (studied or) unstudied factor (Owens & Burnham, 2009).

Nevertheless, notable insights are apparent in terms of the focus of future prevention programs, including the protective value of infants sleeping in their own room from birth. This study has offered general support for previous theoretical models of infant sleep (France & Blampied, 1999; Sadeh et al., 2010) and provided evidence for the central role of maternal sleep-related cognitions relating to limit-setting, anger, doubt, and feeding concerns during the first 12 months of life. Further, it has confirmed the prominence of active physical comforting, particularly following night-wakings, as the most immediate and direct path to infant sleep disturbance (Sadeh et al., 2010). Taken together, these findings provide direction and guidance regarding the content of preventive programs, including some of the areas requiring additional information and emphasis in the Baby Sleep parent tip sheet.
CHAPTER 9

Study 3: Factors Associated with Persistent Sleep Disturbance and Enduring Healthy Sleep in Infants

It is the stretched soul that makes music, and souls are stretched by the pull of opposites...Where there is no polarity—where energies flow smoothly in one direction —there will be much doing but no music. (Hoffer, 1982, p. 67)

Sleep, or the lack thereof, is a critical aspect of childrearing. ‘Good’ babies sleep. Most babies don’t. As long as everyone gets enough sleep, parents can deal with just about anything during the day. However, when you are awake at 4:00 a.m. facing a screaming baby for the third time that night, all sanity goes out the window. It would try anybody’s patience. What parents resort to as a solution can be incredible: circling the block in their car at 3:30 a.m. wearing their pajamas with mismatched socks, their baby sleeping peacefully in the car seat, trying to imagine how they are going to explain the situation if pulled over by a police officer. (Mindell, 2005, pp. 3–4)

This penultimate chapter presents findings from the final study of the SNSP. While the earlier reports have provided important infant sleep problem prevention information, a further knowledge gap warrants exploration. Studies focussed on correlational relationships provide limited definitive information about the cognitions, behaviours, and emotional well-being of the small groups of participants with infants at the extreme ends of the sleep health continuum. The experiences of these people are paramount, because they represent two important categories of preventive outcome—one being the ideal situation to which interventions aspire, the other the program antithesis, the worst case scenario.

This chapter approaches the issue of problem infant sleep from a more pragmatic, clinical perspective. It begins with the well-established premise that infant sleep problems, particularly in the first year of life, are a serious issue for many families with young children. While studies have shown that up to 46% of Australian families endure infant sleep disturbance (Armstrong et al., 1994; Bayer, Hiscock, Hampton, et al., 2007; Hiscock, Bayer et al., 2007; Hiscock & Wake, 2001), there is a tendency to overlook the fact that these are generally cross-sectional as opposed to lifetime prevalence figures. Given the magnitude of the problem, children with consistently healthy sleep from an early age may well be in the
minority. However, these infants exhibit the sleep patterns that prevention programs aim to emulate. Preventive efforts strive to achieve optimal sleep habits, not sleep which is tolerable, or sufficient to avoid community treatment services. Consequently, the individual and family characteristics of infants with optimal sleep patterns ought to be of considerable interest to prevention program developers.

At the other end of the spectrum, it is difficult to determine how many children experience persistent sleep problems, particularly within the first year of life. These are the children most likely to come to the attention of health professionals and treatment services. Still, evidence suggests that many parents seek treatment only after the problem has reached crisis point, usually reporting a long history of unsuccessful management attempts and confusion over conflicting advice (Armstrong et al., 1994; Burnham et al., 2006; Douglas & Hiscock, 2010; Scott & Richards, 1990b). Parents typically present in a state of emotional turmoil, amplified by chronic partial sleep deprivation, lack of parenting confidence, and separation issues (Daws, 1989; Fisher et al., 2002; Levitzky & Cooper, 2000; Medina et al., 2009; A. Scher, 2008; Thunström, 1999). The individual and family characteristics of these children are important for informing prevention researchers about the various factors associated with chronic paediatric sleep disturbance (Thunström 1999).

This study investigates the underlying factors associated with the best and worst child sleep outcomes during the first year of life. From a clinical perspective, it is intriguing to compare and contrast the family characteristics and practices of children with optimal and persistently problematic sleeping patterns. Sampling techniques which closely examine the characteristics of outermost scoring individuals are collectively known as extreme groups analyses (Taris & Kompier, 2006). There are, however, drawbacks associated with analyses focussed on a limited part of a target population. Hence, any implementation of the extreme groups method ought to involve careful consideration, and be accompanied by clear justifications (Preacher, Rucker, MacCallum, & Nicewander, 2005).

The extreme groups approach was originally conceptualised as a two-stage experimental design, prompted partly by a desire to limit the total number of subjects (Feldt, 1961). Important data is firstly gathered from a large sample of individuals within a population of interest. Participants are then selected on the basis of their extreme scores on a central variable and subjected to more extensive testing (Fowler, 1992; Taris & Kompier, 2006). A number of authors have drawn attention to the unique insights and statistical

---

144 The term optimal is used in this thesis to describe the best infant sleep that can be reasonably anticipated. It refers to the meaningful goal of early consolidated sleep with relatively few night-wakings over time.
advantages afforded by this method (e.g., Feldt, 1961; Kagan, Snidman, & Arcus, 1998; Radke-Yarrow, 1998) and its popularity has continued in recent years (DeCoster, Gallucci, & Iselin, 2011; Preacher et al., 2005).

The main criticisms of the extreme groups method involves its use merely to amplify the power of subsequent statistical tests by maximising the contrasts between subjects, including the tendency of researchers to generalise their findings across the entire sample population (Preacher et al., 2005; Taris & Kompier, 2006). In addition, an implicit assumption is that the relationships between two variables, $x$ and $y$, are similar throughout the distribution. In fact, the relationship may change toward the middle or in the tails of the distribution, or the association may be moderated nonlinearly in a variety of ways (Preacher et al., 2005). Thus, there is a heightened potential for model misspecification via what is essentially, forced linearity (McNemar, 1960; Preacher et al., 2005).

Interestingly, Preacher et al. (2005) argue that studies limiting their generalisations to the extremities of a distribution do not always fall within the definition of the extreme groups approach. They draw attention to the concept of post hoc subgrouping in which the data is obtained for all individuals but analysed only for extreme scoring participants (e.g., gifted children, severely depressed mothers). According to DeCoster et al. (2011), this method does not lead to contrived statistical advantage since overall gains are counteracted by the loss of participants. Nevertheless, given no clear cost-efficiencies in terms of data collection, both Preacher et al. (2005) and Taris and Kompier (2006) question how post hoc subgrouping can offer more insight into the process under study than analysing all of the data would provide. However, these authors have not thoroughly considered the circumstances that might lead to a discerning employment of this technique.

Prior to this final study, the complete dataset has already been analysed; it is effectively a supplementary investigation. Further, it is important to determine what the data reveals about the practical significance of the phenomena of interest rather than merely aiming to uncover statistically significant probability values (Cohen, 1994; Kirk, 1996, 2001; Wilkinson & the Task Force on Statistical Inference, 1999). For instance, Nehmy (2010) contends that prevention trial comparisons focussing exclusively on group means are neglectful of individual experience pertaining to diagnostic status or clinically significant impairment. This report aims to provide practical insight and advice on preventing chronically disordered infant sleep and contrariwise, facilitating optimal sleep.

In this particular study, the emphasis is not necessarily on the worst and best sleepers at each cross-sectional point in time, but those infants who have been reported to have poor or
healthy sleep over an extended period. The objective is to learn not only how to avoid the worst case scenario, but about what is required for optimum sleeping in children. In addition to the information already presented, the parents of optimally sleeping and persistently sleep-disturbed children provide the greatest opportunity for learning in a purely practical sense about what to do, and what to avoid, where infant sleep is concerned.

Global hypotheses are guided by the theoretically-driven models of child sleep presented in Chapter 4 (see Figures 6 & 7). Reports of infant temperament, sleep-related parent cognitions and practices, maternal well-being, and the co-parenting relationship are expected to differ significantly between the groups of families with persistently sleep-disturbed and optimally sleeping infants. In general, it is anticipated that in comparison with mothers of infants with enduring healthy sleep patterns, mothers of infants with persistent sleep disturbance will report more problematic cognitions about infant sleep, less adaptive parenting behaviours at bedtime and following night-wakings, and more severe symptoms of depression and stress, while perceiving their infant to be more temperamentally difficult and their co-parenting relationship as less supportive.

**METHOD**

**Participants**

Four hundred and twelve first-time mothers and their healthy infants were recruited from M&CH Centres throughout Victoria, Australia. Of these, 354 ($M = 29.84$ years, $SD = 4.22$ years, $R = 18–44$ years) mothers attempted all requirements of the research program. Detailed sampling procedures and the characteristics of these participants have been described in the General Method. For this particular study, 80 parents ($M = 30.36$ years, $SD = 4.78$ years, $R = 20–44$ years) were selected and allocated to one of two experimental groups ($n = 40$) on the basis of their infants’ extreme scores on an index of sleep quality, as described in the Procedure.

**Materials**

The Baby Sleep parent tip sheet (Watts et al., 2000), as detailed in the General Method.

---

145 i.e., again, not mainstream sleeping; average sleeping in the community is skewed by the high prevalence of disturbed paediatric sleep and considered to be an inadequate aspiration.

146 As with the previous studies, predictions remain at a relatively broad level; many of the analyses are considered exploratory and the volume of variables under review renders specific hypotheses too unwieldy.
Measures

Infant temperament was measured with the STSI (Sanson et al., 1987); maternal cognitions were assessed using the MCISQ (Morrell, 1999b); information on parental feeding and sleep-related caregiving practices was obtained via a parent questionnaire; prospective infant sleep patterns were captured using a 4-day infant sleep diary (Wolfson, 1998) and indexed using the SBS (Richman, 1981); retrospective infant sleep behaviour was assessed with the ISQ (Morrell, 1999a); maternal depressive symptoms were measured by the EPDS (Cox et al., 1987); the PSS (Berry & Jones, 1995) was employed as an indicator of parenting stress; and the quality of the co-parenting alliance was evaluated via the PAI (Abidin & Brunner, 1995). The psychometric properties of all measures have been specified previously.

Procedure

Scores on the infant sleep quality index from the previous study were used to establish two extreme groups.147 Bearing in mind the well-accepted optimal tail proportions of 25 to 27% (Feldt, 1961; Kelley, 1939), the sample population was initially split into quartiles at 6 and 12 months. Table 29, which details the outcome of this procedure, provides insight into the stability of sleep behaviours during the first year of life. For example, of 86 below average sleepers at 6 months, 17.4% ($n = 15$) were considered to be good sleepers at 12 months. In general, sleep quality remained fairly stable between the two data collection points. There was a tendency for poor sleepers at 6 months to be, at best, below average sleepers at 12 months, with the reverse true for good sleepers.

Notably, this table shows that relative to the remainder of the sample, 40 of the poorest sleepers at 6 months were also among the worst sleeping group at 12 months. An initial impression was that this group was comparable with the 33 infants who emerged from the original sample as severely sleep-disordered at both ages under Morrell’s (1999a) criteria.148 Conversely, 40 of the healthiest sleepers at 6 months continued their good sleep patterns at 12 months.149 Further scrutiny revealed that the group of 40 chronically sleep-disturbed infants contained 26 of the 33 cases identified using Morrell’s (1999a) threshold of 12 at each age and 5 of the 7 discrepant cases had already been excluded due to missing confirmatory SBS values. At 12 months, 35 of 40 mothers indicated that their child had been

147 To ensure the integrity of subject selection, 10 participants with missing SBS information at either 6 or 12 months were excluded, leaving an original sample of 344.
148 Reported in Study 1.
149 When the 27th and 73rd percentiles were employed as thresholds, infants falling into the poorest and healthiest sleeping groups at each time of measurement numbered 43 and 47, respectively.
Table 29  
*Sleep Quality Index Quartile Group Membership at 6 and 12 Months*

<table>
<thead>
<tr>
<th>6-Month Quartile Ranks</th>
<th>n</th>
<th>12-Month Quartile Ranks</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Poor sleepers</strong></td>
<td></td>
<td><strong>40 (46.5)</strong></td>
<td></td>
</tr>
<tr>
<td>Below average sleepers</td>
<td></td>
<td>25 (29.1)</td>
<td></td>
</tr>
<tr>
<td>Above average sleepers</td>
<td></td>
<td>14 (16.3)</td>
<td></td>
</tr>
<tr>
<td>Good sleepers</td>
<td></td>
<td>7 (8.1)</td>
<td></td>
</tr>
<tr>
<td><strong>Below average sleepers</strong></td>
<td>86 (25.0)</td>
<td><strong>Poor sleepers</strong></td>
<td>24 (27.9)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Below average sleepers</td>
<td>28 (32.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Above average sleepers</td>
<td>19 (22.1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Good sleepers</td>
<td>15 (17.4)</td>
</tr>
<tr>
<td><strong>Above average sleepers</strong></td>
<td>82 (23.8)</td>
<td><strong>Poor sleepers</strong></td>
<td>13 (15.9)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Below average sleepers</td>
<td>20 (24.4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Above average sleepers</td>
<td>26 (31.7)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Good sleepers</td>
<td>23 (28.0)</td>
</tr>
<tr>
<td><strong>Good sleepers</strong></td>
<td>90 (26.2)</td>
<td><strong>Poor sleepers</strong></td>
<td>8 (8.9)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Below average sleepers</td>
<td>14 (15.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Above average sleepers</td>
<td>28 (31.1)</td>
</tr>
<tr>
<td><strong>Good sleepers</strong></td>
<td>40 (44.4)</td>
<td><strong>Poor sleepers</strong></td>
<td>85 (24.7)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Below average sleepers</td>
<td>87 (25.3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Above average sleepers</td>
<td>87 (25.3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Good sleepers</td>
<td>85 (24.7)</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>344 (100)</td>
<td><strong>TOTAL</strong></td>
<td>344 (100)</td>
</tr>
</tbody>
</table>

*Note.* Participant infants were split into quartiles according to their standardised sleep quality index score at 6 and 12 months. Poor sleepers = score < 25th percentile; Below average sleepers = score 25th–50th percentile; Above average sleepers = score 50th–75th percentile; Good sleepers = score > 75th percentile. Percentages within group shown in brackets.
night-waking for 6 months or more, and 26 had never undergone a period of sleeping through the night. As a final check, infants with scores above the 75th percentile on the SBS at each age were identified \((n = 40)\). Of these, 33 (82.5\%) were categorised as poorly sleeping at each age as described above. Among the healthy sleeper group, just 3 parents indicated that their infant had been night-waking one night per week for between one and 3 months and another, twice weekly for 10 months.

Accordingly, infants with scores above the 75th percentile on the index of sleep quality at each age were allocated to the *Persistent Sleep Problem* group \((n = 40)\). These children were deemed to have chronically disturbed sleep during the first 12 months of life. Infants with sleep quality scores below the 25th percentile at both 6 and 12 months were classified as good sleepers and were assigned to the *Enduring Healthy Sleep* group \((n = 40)\). Members of this group were considered to have optimal sleep throughout their first year.

**Data Analyses**

A series of multivariate and univariate tests were conducted to identify the characteristics of families with infants who were either persistently sleep-disturbed or exhibiting long-term healthy sleep patterns. The idea was to identify any between-group mean differences across a broad range of dependent variables presumed to be related to infant sleep patterns and parent adjustment during the first year of life. In examining the factors associated with extreme infant sleeping behaviour, the current study is aimed at further developing the advice provided in the Baby Sleep parent tip sheet, and more importantly, informing future prevention research. For detailed supplementary information on the constructs/variables included in this study, please refer to Appendix G.

**RESULTS**

**Demography, Infant Health, Temperament, and Development**

**Demographic, Pregnancy, and Birthing**

There were no significant differences between the groups of persistently sleep-disordered and optimally sleeping children on the following demographic variables: maternal age; paternal age; maternal education; and residential location. Similarly, the following infant characteristics bore non-significant results: sex; estimated gestation; length of labour; delivery type; APGAR scores; and birth weight.
Infantile Colic

Some significant differences were found in relation to the experience of infantile colic symptoms. Fifteen (38.5%) of 39 infants with persistent sleep problems were reported to have experienced symptoms of colic compared to just 5 (12.5%) of 40 children with healthy sleep patterns \((F(1, 77) = 7.53, p < .01, \eta^2 = .089)\). If Wessel et al.’s (1954) criteria is adopted as a definition, the comparative figures were 7 of 39 (17.9%) infants with chronic sleep problems versus one (2.5%) of 40 good sleepers \((F(1, 77) = 5.40, p < .05, \eta^2 = .066)\). These findings suggest that infants suffering infantile colic are at increased risk of recurrent sleep problems. The parent-reported rate of colic in the original sample was 26.1%. Of all children experiencing colic, exactly one in 6 ended up being categorised as persistently sleep-disturbed compared to approximately one in 11 of those without colic. Overall, 6.8% of children had a history of infantile colic as defined by Wessel et al.\(^{151}\) with 29.2% of these cases exhibiting ongoing sleep disturbance.

Infant Temperament

The next series of analyses investigated the possible link between childhood temperament and extreme infant sleeping patterns. While there is no total scale score on the STSI, high scores across the dimensions are generally reflective of a more problematic temperament in terms of affability and behavioural organisation (Sanson et al., 2009). Given that the subscales measure different aspects of a cohesive theme, multivariate analyses of variance were used to compare temperament scores for each group, at each data collection point. At 6 months, the multivariate effect for temperament was significant, with mothers in the persistently sleep-disturbed group perceiving their infant to have a less affable and more disorganised temperament, on average, than mothers of healthy sleepers (Wilks = .661, \(F(5, 74) = 7.57, p < .001, \text{partial } \eta^2 = .339\)). Similar significant results were revealed at 12 months where parents of infants with unremittent sleep problems again rated their child’s temperament as more challenging (Wilks = .625, \(F(5, 74) = 8.90, p < .001, \text{partial } \eta^2 = .375\)).

Follow-up univariate tests revealed significant differences between the groups on two of the five STSI subscales at 6 months and three of the five subscales at 12 months, with all mean discrepancies in the expected direction. On average, persistently sleep-disturbed infants were perceived by their mothers to be less rhythmical and more irritable at 6 and 12

\(^{150}\) This is not strictly accurate. As outlined earlier, the number of colicky nights encountered each week, which is required for Wessel et al.’s (1954) definition, was not recorded. Rather, these infants met 2 of the 3 criteria.

\(^{151}\) This is not strictly accurate, see previous footnote.
months. Results were highly significant with large effect sizes. Additionally, these infants were regarded as significantly less cooperative and manageable at 12 months. The results of the analyses are shown in Table 30 along with details of two further significant one-way comparisons of scores on the EDS. Persistently sleep-disturbed children were regarded by their parents as more temperamentally difficult than were optimally sleeping infants at both 6 and 12 months.

Table 30

Comparison of STSI Parent Temperament Ratings of 6- and 12-Month-Old Infants with Problematic and Optimal Sleep Patterns

<table>
<thead>
<tr>
<th>Age/Dimension</th>
<th>Persistent Sleep Problema</th>
<th>Enduring Healthy Sleepa</th>
<th>F(1, 78)</th>
<th>P</th>
<th>η²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>6 Months</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Approach</td>
<td>2.11</td>
<td>0.63</td>
<td>1.97</td>
<td>0.68</td>
<td>ns</td>
</tr>
<tr>
<td>Rhythmicity</td>
<td>2.89</td>
<td>0.80</td>
<td>2.25</td>
<td>0.75</td>
<td>13.55 &lt; .001 .148</td>
</tr>
<tr>
<td>Cooperation</td>
<td>2.52</td>
<td>0.73</td>
<td>2.29</td>
<td>0.53</td>
<td>ns</td>
</tr>
<tr>
<td>Activity</td>
<td>4.34</td>
<td>0.60</td>
<td>4.22</td>
<td>0.70</td>
<td>ns</td>
</tr>
<tr>
<td>Irritability</td>
<td>3.10</td>
<td>0.96</td>
<td>2.13</td>
<td>0.67</td>
<td>27.89 &lt; .001 .263</td>
</tr>
<tr>
<td>Easy-Difficult</td>
<td>2.50</td>
<td>0.58</td>
<td>2.22</td>
<td>0.58</td>
<td>7.19 &lt; .001 .056</td>
</tr>
<tr>
<td>12 Months</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Approach</td>
<td>2.29</td>
<td>0.78</td>
<td>2.22</td>
<td>0.74</td>
<td>ns</td>
</tr>
<tr>
<td>Rhythmicity</td>
<td>2.60</td>
<td>0.62</td>
<td>2.01</td>
<td>0.59</td>
<td>19.45 &lt; .001 .200</td>
</tr>
<tr>
<td>Cooperation</td>
<td>3.01</td>
<td>0.83</td>
<td>2.58</td>
<td>0.85</td>
<td>5.22 &lt; .05 .063</td>
</tr>
<tr>
<td>Activity</td>
<td>4.41</td>
<td>0.76</td>
<td>4.46</td>
<td>0.79</td>
<td>ns</td>
</tr>
<tr>
<td>Irritability</td>
<td>3.16</td>
<td>0.94</td>
<td>2.13</td>
<td>0.72</td>
<td>30.02 &lt; .001 .278</td>
</tr>
<tr>
<td>Easy-Difficult</td>
<td>2.71</td>
<td>0.51</td>
<td>2.52</td>
<td>0.53</td>
<td>4.40 &lt; .05 .035</td>
</tr>
</tbody>
</table>

Note. STSI = Short Temperament Scale for Infants; Cooperation = Cooperation-Manageability subscale; Activity = Activity-Reactivity subscale; Easy-Difficult Scale = Mean of Approach, Cooperation-Manageability, & Irritability subscales; ns = not statistically significant.

a n = 40.
Child Illness

At 6 months the experience of child illness was not related to extreme infant sleeping patterns. At 12 months, however, children with persistent sleep problems were significantly more likely to have experienced severe (transient) illness in the previous 6 months compared to their optimally sleeping counterparts \( F(1, 78) = 7.01, p < .01, \eta^2 = .083 \).

Parent Cognitions, Strategies, and Behaviours

Written Anticipatory Guidance

There was a significant group discrepancy in terms of access to the Baby Sleep advice, with parents of persistently sleep-disturbed infants significantly less likely to have been tip sheet recipients \( F(1, 78) = 14.86, p < .001, \eta^2 = .160 \). Twenty-eight (70%) parents of infants with enduring healthy sleep patterns and 12 (30%) parents in the persistent sleep problem group were members of the intervention group in Study 1.\(^\text{152}\) In other words, 7.0% (12/172) of intervention infants versus 16.3% (28/172) of controls developed persistent sleeping problems with the reverse true for optimal sleepers.\(^\text{153}\)

Infant Sleep Location

The choice of newborn crib location was strongly linked to later sleep outcomes. Twenty-five (62.5%) infants with enduring healthy sleep patterns slept in their own bedroom as a newborn compared to just 4 (10.0%) of the persistently sleep-disturbed infants \( F(1, 78) = 33.14, p < .001, \eta^2 = .298 \). At 6 months, all but 3 of the good sleepers (92.5%) were sleeping independently each night compared to half of the infants with chronic sleep issues \( F(1, 78) = 22.06, p < .001, \eta^2 = .220 \). In the first 6 months, infants with optimal sleep patterns spent an average of 20.53 weeks sleeping in their own bedroom. The corresponding mean figure for the persistently sleep-disturbed children was just 8.34 weeks \( F(1, 78) = 36.32, p < .001, \eta^2 = .318 \). By the end of the 12-month period, 39 (97.5%) children with enduring healthy sleep patterns slept independently. A further 9 infants with chronic sleep problems moved to their own room during this period, meaning that 11 (27.5%) continued to sleep within their parents’ bedroom \( F(1, 78) = 10.89, p < .01, \eta^2 = .123 \). Between the ages of 6 and 12 months, infants with healthy sleep spent an average of 24.70 of the 26 weeks

\(^\text{152}\) Conversely, 12 (30%) parents of optimally sleeping infants and 28 (70%) parents of infants with unremittent sleep disturbance were control group members in the first study.

\(^\text{153}\) Five infants in each experimental group from Study 1 were ineligible for this investigation (i.e., allocation to the extreme groups) due to missing confirmatory SBS values.
sleeping in their own bedroom. By comparison, the children with unremittent sleep problems slept away from their parents at night for an average of 17.28 weeks ($F(1, 78) = 13.43, p < .001, \eta^2 = .147$). In the first 12 months of life, the optimally sleeping infants spent an average of 6.77 weeks sleeping within the parental bedroom compared to 26.38 weeks among their sleep-disordered contemporaries ($F(1, 78) = 30.60, p < .001, \eta^2 = .282$).

As shown in Figure 13, large proportions of infants with ongoing sleep-problems continued to sleep within the parental bedroom at 6 and 12 months compared to healthy sleepers and the infants not involved in this study. In effect, 18.1% of all eligible (i.e., for this study) infants from the original sample ($n = 344$) who were sleeping within the parental bedroom at birth, were later classified as having persistent sleep disturbance. This percentage rose to 33.3% among 6-month-olds still sleeping with their parents, with only 5.0% of these emerging as optimal sleepers. In contrast, just 2.8 percent of infants sleeping in their own room from birth had subsequent chronic sleep problems.

Figure 13. The sleep location of infants with extreme sleep patterns ($n = 40$) in comparison with the remainder of the sample ($n = 274$) at birth, 6 months, and 12 months.
Maternal Cognitions

The next analyses investigated whether variations in maternal sleep-related cognitions were associated with extreme infant sleeping patterns. The total scale score on the MCISQ and five subscale scores were used as dependent variables in a series of ANOVAs with experimental group as the between-subjects factor. As shown in Table 31, significant group differences were found on all mean scores, except Safety, at both 6 and 12 months. In general, mothers of infants with chronic sleep problems were significantly more likely to

Table 31
Comparison of Maternal Cognitions about Infant Sleep Among Mothers of Problematic and Optimal Sleepers at 6 and 12 Months

<table>
<thead>
<tr>
<th>Age/Measure</th>
<th>Persistent Sleep Problem</th>
<th>Enduring Healthy Sleep</th>
<th>F(1, 78)</th>
<th>P</th>
<th>η²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>6 Months</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Setting Limits</td>
<td>16.38</td>
<td>4.85</td>
<td>10.08</td>
<td>4.29</td>
<td>37.89</td>
</tr>
<tr>
<td>Anger</td>
<td>5.78</td>
<td>3.20</td>
<td>3.95</td>
<td>2.84</td>
<td>7.10</td>
</tr>
<tr>
<td>Doubt</td>
<td>6.85</td>
<td>4.05</td>
<td>2.41</td>
<td>2.71</td>
<td>32.31</td>
</tr>
<tr>
<td>Feeding</td>
<td>6.43</td>
<td>4.09</td>
<td>2.70</td>
<td>2.95</td>
<td>26.33</td>
</tr>
<tr>
<td>Safety</td>
<td>3.36</td>
<td>2.40</td>
<td>4.18</td>
<td>2.65</td>
<td>ns</td>
</tr>
<tr>
<td>MCISQ Total</td>
<td>39.18</td>
<td>12.00</td>
<td>23.14</td>
<td>10.20</td>
<td>39.25</td>
</tr>
<tr>
<td>12 Months</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Setting Limits</td>
<td>13.85</td>
<td>5.13</td>
<td>7.24</td>
<td>3.83</td>
<td>41.31</td>
</tr>
<tr>
<td>Anger</td>
<td>5.46</td>
<td>3.59</td>
<td>3.00</td>
<td>2.12</td>
<td>13.84</td>
</tr>
<tr>
<td>Doubt</td>
<td>5.53</td>
<td>3.79</td>
<td>1.75</td>
<td>2.10</td>
<td>30.39</td>
</tr>
<tr>
<td>Feeding</td>
<td>4.10</td>
<td>3.13</td>
<td>1.05</td>
<td>2.22</td>
<td>24.26</td>
</tr>
<tr>
<td>Safety</td>
<td>2.43</td>
<td>2.19</td>
<td>2.40</td>
<td>2.46</td>
<td>ns</td>
</tr>
<tr>
<td>MCISQ Total</td>
<td>31.00</td>
<td>11.17</td>
<td>15.95</td>
<td>8.49</td>
<td>43.02</td>
</tr>
</tbody>
</table>

Note. MCISQ Total = Maternal Cognitions about Infant Sleep Questionnaire full-scale score; ns = not statistically significant.

a n = 40.
report maladaptive cognitions about infant sleep than were mothers of infants with enduring healthy sleep at each age.

Specifically, mothers of sleep-disturbed children acknowledged increased difficulties with limit-setting and resisting their infant’s cries, more thoughts about anger in response to their infant’s perceived demands, increased doubt about their parenting competence, and more concerns about infant hunger during the night compared with mothers of optimal sleepers. With the exception of Anger at 6 months, all comparisons returned large effect sizes. Findings suggest that problematic maternal cognitions about infant sleep are strongly related to ongoing infant sleep problems during the first year of life. At 6 months, concern about SIDS appeared to be higher among parents of optimal sleepers but the result was not significant. A further insignificant result at 12 months suggested that the Safety subscale may be unrelated to persistent sleep problems in the first year. With the Safety items removed from the MCISQ total, group discrepancies in reported cognitions about infant sleep were even more pronounced at 6 months ($F(1, 74) = 52.40, p < .001, \eta^2 = .415$) and 12 months ($F(1, 73) = 50.45, p < .001, \eta^2 = .409$).

**Parental Involvement at Bedtime**

Parenting behaviours at the infant’s bedtime were strongly associated with extreme sleeping patterns. Six-month-old infants with chronic sleeping problems were significantly more likely to be already asleep when placed in their cribs each night ($F(1, 78) = 38.84, p < .001, \eta^2 = .332$). Just 3 (7.5%) of the infants with enduring healthy sleep patterns were normally asleep when entering their crib at bedtime compared to 25 (62.5%) children with sleeping difficulties. By 12 months, all infants with ongoing healthy sleep were awake when entering their crib at bedtime compared to just half of the persistently sleep-disturbed infants ($F(1, 78) = 39.00, p < .001, \eta^2 = .333$). At each age, 33% of the variability in sleep status when entering the crib was associated with group membership.

A second important distinction concerned whether or not parents were actively involved in their child’s sleep onset at the beginning of the night. Infants with chronic sleep problems were significantly more likely to be assisted to sleep by their parents at bedtime than were infants with optimal sleep. At least three-quarters of parents with persistently sleep-disturbed infants reported intervening in some way in their child’s initial sleep onset process at 6 and 12 months. In particular, large numbers of parents used regularly feeding while more than a quarter acknowledged holding or rocking their child to induce sleep each night. By contrast, relatively few parents of optimally sleeping children reported regularly
engaging in stimulatory bedtime rituals. The results of this comparison, including a summary of the various strategies employed by parents in each group, are displayed in Table 32.

Table 32
Parents using Various Methods of Assisting their 6- and 12-Month-Old Problematic or Optimal Sleeper to Fall Asleep at Bedtime

<table>
<thead>
<tr>
<th>Age/Bedtime Strategy</th>
<th>Persistent Sleep Problem</th>
<th>Enduring Healthy Sleep</th>
<th>$F$ (1, 78)</th>
<th>$p$</th>
<th>$\eta^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 Months</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rocking</td>
<td>11 (27.5)</td>
<td>1 (2.5)</td>
<td>10.89</td>
<td>&lt; .01</td>
<td>.123</td>
</tr>
<tr>
<td>Feeding</td>
<td>26 (65.0)</td>
<td>2 (5.0)</td>
<td>51.06</td>
<td>&lt; .001</td>
<td>.396</td>
</tr>
<tr>
<td>Parental presence</td>
<td>4 (10.0)</td>
<td>1 (2.5)</td>
<td>ns</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Music/Musical toy</td>
<td>5 (12.5)</td>
<td>5 (12.5)</td>
<td>ns</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>33 (82.5)</td>
<td>8 (20.0)</td>
<td>50.05</td>
<td>&lt; .001</td>
<td>.391</td>
</tr>
<tr>
<td>12 Months</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rocking</td>
<td>12 (30.0)</td>
<td>0 (0.0)</td>
<td>16.71</td>
<td>&lt; .001</td>
<td>.176</td>
</tr>
<tr>
<td>Feeding</td>
<td>20 (50.0)</td>
<td>2 (5.0)</td>
<td>26.55</td>
<td>&lt; .001</td>
<td>.254</td>
</tr>
<tr>
<td>Parental presence</td>
<td>10 (25.0)</td>
<td>1 (2.5)</td>
<td>9.32</td>
<td>&lt; .01</td>
<td>.107</td>
</tr>
<tr>
<td>Music/Musical toy</td>
<td>5 (12.5)</td>
<td>1 (2.5)</td>
<td>ns</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>2 (5.0)</td>
<td>0 (0.0)</td>
<td>ns</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>30 (75.0)</td>
<td>3 (7.5)</td>
<td>69.18</td>
<td>&lt; .001</td>
<td>.470</td>
</tr>
</tbody>
</table>

Note. Percentage within group shown in brackets. ns = not statistically significant.

a Some parents reported using more than one strategy. b $n = 40$. c Includes gentle patting/massaging.
d Number of parents using one or more maladaptive strategies.

Pacifier Use

At each age, parents were asked whether their infant fell asleep at bedtime with a pacifier. Fourteen (35.0%) infants with good sleep patterns used a pacifier sometimes or often at 6 months compared to 18 (45.0%) chronically sleep-disturbed infants. Comparative figures at 12 months were 15 (32.5%) and 17 (37.5%). Chi-square tests (never, sometimes, often) found no significant response differences at either data collection point. Pacifier use at bedtime was not associated with an increased risk of persistent sleep problems.
Use of Transitional Objects

Parents were also asked whether their infants slept with a transitional object each night (e.g., soft toy, special blanket). At 6 months, just 20.0% of the sample utilised a sleep attachment object with this proportion increasing marginally to 27.5% at 12 months. Seven (17.5%) optimally sleeping children were utilising transitional objects at this time compared to 9 (22.5%) in the persistent sleep problem group, a non-significant result. At 12 months, the level of use among healthy sleepers doubled to 35.0% while the group with long-term sleep disturbance proportion dropped slightly to 20.0%. However, there were again, no statistically significant group differences. A repeated measures $t$-test confirmed that the use of sleep attachment objects among good sleepers increased over the second six months of life ($t(39) = 2.21, p < .05, d = .350$).

Typical Parent Response to Infant Night-Waking

Significant differences were reported in the timing and nature of parent responses to infant crying at night (i.e., whether or not it was atypical behaviour) as detailed below.

Immediacy of Response

When infants woke, parents of optimally sleeping children were more inclined to delay their response, or not attend at all, with differences becoming slightly more pronounced at 12 months. Findings were statistically significant according to chi-square analyses using the 6-month ($\chi^2(2, N = 80) = 8.27, p < .05$) and 12-month data ($\chi^2(2, N = 80) = 15.62, p < .001$). Table 33 exhibits the pattern of these results at each age.

On average, parents of children with optimal sleep patterns reported waiting a significantly longer period of time before attending. At 6 months, these parents waited an average of 4 minutes and 32 seconds while parents of chronically sleep-disturbed children responded to their child’s signalling after about 1 minute and 44 seconds ($F(1, 77) = 13.96, p < .001, \eta^2 = .154$). The difference between the groups increased by about 24 seconds at 12 months. Mothers of healthy sleepers waited an average of 5 minutes and 38 seconds before attending, compared to just 2 minutes and 26 seconds among parents of children with unremittent sleep problems ($F(1, 72) = 12.74, p < .01, \eta^2 = .150$).¹⁵⁴ These differences appear to reflect the problem group parents’ inclination towards immediate response.

¹⁵⁴ Parents who indicated typically ignoring any night-time crying were excluded. No information was collected on the threshold at which these (all healthy sleep group) parents might finally attend.
Table 33

Typical Parent Response to the Infant Night-Crying of Problematic and Optimal Sleepers at 6 and 12 Months

<table>
<thead>
<tr>
<th>Age/Groupa</th>
<th>Ignore</th>
<th>Wait before Attending</th>
<th>Attend Immediately</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 Months</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persistent Sleep Problem</td>
<td>0 (0.0)</td>
<td>19 (47.5)</td>
<td>21 (52.5)</td>
</tr>
<tr>
<td>Enduring Healthy Sleep</td>
<td>1 (2.5)</td>
<td>30 (75.0)</td>
<td>9 (22.5)</td>
</tr>
<tr>
<td>12 Months</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persistent Sleep Problem</td>
<td>0 (0.0)</td>
<td>26 (65.0)</td>
<td>14 (35.0)</td>
</tr>
<tr>
<td>Enduring Healthy Sleep</td>
<td>6 (15.0)</td>
<td>32 (80.0)</td>
<td>2 (5.0)</td>
</tr>
</tbody>
</table>

Note. These results indicate how the parent would normally respond if their infant woke during the night on any occasion and are independent of the regularity of night-waking. Percentage within group shown in brackets.
a \( n = 40. \)

Nature of the Response

Parents of infants with persistent sleep disturbance reported using a significantly wider range of night-time parenting strategies when responding to their waking child than did parents of healthy sleepers. On average, sleep-disturbed 6-month-old infants regularly received 3.2 different types of parental attention compared to 1.2 among optimally sleeping children (\( F(1, 78) = 37.95, p < .001, \eta^2 = .327 \)). At 12 months, the mean numbers of parental responses used were 3.4 and 0.7, respectively (\( F(1, 78) = 59.79, p < .001, \eta^2 = .434 \)).

Parents of infants with chronic sleeping difficulties were also significantly more likely to engage in active physical comforting when attending to their night-waking infant. When infants were 6 months old, all but one of the sleep-disturbed group parents (97.5%) reported regularly stimulating their child to induce sleep after night-wakings compared to 7 (17.5%) parents of healthy sleepers (\( F(1, 78) = 147.91, p < .001, \eta^2 = .655 \)). Similar differences were observed 6 months later. Thirty-seven parents (92.5%) continued to actively comfort their persistently sleep-disturbed 12-month-old infant during the night while just 3 (7.5%) parents of optimal sleepers persevered with these methods (\( F(1, 78) = 203.08, p < .001, \eta^2 = .723 \)).

Further analyses were conducted to examine the specific the types of active physical comforting favoured by the parents in each group. These findings, which are presented in
Table 34, suggest that active night-time practices such as feeding, rocking, and co-sleeping are relatively common among parents of infants with persistent sleep problems but are used less frequently by parents of infants with enduring healthy sleep patterns. Consequently, there was also a marked group disparity in terms of the mean number of night-time stimulatory strategies employed. Parents of chronically sleep-disturbed 6-month-olds used

Table 34
Parents using Various Methods of Response to Infant Night-Waking in Problematic and Optimal Sleepers at 6 and 12 Months

<table>
<thead>
<tr>
<th>Night-waking Response</th>
<th>Persistent Sleep Problem</th>
<th>Enduring Healthy Sleep</th>
<th>F (1, 78)</th>
<th>p</th>
<th>η²</th>
</tr>
</thead>
</table>

### 6 Months

<table>
<thead>
<tr>
<th>Night-waking Response</th>
<th>Persistent Sleep Problem</th>
<th>Enduring Healthy Sleep</th>
<th>F (1, 78)</th>
<th>p</th>
<th>η²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feed č</td>
<td>37 (92.5)</td>
<td>7 (17.5)</td>
<td>102.63</td>
<td>&lt; .001</td>
<td>.568</td>
</tr>
<tr>
<td>Change nappy</td>
<td>15 (37.5)</td>
<td>6 (15.0)</td>
<td>5.46</td>
<td>&lt; .05</td>
<td>.065</td>
</tr>
<tr>
<td>Hold/rock</td>
<td>14 (35.0)</td>
<td>0 (0.0)</td>
<td>51.06</td>
<td>&lt; .001</td>
<td>.396</td>
</tr>
<tr>
<td>Parental presence d</td>
<td>10 (25.0)</td>
<td>0 (0.0)</td>
<td>13.00</td>
<td>&lt; .01</td>
<td>.143</td>
</tr>
<tr>
<td>Take to parents’ bed</td>
<td>15 (37.5)</td>
<td>0 (0.0)</td>
<td>23.40</td>
<td>&lt; .001</td>
<td>.231</td>
</tr>
<tr>
<td>Other stimulation</td>
<td>6 (15.0)</td>
<td>1 (0.0)</td>
<td>4.01</td>
<td>&lt; .05</td>
<td>.049</td>
</tr>
<tr>
<td>Total e</td>
<td>39 (97.5)</td>
<td>10 (25.0)</td>
<td>96.75</td>
<td>&lt; .001</td>
<td>.554</td>
</tr>
</tbody>
</table>

### 12 Months

<table>
<thead>
<tr>
<th>Night-waking Response</th>
<th>Persistent Sleep Problem</th>
<th>Enduring Healthy Sleep</th>
<th>F (1, 78)</th>
<th>p</th>
<th>η²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feed č</td>
<td>22 (55.0)</td>
<td>1 (2.5)</td>
<td>39.54</td>
<td>&lt; .001</td>
<td>.336</td>
</tr>
<tr>
<td>Change nappy</td>
<td>12 (30.0)</td>
<td>4 (10.0)</td>
<td>5.20</td>
<td>&lt; .05</td>
<td>.063</td>
</tr>
<tr>
<td>Hold/rock</td>
<td>14 (35.0)</td>
<td>2 (5.0)</td>
<td>12.76</td>
<td>&lt; .01</td>
<td>.141</td>
</tr>
<tr>
<td>Parental presence d</td>
<td>12 (30.0)</td>
<td>0 (0.0)</td>
<td>16.71</td>
<td>&lt; .001</td>
<td>.176</td>
</tr>
<tr>
<td>Take to parents’ bed</td>
<td>19 (47.5)</td>
<td>0 (0.0)</td>
<td>35.29</td>
<td>&lt; .001</td>
<td>.311</td>
</tr>
<tr>
<td>Other stimulation</td>
<td>8 (20.0)</td>
<td>3 (7.5)</td>
<td>ns</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total e</td>
<td>37 (92.5)</td>
<td>8 (20.0)</td>
<td>89.37</td>
<td>&lt; .001</td>
<td>.534</td>
</tr>
</tbody>
</table>

**Note.** These results indicate the typical parent response and are independent of the regularity of night-waking. Percentage within group shown in brackets. ns = not statistically significant.

a Some parents reported using more than one strategy. b n = 40. c Use of this strategy does not necessarily indicate that the infant is receiving regular night-feeds. d Parent present until infant resumes sleep onset (includes gentle patting/massaging). e Percentage of parents using one or more maladaptive strategies.
an average of 2.4 active strategies compared to just 0.4 among those with optimally sleeping infants \( (F(1, 78) = 81.52, p < .001, \eta^2 = .511) \). By 12 months, these numbers had fallen slightly to 2.1 among problem group parents while those with good sleepers used an average of 0.2 stimulatory techniques \( (F(1, 78) = 82.82, p < .001, \eta^2 = .515) \). Parents of infants with unremittent sleep disturbance reported regularly responding to infant night-waking using an average of more than two types of stimulation each, while just 1 in 5 parents in the enduring healthy sleep pattern group reported using one such strategy.

**Breastfeeding**

Large group disparities were evident in relation to breastfeeding practices, particularly at 6 months where the effect sizes were large. As expected, breastfeeding over a longer term was associated with persistent sleep disturbance. The same numbers of healthy sleepers were being currently breastfed at 6 months as were sleep-disturbed infants at 12 months. In addition, problem group mothers were more inclined to use breastmilk as their infant’s only source of milk. Over the course of the first year, mothers of infants with ongoing sleep problems breastfed their infant for an additional 4 months. Table 35 details the results of these comparisons.

<table>
<thead>
<tr>
<th>Age/Feeding Practice</th>
<th>Persistent Sleep Problem(^a)</th>
<th>Enduring Healthy Sleep(^a)</th>
<th>( F(1, 78) )</th>
<th>( p )</th>
<th>( \eta^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>6 Months</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Currently breastfeeding</td>
<td>37 (92.5)</td>
<td>22 (55.0)</td>
<td>17.31</td>
<td>&lt; .001</td>
<td>.182</td>
</tr>
<tr>
<td>Exclusive breastmilk(^b)</td>
<td>34 (85.0)</td>
<td>14 (35.0)</td>
<td>27.47</td>
<td>&lt; .001</td>
<td>.260</td>
</tr>
<tr>
<td>Breastfeeding duration</td>
<td>25.8 weeks</td>
<td>19.0 weeks</td>
<td>23.33</td>
<td>&lt; .001</td>
<td>.230</td>
</tr>
<tr>
<td><strong>12 Months</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Currently breastfeeding</td>
<td>22 (55.0)</td>
<td>10 (25.0)</td>
<td>8.07</td>
<td>&lt; .01</td>
<td>.094</td>
</tr>
<tr>
<td>Exclusive breastmilk(^b)</td>
<td>9 (22.5)</td>
<td>2 (5.0)</td>
<td>5.38</td>
<td>&lt; .05</td>
<td>.065</td>
</tr>
<tr>
<td>Breastfeeding duration</td>
<td>46.2 weeks</td>
<td>28.5 weeks</td>
<td>28.31</td>
<td>&lt; .001</td>
<td>.266</td>
</tr>
</tbody>
</table>

*Note.* Percentage within group shown in brackets.

\(^a\) \( n = 40 \). \(^b\) Refers only to the type of milk provided to the baby. It takes no account of when solid foods were introduced and should not be confused with the concept of exclusive breastfeeding (WHO, 2008).
As these very disparate findings suggest, there was a further significant difference in the mean age at which parents ceased breastfeeding. On average, the 18 infants with persistent sleep problems who were no longer breastfed at 12 months had been fed in this manner until almost 9 months of age (38.9 weeks). By contrast, this figure was just under 5 months (20.6 weeks) among the 30 infants with enduring healthy sleep patterns whose mothers had stopped breastfeeding ($F(1, 46) = 21.53, p < .001, \eta^2 = .319$). This indicates that 31.9% of the total variance associated with the decision (or need) to cease breastfeeding is linked to the long-term sleep patterns of the infant. The groups could not be significantly differentiated on maternally-reported breastfeeding problems, including whether or not problems were encountered and the total number of problems experienced. In sum, chronic infant sleep problems were associated with more adaptive feeding practices in terms of breastfeeding continuity.

**Phasing Out of Night-Feeding**

Substantial group differences were found in parental night-feeding propensity. At 6 months, 37 (92.5%) infants with persistent sleep problems were receiving night-feeds compared with just 3 (7.5%) children with enduring healthy sleep patterns ($F(1, 78) = 203.08, p < .001, \eta^2 = .723$). Significant group differences were also observed 6 months later. Eighteen (45.0%) mothers of poorly sleeping 12-month-olds continued to feed their infants during the night while all mothers assigned to the healthy sleeping group had ceased this practice ($F(1, 78) = 31.91, p < .001, \eta^2 = .290$). In terms of the original sample population, 23.4% of children still receiving night-feeds at 6 months and 42.9% of night-feeding 12-month-olds were classified as having persistent sleep problems.

As would be expected from these results, there was a significant group difference in the mean age at which parents discontinued feeding during the night. On average, healthy sleepers ($n = 40$) ceased night-feeding at just over 3 months (14.1 weeks) of age. In contrast, infants with persistent sleep disturbance who were no longer receiving night-feeds ($n = 20$) had been fed at night, on average, until they were eight and a half months (36.7 weeks) old, more than 5 months (22.6 weeks) later ($F(1, 58) = 67.41, p < .001, \eta^2 = .538$). When the 18 parent-infant dyads continuing their night-feeding ritual at 12 months were included, the average duration over the course of the 12-month period for this group was slightly more than

---

155 Separate analyses were conducted using all group members and just the mothers who had ceased breastfeeding by 12 months.

156 Two additional mothers from this group ceased night-feeds between 6 and 12 months but did not indicate the exact time.
10 months (44.1 weeks), a substantial group difference of 30 weeks (\(F(1, 76) = 163.25, p < .001, \eta^2 = .682\)).

**Parental Estimates of their Infant’s 24-Hour Sleep Behaviours**

Parents were asked to estimate the number of hours their child normally slept at night and during the day, and about the typical number of daytime naps. At each age, infants with enduring healthy sleep patterns were estimated to sleep for significantly more hours during the night, and over each 24-hour period, than were infants with persistent sleep problems. Significant differences were also found in daytime sleep hours at 12 months. There were no group differences on the estimated number of daytime naps at either age. As further confirmation of the parent-estimated differences in night-time sleep hours, similar results were revealed at 6 and 12 months using the night sleep hours from the infant sleep diary. Table 36 shows the results of these analyses.

Taken together, findings indicate that at 6 and 12 months, infants with optimal sleep patterns received about an hour and three-quarters extra in sleep each night than did infants with persistent sleep problems. This disparity was extended to more than 2 hours over a 24-hour period. Although only significant at 12 months, the inclination was towards optimal sleepers settling for longer periods during the day.\(^{157}\)

**Parental Reported Concerns and Beliefs about their Infant’s Sleep Patterns**

Parents were also surveyed about their level of concern vis-à-vis their infant’s sleeping patterns and/or behaviours. Four possible responses were offered, with the results shown for each group at 6 and 12 months in Table 37. While the parents of children with enduring healthy sleep were rarely concerned about their infant’s sleep patterns or behaviours, the reverse was true for parents of persistently sleep-disturbed children. Fifty-five percent of the latter group were at least mildly concerned about their child’s sleep at 6 months and consequently, highly significant group differences were evident (\(\chi^2(3, N = 80) = 18.80, p < .001\)). The ratio of concerned problem group parents increased to 77.5% at 12 months, again in stark contrast to their healthy sleep group contemporaries (\(\chi^2(3, N = 80) = 40.84, p < .001\)). However, 22.5% of mothers with 12-month-old persistently sleep children remained unperturbed by their infant’s sleep patterns and/or behaviours.

Parents in each group were then asked whether or not they believed their child had a

---

\(^{157}\) At the time of writing, information from the sleep diary regarding daytime sleep and napping behaviour has not yet been extracted. Total night sleep hours is not assessed by the ISQ.
Table 36

Prospective and Retrospective Parent Accounts of Infant Sleep Behaviours in Problematic and Optimal Sleepers at 6 and 12 Months

<table>
<thead>
<tr>
<th></th>
<th>Persistent Sleep Problem</th>
<th>Enduring Healthy Sleep</th>
<th>Difference</th>
<th>$F$</th>
<th>$p$</th>
<th>$\eta^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>6 Months</strong></td>
<td>(n = 39)</td>
<td>(n = 40)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Infant Sleep Diary</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Night Sleep</td>
<td>9:08</td>
<td>10:54</td>
<td>1:47</td>
<td>84.44</td>
<td>&lt;.001</td>
<td>.520</td>
</tr>
<tr>
<td>Parental Estimates</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Night Sleep</td>
<td>9:15</td>
<td>11:07</td>
<td>1:52</td>
<td>55.55</td>
<td>&lt;.001</td>
<td>.419</td>
</tr>
<tr>
<td>Day Sleep</td>
<td>3:21</td>
<td>3:44</td>
<td>0:23</td>
<td>ns</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Sleep</td>
<td>12:37</td>
<td>14:51</td>
<td>2:15</td>
<td>36.86</td>
<td>&lt;.001</td>
<td>.324</td>
</tr>
<tr>
<td>Daytime Naps</td>
<td>2.81</td>
<td>2.55</td>
<td>-0.26</td>
<td>ns</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>12 Months</strong></td>
<td>(n = 40)</td>
<td>(n = 40)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Infant Sleep Diary</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Night Sleep</td>
<td>9:37</td>
<td>11:19</td>
<td>1:42</td>
<td>78.74</td>
<td>&lt;.001</td>
<td>.502</td>
</tr>
<tr>
<td>Parental Estimates</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Night Sleep</td>
<td>9:51</td>
<td>11:30</td>
<td>1:39</td>
<td>46.49</td>
<td>&lt;.001</td>
<td>.324</td>
</tr>
<tr>
<td>Day Sleep</td>
<td>2:33</td>
<td>2:57</td>
<td>0:24</td>
<td>4.80</td>
<td>&lt;.05</td>
<td>.058</td>
</tr>
<tr>
<td>Total Sleep</td>
<td>12:24</td>
<td>14:26</td>
<td>2:03</td>
<td>65.11</td>
<td>&lt;.001</td>
<td>.455</td>
</tr>
<tr>
<td>Daytime Naps</td>
<td>1.78</td>
<td>1.79</td>
<td>0.01</td>
<td>ns</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* Time periods shown in hours:minutes. Sleep behaviour captured by the infant sleep diary is to the nearest 15 minutes. Naps estimated average number per day. Computation anomalies are due to rounding. ns = not statistically significant.

sleeping problem. Again, four possible responses were available with the results presented in Table 38. Almost all parents of optimally sleeping children indicated a belief that their infant’s sleeping patterns were problem-free at each age. Although about 60% of parents with chronically sleep-disturbed children recognised that a sleep-problem existed, very few believed, or were able to acknowledge, that the problem may be severe in nature. Nevertheless, significant differences in parental response patterns were evident at 6 months.
Table 37  
*Level of Concern among Parents of Problematic and Optimal Sleepers at 6 and 12 Months*

<table>
<thead>
<tr>
<th>Age/Groupa</th>
<th>Not at all Concerned</th>
<th>Concerned</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mildly</td>
<td>Moderately</td>
<td>Very</td>
</tr>
<tr>
<td>6 Months</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persistent Sleep Problem</td>
<td>18 (45.0)</td>
<td>15 (37.5)</td>
<td>4 (10.0)</td>
<td>3 (7.5)</td>
<td></td>
</tr>
<tr>
<td>Enduring Healthy Sleep</td>
<td>36 (90.0)</td>
<td>3 (7.5)</td>
<td>1 (2.5)</td>
<td>0 (0.0)</td>
<td></td>
</tr>
<tr>
<td>12 Months</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persistent Sleep Problem</td>
<td>9 (22.5)</td>
<td>17 (42.5)</td>
<td>9 (22.5)</td>
<td>5 (12.5)</td>
<td></td>
</tr>
<tr>
<td>Enduring Healthy Sleep</td>
<td>37 (92.5)</td>
<td>3 (7.5)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* Percentage within group shown in brackets.  

a*n = 40.*

Table 38  
*Sleep Problem Perception among Parents of Problematic and Optimal Sleepers at 6 and 12 Months*

<table>
<thead>
<tr>
<th>Age/Groupa</th>
<th>No</th>
<th>Yes</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mild</td>
<td>Moderate</td>
<td>Severe</td>
</tr>
<tr>
<td>6 Months</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persistent Sleep Problem</td>
<td>18 (45.0)</td>
<td>17 (42.5)</td>
<td>5 (12.5)</td>
<td>0 (0.0)</td>
<td></td>
</tr>
<tr>
<td>Enduring Healthy Sleep</td>
<td>39 (97.5)</td>
<td>1 (2.5)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td></td>
</tr>
<tr>
<td>12 Months</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persistent Sleep Problem</td>
<td>14 (35.0)</td>
<td>16 (40.0)</td>
<td>8 (20.0)</td>
<td>2 (5.0)</td>
<td></td>
</tr>
<tr>
<td>Enduring Healthy Sleep</td>
<td>40 (100)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* Percentage within group shown in brackets.  

a*n = 40.*

(χ²(2, N = 80) = 26.96, *p* < .001) and 12 months (χ²(3, N = 80) = 38.52, *p* < .001). Similar to the previous analyses, relatively large proportions of the sleep problem group mothers were of the belief that not even a mild sleep problem existed at both 6 and 12 months.
Parental Mood, Stress, and Relationship

Postnatal Depression

The next analyses investigated whether mothers of children with unremittent sleep disturbance would report higher levels of postnatal depression symptomatology than mothers of optimal sleepers during the first postpartum year. A series of single-factor between-subjects ANOVAs subsequently revealed significant group differences in mean EPDS scores at each data collection point. As Table 39 shows, the sleep problem group mothers also reported significantly more intense anxiety symptoms at pretest and 12 months.

Since all mean EPDS scores were well within the normal range, however, it is probably more useful to focus on the participants with symptoms of clinical importance. Analyses were subsequently conducted to examine any group differences in the experience

Table 39
Postnatal Depression and Anxiety among Mothers of Problematic and Optimal Sleepers at Pretest, 6 Months, and 12 Months

<table>
<thead>
<tr>
<th>Age/Measure</th>
<th>Persistent Sleep Problem</th>
<th>Enduring Healthy Sleep</th>
<th>F</th>
<th>P</th>
<th>η²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>Pretest</td>
<td>(n = 33)</td>
<td></td>
<td>(n = 39)</td>
<td></td>
<td>F(1, 70)</td>
</tr>
<tr>
<td>EPDS</td>
<td>7.79</td>
<td>3.34</td>
<td>5.77</td>
<td>4.42</td>
<td>4.64</td>
</tr>
<tr>
<td>EPDS Anxiety</td>
<td>3.88</td>
<td>1.65</td>
<td>3.00</td>
<td>2.01</td>
<td>4.00</td>
</tr>
<tr>
<td>6 Months</td>
<td>(n = 40)</td>
<td></td>
<td>(n = 40)</td>
<td></td>
<td>F(1, 78)</td>
</tr>
<tr>
<td>EPDS</td>
<td>7.03</td>
<td>4.71</td>
<td>4.43</td>
<td>3.68</td>
<td>7.57</td>
</tr>
<tr>
<td>EPDS Anxiety</td>
<td>3.50</td>
<td>1.99</td>
<td>2.68</td>
<td>1.98</td>
<td>ns</td>
</tr>
<tr>
<td>12 Months</td>
<td>(n = 40)</td>
<td></td>
<td>(n = 40)</td>
<td></td>
<td>F(1, 78)</td>
</tr>
<tr>
<td>EPDS</td>
<td>6.25</td>
<td>4.58</td>
<td>3.50</td>
<td>3.34</td>
<td>9.41</td>
</tr>
<tr>
<td>EPDS Anxiety</td>
<td>3.08</td>
<td>1.83</td>
<td>1.93</td>
<td>1.76</td>
<td>8.20</td>
</tr>
</tbody>
</table>

Note. EPDS = Edinburgh Postnatal Depression Scale full-scale score; EPDS Anxiety = EPDS Anxiety subscale (items 3, 4, & 5); ns = not statistically significant.

*a Pretest refers to participants who completed the EPDS within 120 days of childbirth.
of possible and probable depression. As displayed in Table 40, a higher proportion of mothers with persistently sleep-disturbed children were found to be suffering from minor and major postnatal depression according to the established cut-offs at pretest, 6 months, and 12 months. At least 10% of mothers in the chronic sleep problem group described symptoms of probable clinical depression at each time of measurement. While group differences were in the expected direction, results were statistically significant at 6 months only ($\chi^2(2) = 7.83, p < .05$).

Table 40
Possible and Probable Depression among Mothers of Problematic and Optimal Sleepers at Pretest, 6 Months, and 12 Months

<table>
<thead>
<tr>
<th>Age/Group</th>
<th>Depression</th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unlikely</td>
<td>Possible</td>
<td>Probable</td>
</tr>
<tr>
<td>Pretest$^a$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persistent Sleep Problem</td>
<td>24 (72.7)</td>
<td>5 (15.2)</td>
<td>4 (12.1)</td>
</tr>
<tr>
<td>Enduring Healthy Sleep</td>
<td>33 (84.6)</td>
<td>3 (7.7)</td>
<td>3 (7.7)</td>
</tr>
<tr>
<td>6 Months</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persistent Sleep Problem</td>
<td>27 (67.5)</td>
<td>8 (20.0)</td>
<td>5 (12.5)</td>
</tr>
<tr>
<td>Enduring Healthy Sleep</td>
<td>37 (92.5)</td>
<td>2 (5.0)</td>
<td>1 (2.5)</td>
</tr>
<tr>
<td>12 Months</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persistent Sleep Problem</td>
<td>33 (82.5)</td>
<td>3 (7.5)</td>
<td>4 (10.0)</td>
</tr>
<tr>
<td>Enduring Healthy Sleep</td>
<td>37 (92.5)</td>
<td>3 (7.5)</td>
<td>0 (0.0)</td>
</tr>
</tbody>
</table>

Note. Unlikely Depression = Edinburgh Postnatal Depression Scale (EPDS) score of 9 or less; Possible depression = EPDS score 10–12; Probable depression = EPDS score of 13 or more. Percentage within group shown in brackets.

$^a$ Pretest refers to groups of participants who completed the EPDS within 120 days of childbirth.

The next analyses involved scores on the EPDS Anxiety subscale. In terms of clinically important anxiety symptoms, the pretest assessment provided the only significant group difference. Twenty-one of 33 (63.6%) mothers of persistently sleep-disturbed infants exceeded the established EPDS threshold for clinical anxiety compared to 14 of 39 (35.9%) healthy sleep group parents ($F(1, 70) = 5.80, p < .05, \eta^2 = .076$).
Parenting Stress

The penultimate series of analyses explored the relationship between extreme infant sleeping patterns and parenting stress. Parents of 6-month-old infants with chronic sleep problems ($M = 35.05$) reported significantly higher mean levels of parenting stress than did parents of optimal sleepers ($M = 30.84$) with a medium effect size being reflective of a somewhat robust relationship ($F(1, 74) = 4.88, p < .05, \eta^2 = .062$). At 12 months, mothers of the persistently sleep-disturbed children again recorded slightly higher parenting stress scores ($M = 33.54$ vs. 30.63), but the difference was no longer of statistical significance.

Parenting Alliance

The final analyses of this study focussed on the co-parenting alliance construct. The PAI scores reported by mothers of 6-month-old persistently sleep-disturbed infants ($M = 85.78$) did not differ significantly from those offered by mothers of optimal sleepers ($M = 89.05$). At 12 months, however, the groups did differ significantly on this measure ($F(1, 73) = 4.01, p < .05, \eta^2 = .052$). Mothers of infants with enduring healthy sleep patterns ($M = 91.21$) professed a significantly stronger alliance with the child’s other parent than did the mothers of infants with chronic sleeping difficulties ($M = 85.81$).

DISCUSSION

This study has explored some of the infant characteristics, and parent cognitions, behaviours, and emotional experiences associated with extreme infant sleeping patterns during the first year of life. To date, the majority of paediatric sleep studies have focussed on a narrow range of factors linked with childhood sleep disturbance while only a small number have comprehensively investigated the issues surrounding severe and chronic childhood sleep problems. Few, if any studies have extended beyond comparisons with a non-sleep-disturbed control condition to consider the family characteristics of optimally sleeping children. In contrast, the current project has investigated a wide range of proximal factors associated with ongoing maladaptive and adaptive sleep behaviours within the first year of life. The focus of this study has not been on significant probability values but rather the practical significance of findings (Kirk, 1996, 2001; Wilkinson & the Task Force on Statistical Inference, 1999). The idea has been to provide theorists, researchers, and practitioners with clinically relevant information about the risk and protective factors associated with long-term problematic and optimal infant sleep patterns.
Demography, Infant Health, Temperament, and Development

Demographic and Infant Variables

As anticipated, there were no significant differences between persistently sleep-disturbed and optimally sleeping infants across a range of demographic factors. While some earlier research found a relationship between birthing variables and infant sleep disturbance (Bernal, 1973; Blurton Jones et al., 1978; Richman, 1981), to the author’s knowledge, no such findings have been published since this time. These non-significant results are consistent with subsequent reports (Anders & Keener, 1985; Pollock, 1992; Van Tassel, 1985). Contemporary thinking is consistent with Pollock (1992) and the AASM (2001), who submit that any potential associations between obstetric factors and later sleep problems are likely to be swamped by more dominant factors, such as oversolicitous parenting practices. The present study provides broad, evidence-based support for this reasoning.

Infantile Colic

Findings in relation to infantile colic were consistent with the notion of colic as a prodromal factor in paediatric sleep disturbance (Chavin & Tinson, 1980; France & Blampied, 1999; Rautava et al., 1995; Weissbluth, 1995). Significant group differences were found in parental perceptions of having experienced colic, and according to the two of the three key criteria of Wessel et al. (1954). Colic can be a tremendously stressful experience, particularly for first-time parents, and its materialisation may leave parents vulnerable to a more vigilant, stimulatory style of parenting (AASM, 2001; France & Blampied, 1999; Papoušek et al., 2001; Weissbluth, 1987, 2005). While this theory was not specifically considered, findings do suggest that colic is a risk factor for persistent sleep disturbance during the first year of life. Given that infantile colic may represent the extreme end of the normal crying continuum (Barr, 1998a), it is possible that its relationship with childhood sleep problems involves both endogenous and exogenous factors. In other words, colicky symptoms may be linked to chronically poor infant sleep outcomes via biological aspects such as temperament (i.e., low rhythmicity, high irritability), augmented by ritualistic maladaptive parenting practices following remission.

Infant Temperament

There was a significant relationship between extreme infant sleeping patterns and maternal ratings of child temperament. In general, infants with persistent sleep problems
were deemed to have more challenging temperaments than infants with enduring healthy sleep at 6 months, with slightly more divergence at 12 months. Sleep-disturbed infants were perceived as less rhythmical and more irritable by their parents at each data collection point, and less cooperative/manageable at 12 months. In addition, infants with problematic sleep were rated as significantly more difficult by their mothers at both ages. These findings are consistent with those of Sanson et al. (1987) who reported significant correlations between infant sleep problems and the same dimensions in their validation study.

It is understandable that poorly sleeping infants would be perceived as having less stable behavioural patterns and routines than their optimally sleeping counterparts. The Rhythmicity subscale is concerned with regularity of biological functions, including eating, sleeping, and toileting, which are at least to some extent intrinsic, and which moderate the child’s interactions with caretakers (Prior et al., 2000). This may be the STSI dimension most amenable to environmental influence (Prior, 1992), including early parenting and family routines, a point which sits comfortably with the knowledge that the regulation of sleep, wakefulness, and crying is particularly sensitive to dyadic interactions (Anders, 1994; Rivkees et al., 2004). The finding that infants with poor consolidation of self-regulated sleep over the first year were more arhythmical supports the construct validity of the STSI.

The strongest relationship between child sleeping patterns and temperament involved parental perceptions of irritability. STSI Irritability taps innate tendencies towards negative affect, including crying and whingeing (Sanson, Prior, Oberklaid, & Smart, 1998). These results are also supportive of the instrument’s construct validity, suggesting that inherent infant irritability results in difficulties with the self-regulation of sleep-wake states and contributes to persistent sleep problems. Alternatively, increased irritability may be a symptom or outcome of chronically disturbed sleep.

Group differences in Cooperation-Manageability were evident only at 12 months and, excluding the composite scale, this was the weakest of the significant results at this age. It was, however, consistent with findings among 4- to 8-month-olds in the STSI validation study (Sanson et al., 1987) and the effect size was bordering on medium in strength. Cooperation-Manageability is concerned with the ease with which a child adapts to parental demands and change, mainly during daytime activities. The difference in parental ratings on this factor may reflect a tendency of mothers with persistently sleep-disturbed infants to perceive their children as more innately stubborn and inflexible over time.

It was not surprising that mothers of infants with chronic sleeping problems rated their infants as more difficult. This scale is comprised of the three subscales with the strongest
link to behaviour problem ratings and is particularly indicative of infant colic, crying, and sleeping problems (Prior et al., 2000). Regardless, perusal of the mean scores suggests that current findings on this composite scale are mainly reflective of large group differences in Irritability, and therefore extensive comment is probably unwarranted. In other words, persistent sleep problems are significantly associated with Sanson et al.’s (1987) concept of difficult infant temperament, predominantly via the Irritability dimension.

Child Illness

Among 12-month-olds with persistent sleep disturbance, there was some evidence of an increased likelihood of illness during the previous 6 months. Given the lack of group disparity at 6 months, however, it seems implausible that chronic sleep disturbance emerged as a direct result of parents generally being unable to adjust their night-time parenting strategies following a period of child ill health (France & Blampied, 1999).\textsuperscript{158} It appears more likely that compared to optimal sleepers, children with chronically unsettled sleep are more susceptible to physical health problems over time.

Parent Cognitions, Strategies, and Behaviours

Written Anticipatory Guidance

Fewer parents of persistently sleep-disturbed children were recipients of the Baby Sleep parent tip sheet, providing further evidence for the efficacy of this intervention. While its utility in preventing infant sleep problems has already been demonstrated, this study extends findings to chronic infant sleep disturbance during the first 12 months of life. This is a telling outcome because it suggests that the infants of new mothers receiving the written anticipatory guidance are significantly less likely to experience persistent sleep problems and also have greater potential for achieving optimal sleep. The effective prevention of unremittent infant sleep disturbance and facilitation of healthy sleep patterns has important positive long-term ramifications for individual and family well-being.

Infant Sleep Location

The physical location of the child’s crib has seldom been investigated in Western cultures, despite an extensive literature on childhood sleep. Most notable in the present study was that a significantly larger proportion of the infants with optimal sleep had been sleeping

\textsuperscript{158} i.e., sleep problems had already been established.
in their own room since birth. Parents who pre-planned that their infant would sleep independently were ultimately less likely to find themselves with a persistently sleep-disturbed infant. It is unlikely that this result reflects differences in housing circumstances, particularly in a sample where very few addresses were given as flats or units. Further, Burnham et al. (2002a) observed that crib location within the parental bedroom was rarely, if ever, determined by lack of space. The decision to locate the infant in his/her own room from birth probably reflects factors such as personality type, parenting self-efficacy, culture, and the wish to minimise the sleep disruption to one of the parents. Interestingly, Burnham et al. found no relationship between crib location and infant temperament/maternal adult attachment style, although assessment of the latter was not ideal.

In the SNSP, the reluctance of the sleep-disturbed group parents to move their child to his/her own bedroom is reflected in the remarkable finding that, on average, these children spent an additional four and a half months sleeping within the parental bedroom over the course of the first year. These results are as fascinating as they are unexpected; it is extraordinary that this factor has not featured more prominently in previous research. Infants who sleep in their parents’ bedroom appear to be at increased risk of developing persistent sleep disturbance before their first birthday.

Since virtually all infants wake briefly between sleep cycles on several occasions during the night (e.g., Paret, 1983), parents sleeping in close proximity to their infants are more likely to be cognisant of brief arousals and therefore have increased opportunity to respond with behaviour of reinforcing intensity (Scott & Richards, 1990a). As such, infants rooming-in with their parents may be at a disadvantage for developing sleep self-initiation skills. All things considered, it appears that choosing to locate a newborn’s crib away from the parental bedroom may be an adaptive strategy in terms of the developmental course of sleep-wake state organisation.159

Maternal Cognitions

To date, there is a dearth of research on the underlying cognitions associated with the use of active physical comforting (Sadeh et al., 2007), particularly in the first year of life. In the current study, mothers of children with stability of sleep behaviours reported more adaptive sleep-related cognitions at each time of measurement. In contrast, the mothers of persistently sleep-disturbed children appeared to be more distressed by their infants’ sleeping

---

159 As indicated in the previous report, however, any advice may have ramifications in terms of SIDS risk (AAP, 2005). This issue will be addressed in the final chapter.
patterns, according to their MCISQ responses. Four of the five dimensions of the MCISQ varied significantly between the groups at each data collection point. Results suggest that the sleep-related cognitions of mothers with chronically sleep-disturbed infants differ markedly from those of mothers whose infants consistently sleep well. While the direction of this relationship is unknown, in practical terms it is largely irrelevant—maladaptive beliefs may be either prevented from rising to prominence or challenged and supplanted. Both preventive and treatment efforts should aim to effectively educate and instruct parents using empirically-based practical information about infant sleep and adaptive night-time parenting approaches.

In particular, mothers of children with unremittent sleep problems reported significantly more concerns involving limit-setting. This was the strongest difference between the groups at both 6 and 12 months, involving very large effect sizes. MCISQ Setting Limits is closely related to the structured care models underlying most behavioural prevention and treatment programs (St James-Roberts, 2007). It is focussed on maternal cognitions regarding night-time signalling behaviour, and examines beliefs about the immediacy of response, including the likely outcome of a delayed reaction or non-attendance. Limit-setting is also germane to France and Blampied’s (1999) theory, which emphasises the importance of optimal stimulation in night-time parenting practices.

When mothers who feel more compelled to react quickly at night also engage in high levels of active physical comforting, a vicious cycle of interaction may be established, contributing to and maintaining infant sleeping difficulties (France & Blampied, 1999; Morrell & Steele, 2003). An important challenge for the developers of prevention programs is to educate new parents about the common pitfalls of night-time parenting, including how unhelpful cognitions can ultimately impact the development of infant self-soothing behaviours. It is critical to provide clear information about limit-setting strategies that steer parents away from attending to their baby’s every whimper, in favour of techniques which foster development and independence.

As expected, there were significant differences in maternal sleep-related cognitions involving anger. Consistent with Morrell’s (1999b) validation study, the mothers of infants with enduring healthy sleep were significantly less consumed with anger regarding their infant’s sleep patterns than were mothers of infants with unremittent sleep problems. Relevant items on the MCISQ are predominantly concerned with feelings of irritation, regret, and helplessness in relation to the perceived demands of the child when he/she cries at night. Accordingly, Morrell has highlighted the likely utility of his instrument in identifying mothers who are most affected by infant crying.
Psychologically, anger relates to the perception of having been threatened, wronged, or denied, and involves a tendency to react through retaliation. Importantly, it may also inhibit the person’s ability to process information accurately, resulting in impaired judgment, decision making, and problem solving (Flint, 2012). The anger construct has rarely been studied in the mainstream paediatric sleep literature, despite knowledge that frequent interruptions to parental sleep may be frustrating and generally associated with negative affective experience. Further, there is considerable evidence linking excessive crying and irritability with increased risk of explicit aggressive thoughts and fantasies, aversive disciplinary practices, and child abuse (e.g., Reijneveld et al., 2004).

Infant crying yields autonomic arousal and elicits two categories of adult response: a tendency to intervene based on empathy or altruism, and intervention in an effort to terminate an aversive signal (Frodi, Lamb, Leavitt, & Donovan, 1978; Murray, 1979). In the majority of cases, empathic responses predominate. However, in unsupportive or otherwise stressful environments, continued exposure to infant crying may tip the balance past the threshold of acceptable standards of care (Frodi & Lamb, 1980). The results of the current study suggest that more attention should be given to issues of caregiver anger and emotional regulation, particularly in those with persistently sleep-disordered children. Health professionals must be cognisant of the feelings of anger, regret, and helplessness often experienced by parents, as well as the possible consequences of failing to conduct a thorough assessment.

Significant group differences in maternal cognitions involving doubt were also consistent with Morrell’s (1999b) validation study. Results indicated that mothers of chronically sleep-disturbed infants were experiencing significantly more doubt and uncertainty about the adequacy of their parenting than were those with optimally sleeping children. The implication is that the mothers of poorly sleeping children have a tendency to blame themselves for the unsettled behaviour. This is similar to other findings linking paediatric sleep problems to lowered self-efficacy (Wolfson et al., 1992), less positive perceptions of parenting, and increased feelings of incompetence (Thunström, 1999). Some items on the Doubt subscale\(^{160}\) are reminiscent of an overly vigilant and solicitous parenting style first described by Moore and Ucko (1957). Elevated scores on this dimension are comparable to the high neuroticism scores found among mothers of sleep-disturbed infants in the study by Gelman et al. (1998).

A final somewhat surprising result on the MCISQ occurred in relation to the Feeding

\[160\] e.g., “I should be getting up during the night to check that my child is still alright.”
subscale. Mothers of persistently sleep-disturbed infants were significantly more likely to report maladaptive beliefs and thoughts about nocturnal feeding throughout the first 12 months of their child’s life than were mothers of infants with enduring healthy sleep patterns. While this result had been anticipated at 6 months, the significant group discrepancy at 12 months was surprising. These findings draw attention to some of the specific cognitions associated with the continuity of night-feeding beyond the time when sleeping through the night is developmentally possible. The Feeding subscale contains items which capture fears about a potential lack of nutritional intake in the child while also relating this possibility to sleeping problems. The suggestion is that mothers of persistently sleep-disturbed children are more steadfast in their beliefs or attributions about infant hunger as the cause of infant signalling. This notion is in contrast to knowledge that excessive and unnecessary feeding is disruptive to normal sleep regulation and consolidation (Ferber, 1985b). Findings highlight the importance of providing parents with normative information and advice that challenges unhelpful beliefs around infant feeding practices.

This study found no support for Morrell’s (1999b) suggestion that cognitions about safety issues may be more prevalent among mothers of poorly sleeping younger children, at least in terms of chronic sleep disturbance. While safety concerns might be more salient among all first-time parents of very young infants, Morrell’s idea that these fears should affect the mothers of infants with sleeping problems to a greater degree is difficult to rationalise. In fact, it is counterintuitive since caregivers frequently interacting with their waking baby during the night seem unlikely to be as concerned about SIDS as those whose babies have slept peacefully throughout the night. Regardless, support for neither scenario was evident in the present study.

**Parental Involvement at Bedtime**

There were conclusive group differences in two important aspects of bedtime settling practice. Firstly, optimally sleeping infants were significantly more likely to enter their crib awake, at each data collection point. Just 3 (7.5%) 6-month-old infants were typically asleep when entering their cribs at bedtime and all were awake at 12 months. Although parents from the original sample were less inclined to permit their children to fall asleep away from their

---

161 By way of explanation, Morrell (1999b) did not find a relationship between infant sleep problems and feeding-related maternal cognitions among 13- to 16-month-old infants although he did suggest that feeding cognitions may be more salient among mothers of younger children. Hence, a connection in this study was considered likely at 6 months and possible (but improbable) at 12 months among mothers of chronically sleep-disturbed infants.
crib over time, a substantial proportion of the infants with chronic sleep problems regularly entered their cribs each night when already asleep, even at 12 months. The ratio of 50.0% among persistently sleep-disturbed 12-month-old infants compares poorly with the sample average of 17.5% reported in Study 1, and 13.4% among all non-persistently sleep-disturbed infants. Consistent with Ferber’s (1985b) ideas, sleep onset outside the infant’s crib has previously been associated with a decreased ability to self-soothe following night-wakings (Anders et al., 1992; Burnham et al., 2002a). The current research extends these findings to persistent infant sleep disturbance during the first 12 months of life, providing additional practical knowledge for future preventive programs as well as supplementary advice for clinical practice.

In the second marked divergence of approach to bedtime settling, substantial differences in the rates of parent-induced initial sleep onset were observed at both 6 and 12 months. Parents of infants with persistent sleep problems were significantly more likely to intercede at bedtime than were parents of optimally sleeping infants. In fact, 82.5% of the sleep-disturbed 6-month-old infants were assisted to sleep each night compared to just 20.0% of the children with enduring healthy sleeping patterns. At 12 months, three-quarters of children with problematic sleep experienced a form of regular bedtime parental intervention compared to just 7.5% of their healthy sleep counterparts. Again, the ratios among problem sleepers compare lamentably with the original sample figures of 46.6 and 31.9%, and 42.0 and 26.4% among all non-persistently sleep-disturbed infants at 6 and 12 months, respectively.

These findings corroborate the widely held view that parental involvements such as rocking or feeding infants until asleep at bedtime is incongruous with the development of sleep self-initiation skills and the propensity for healthy sleep. Moreover, the pattern of results suggests that infants who are denied the opportunity of self-settling at bedtime are at increased risk of chronic sleep disturbance. Findings strongly support the theoretical assertions of Ferber (1985b, 2006) and France and Blampied (1999), and are consistent with previous indications that parental intrusion at sleep onset is associated with increased frequency of infant night-waking (Adair et al., 1991; Johnson, 1991; Paret, 1983).

In particular, it is surprising that such large percentages of parents continued to use stimulative strategies such as rocking and/or feeding their persistently sleep-disturbed child to sleep at 12 months. These parents appear to have embraced the only bedtime routine they

162 However, it is not dissimilar from the 12 month percentage of 47.4 reported in a community sample of American 12-month-old infants (Burnham et al., 2002a).
saw as effective, presumably they either lacked awareness of adaptive bedtime parenting strategies or were unable to implement them. The inference is that some parents find it difficult to move away from habitual bedtime practices that appear to work, even in the face of chronic infant night-waking. Findings offer further insight into the behaviours of parents with persistently sleep-disturbed infants, and again underscore the importance of appropriate information about adaptive bedtime routines for effective prevention.

**Pacifier Use**

The results of the current study suggest that pacifier use may be less relevant to the prevention of infant sleep problems than originally envisaged. During the planning phase of this research project it was reasoned that parents should be wary of relying on pacifiers lest their baby becomes dependent on it for sleep onset. If the pacifier becomes dislodged during the night, normal awakenings between sleep cycles become problematic since a parent will need to replace it to facilitate resettling (Ferber, 1985b; Mindell & Owens, 2010). While the data did not support this theory, more information would be required on each parent’s experience before more definitive conclusions may be drawn. For example, perhaps the pacifiers were a calming, self-soothing influence for some babies while becoming repeatedly dislodged in others.

Findings were, however, consistent with a small number of studies unable to find a distinction between wakers and sleepers in the use of pacifiers (R. Morley et al., 1989; Morrell & Cortina-Borja, 2002; Paret, 1983); the present work extends these results to infants with persistent sleep problems. Taken together, it would appear that pacifier use is not implicated in infant sleep disturbance, including the development of chronic sleeping difficulties. At the very least, there is no empirical evidence thus far to support the view that pacifier use at bedtime may result in inappropriate sleep onset associations. While further well-designed research is required to add clarity to this picture, it may be that matters relating to breastfeeding and SIDS discussed in the final chapter override the need for this knowledge.

**Use of Transitional Objects**

In the SNSP, 12-month-old infants with persistent sleep disturbance were significantly less likely to use a special item at bedtime than were their optimally sleeping contemporaries. The use of transitional objects such as teddy bears and special blankets among healthy

---

163 Known colloquially in Australia as *the dummy run*. Interestingly, Mindell and Owens (2010) point out that most infants older than 6-8 months are capable of relocating their own displaced pacifier.
sleepers doubled to 35% between 6 and 12 months while relative usage among infants with unremittent sleep problems decreased marginally during this period to 20%. Although 35% of children sample-wide developed an attachment to a special object over time, persistently sleep-disturbed children appeared less likely to do this during the second six months of life. It is likely that many parents of chronically sleep-disturbed infants did not have knowledge of the possible benefits of objects such as a soft toy, and therefore neglected to make one available. Nevertheless, in hindsight it would have been better to enquire further about the infant’s attachment to any available object. Similar to the use of pacifiers, more finely-tuned research is required before a clearer understanding of the role of transitional objects in the development of healthy infant sleep patterns emerges.

**Typical Parent Response to Infant Night-Waking**

Parents also differed markedly in their approach to infant night-waking with significant group differences evident in terms of the immediacy and nature of their responses.

**Immediacy of Response**

The parents of infants with enduring healthy sleep patterns were significantly more likely to wait before attending to their signalling baby. At 6 months, they reported waiting an average of two and three-quarter minutes longer than parents of chronically sleep-disturbed infants. This difference was even more pronounced at 12 months, extending to well over 3 minutes. Burnham et al. (2002a) found that the children of parents who waited longer to respond to awakenings at 3 months were more likely to be self-soothers by 12 months. Current findings are broadly consistent with this report.

As mentioned previously, a note of caution is warranted since these figures are reflective of parents’ best estimates. Nonetheless, they are consistent with expectations and had this been a chance finding, it is unlikely that such strong group disparity would have been evident at both time points. In fact, findings may be somewhat conservative, since one parent of an optimal sleeper at 6 months, and six more at 12 months reported ignoring any infant signalling and were excluded from the analyses. Inclusion of data on the “breaking point” at which these parents might finally attend would have further accentuated the group differences. The problem group parents’ penchant for attending with little or no delay is supportive France and Blampied’s (1999) contention that overindulgent night-time parenting is characterised by a low latency of response to infant signalling.
Nature of the Response

In addition to attending more promptly, parents of persistently sleep-disturbed children tended to use a greater variety of management techniques. They were also significantly more prone to responses involving active physical comforting, including feeding, holding/rocking, remaining with the child, and/or playing music, than were parents of children with optimal sleep patterns. Further, they were found to use a significantly higher total number of discrete active practices, even when all parents acknowledging the regular use of at least one stimulatory strategy were considered separately. The parents of poorly sleeping infants appeared to be either less aware of the maladaptive nature of night-time infant stimulation or less able to cope using non-intrusive approaches.

Indeed, infant crying is a powerful and aversive stimulus, particularly where inexperienced caregivers are concerned. Parents lacking awareness of effective night-time practices are likely to respond using the method that quietens the distressed child the most swiftly. The reinforcement trap (France & Blampied, 1999; Patterson, 1982) is a behavioural account of how maladaptive strategies develop and intensify over time, as each party strives to avoid aversive stimuli, oblivious to the long-term ramifications. Since the child returns to sleep rapidly with parental intervention and continues to protest without it, parents are easily convinced that they are responding appropriately (Ferber, 1987). This vicious circle of dysfunctional reciprocities quickly becomes ritualised (von Hofacker & Papoušek, 1998), and is the nucleus of BIC-SOA (Pelayo, 2011). The results of the current study provide insight into the night-time parenting responses that not only reinforce signalling behaviour, but compromise the infant’s self-regulatory competence (Karraker, 2008).

The increased number of strategies used by the parents of sleep-disturbed infants implies both an inconsistency of approach and a lack of adaptive night-time parenting knowledge. France and Blampied (1999) stress that parents of sleep-disturbed infants tend to use more varied and stimulating management techniques and identify parental ambivalence and irregularity as antecedents of infant sleep disturbance. Lack of parenting self-efficacy and doubt among first-time parents is likely to amplify the experience of negative affect and increase partner disagreement and disharmony. Inconsistent approaches to infant distress, particularly if the parent alternates between engagement and withdrawal, will only serve to intermittently reinforce the crying behaviour, rendering it more resistant to change. Present findings support this theory and suggest that habitually inconsistent and stimulating parenting responses to infant night-waking increase the risk of chronic sleep problems.
Breastfeeding

As anticipated, 6- and 12-month-old infants with persistent sleep problems were significantly more likely to be concurrently breastfed. Considerable evidence now links maternal breastfeeding status to infant sleeping and waking behaviours (Carey, 1975; Elias, Nicolson, Bora, & Johnston, 1986; Hiscock & Wake, 2001; Lucas & St James-Roberts, 1998; Wright, 1993; Zuckerman et al., 1987). In terms of the measurement of sleep patterns, the SNSP is methodologically superior to many previous works and extends this knowledge to extreme sleeping behaviours in 6- and 12-month-old children.

A widespread public health recommendation is that infants should be exclusively breastfed until 6 months of age and then breastfed in combination with other nutrients until at least 12 months of age (AAP, 2012; DoHA, 2009; WHO, 2003). According to national data in Australia, the rate of breastfeeding is 56% at 6 months (Australian Institute of Health and Welfare [AIHW], 2011) and 30% at 12 months (Australian Institute of Family Studies, 2008; Baxter, 2008). By comparison, the rate of breastfeeding among the mothers of persistently sleep-disturbed children at 6 months (92.5%) and 12 months (55.0%) was extraordinarily high. Conversely, the enduring healthy sleep group mothers reported breastfeeding rates similar to the Australian estimates (55% and 25%). In the entire sample, 72.3% of mothers were using breastmilk at 6 months and 31.9% at 12 months.

According to the present study, while prolonged breastfeeding is associated with recognised infant health benefits (DoHA, 2009; HoR, 2007), it is also related to persistent sleep disturbance. Breastfeeding continuity has been somewhat of an enigma for sleep problem preventionists since it was identified as a sleep issue unexpectedly by Carey (1975). This phenomenon also prompted Pinilla and Birch (1993) to successfully demonstrate that breastfed babies could be taught to sleep through the night from an early age. A large percentage of mothers discontinue breastfeeding due to significant physiological or health constraints, particularly within the first 6 months (AIHW, 2011; HoR, 2007). Nevertheless, in the current study, the major disparity in breastfeeding practices between the groups could not be explained by differences in reported breastfeeding problems.164

As highlighted in Chapter 2, there is a tendency for breastfed babies to sleep for shorter intervals because breastmilk is more easily digested than formula (Burness, 1979; Hiscock, 2010; Mindell & Owens, 2010). In addition, the convenience of breastfeeding as a resettling method may lead to more frequent feeding overnight (Hiscock, 2010; Touchette et

164 In fact, mean scores were in the reverse direction, with the group most engaged in breastfeeding reporting the most problems. Unfortunately, mothers were not asked their reasons for ceasing to breastfeed.
al., 2005). It may be speculated that mothers with a very strong drive to breastfeed, at least over the course of the first 12 months, tend to have a parenting style that favours protracted night-feeding. Personality factors such as introversion and neuroticism may also be implicated (Gelman et al., 1998). Perhaps these mothers feel that if they cease night-feeds their milk supply may be threatened or their infants’ well-being adversely affected. As a consequence, their infants do not learn to self-soothe and develop persistent waking problems. The challenge for preventionists is to convey the risk associated with prolonged night-feeding, while safeguarding the renowned benefits of breastfeeding.

**Phasing Out of Night-Feeding**

Correspondingly, the most striking disparity between the groups involved parental willingness to persevere with night-feeding. Parents of infants with persistent sleep problems were significantly more likely to be feeding their children during the night at both 6 and 12 months. Note that the practice of night-feeding is not directly considered by either Morrell’s (1999a) questionnaire or Richman’s (1981) method of sleep diary interpretation, the measures amalgamated to identify the groups.\(^{165}\) Findings draw attention to the remarkable proportion of infant sleep problems that could be prevented if parents were more informed about feeding issues, and willing and able to cease night-feeding at a suitable age.

There is no physiological reason for feeding a healthy, normally developing baby during the night beyond 4 months (Schmitt, 1981). It is possible that the decision to prolong night-feeding in 92.5% of 6-month-old and 45.0% of 12-month-old infants with chronic sleep problems was partly due to differences in philosophical ideas or cultural beliefs. Even the parents of sleep-disturbed infants who were no longer feeding at 12 months had, on average, ceased night-feeding more than 5 months after the parents of children with enduring healthy sleep patterns. One might speculate about mothers’ strong philosophical views about attachment theory, or the relationship between nature, human biology, and frequent breastfeeding (e.g., Blunden et al., 2011; Buckner, 2000). These notions are also promoted heavily by advocates of a proximal care approach to child feeding and sleeping.

Alternatively, prolonged night-feeding may stem from poor knowledge of child development, with many parents unaware that their 4- to 12-month-old child has the capacity to receive its nutritional requirements during the daylight hours. In the current study, this idea is supported by the results on the MCISQ Feeding subscale on which mothers of

\(^{165}\) i.e., children who wake at night receive the same score regardless of whether or not they are fed.
Persistently sleep-disturbed infants were significantly more likely to endorse maladaptive cognitions about night-time feeding. In contrast, 92.5% of parents of 6-month-old and all parents of 12-month-old infants with optimal sleep patterns appeared to have made a transition of thought and practice, being comfortable with a diurnal feeding strategy.

The findings of this study draw attention to the perils of protracted night-feeding and its likely adverse sequelae, persistent night-waking. In very young infants, nocturnal food intake is a biological imperative. In older infants, however, frequent night-feeding is more likely to be a learned behaviour, caused by routinely feeding the child to sleep at bedtime and following night-wakings (Mindell & Owens, 2010). Further, since hunger generally occurs at the time we are accustomed to eating, a child who is used to being fed often at night will tend to wake up hungry. As a result, the child’s night-time sleep does not consolidate into long unbroken periods, but resembles naps between wakings and feedings (Ferber, 2006). This phenomenon, in which the infant becomes habituated to awaken for night-time feedings, has been referred to as learned hunger (Davey, 2009; Ferber, 2006; Owens & Witmans, 2004). Findings from the current study strongly endorse the need for preventive interventions to effectively address the factors associated with prolonged night-feeding.

**Parental Estimates of their Infant’s 24-Hour Sleep Behaviours**

At 6 months, infants with enduring healthy sleep were estimated to sleep more than one and three-quarter hours extra at night and in excess of 2 additional hours in each 24-hour period than were infants with persistent sleep disturbance. Similar large discrepancies were evident at 12 months and both parental estimates of night-time sleep hours were verified by results on the prospective infant sleep diary. In addition, there was an overall trend towards longer sleep periods during the day for healthy sleepers, supporting the notion that sleep begets sleep (Johnson & Mindell, 2011; Watts et al., 2000). Results are almost identical to those of Thunström (1999) who found a 2 hour sleep discrepancy over 24 hours between severely sleep-disturbed and non-sleep-disturbed 6- to 12-month-old Swedish infants. The possible impact of sleep loss among the group with persistent sleep problems, for what was likely to be an extended period within at least the first year of life, is concerning.

Notwithstanding this, questions about the potential risk to the chronically sleep-disturbed group may depend on what constitutes a safe minimum sleep level for these infants. This question is a difficult one, since there is no published data of this nature, and experts have frequently commented on the wide range of individual sleep requirements in childhood. In fact, there have been relatively few large-scale epidemiologic studies which systematically
identify normal sleep and wakefulness patterns and sleep duration throughout development (Owens, 2005a). Given the enormous paediatric sleep literature, this is a remarkable circumstance—one can only speculate that anything less than the optimal carries risk.

A Swiss longitudinal study by Iglowstein, Jenni, Molinari, and Largo (2003), and a systematic review by Galland et al. (2012) are the best examples of empirically-based, comparative estimates of normative total 24-hour sleep duration in 6- and 12-month-old infants. Ferber (1985b, 2006) also provides guidelines for parents in two editions of his popular book. To provide some clarity, these benchmarks are compared with current findings and the total sleep of the control group from the first study (i.e., parents who were non-recipients of the written advice) in Figure 14.

As the above diagram shows, the infants with enduring healthy sleep patterns recorded highest 24-hour sleep totals of any included group, study, or guide. Conversely, the infants with unremittent sleep disturbance were receiving considerably less sleep per day than suggested by the benchmark data. Of course, this group included many parents engaging in practices unfavourable to achieving the best possible sleep outcomes for their infant. As noted earlier, available estimates of total sleep time have been skewed by infants with sleep disturbance in large population studies (Symon, 2011), the inference being that ideal individual sleep requirements are higher than the available normative figures suggest.166

With this in mind, it may be surmised that in reality, the true average lies somewhere between Galland et al.’s (2012) findings and the 24-hour totals of the optimal sleepers in the present study. Although we are little the wiser about what constitutes the minimal sleep requirements at each age, findings with respect to the persistently sleep-disturbed group are alarming. These infants slept, on average, about an hour and a quarter less than the first study control group average at each age, notwithstanding the large discrepancies with the consistently healthy sleepers referred to above. It would appear that the sleep-disturbed infants were receiving less sleep than required for their optimal development, at each time of measurement, by a considerable margin.

As discussed in Chapter 3, sleep is related to every aspect of children’s physical, cognitive, emotional, and social development (Alfano & Gamble, 2009; Mindell & Owens, 2003a). Infants receiving chronic suboptimal levels of sleep, particularly during critical periods of development, are at risk of long-term consequences in these domains of functioning (Touchette et al., 2009). This highlights the importance of preventive programs, particularly since parents tend to seek professional treatment as a last resort, when they are distraught and perplexed by the situation (Armstrong et al., 1994; Burnham et al., 2006; Douglas & Hiscock, 2010; Scott & Richards, 1990b). An important addendum to this discussion is that further longitudinal research is required to determine a more meaningful range of total sleep requirements for children throughout development by satisfactorily accounting for those who are not sleeping well. In addition, the longitudinal use of objective measures will help researchers to better understand the maturation of sleep-wake patterns.

166 A further conclusion from Figure 14 is that Ferber’s (1985b, 2006) estimates from his best-selling popular book are misaligned with the empirical data, particularly in the revised edition. As pointed out in Chapter 2, it would appear that typical infant sleep requirements are more stable between 6 and 12 months than Ferber has suggested on both occasions. It is somewhat alarming that, in the case of the updated version, parents have been provided with a normative total sleep figure at 12 months which is below the average amount reported by the parents of chronically sleep-disturbed children in the current study (albeit in a different Western country). Thus, it is fortunate that the Baby Sleep parent tip sheet includes Ferber’s earlier guidelines.
during the first year of life and the potential impact of sleep fragmentation, as opposed to sleep duration per se, in relation to optimal development (So et al., 2007).

**Parental Reported Concerns and Beliefs about their Infant’s Sleep Patterns**

As expected, there were significant group differences in the level of parental concern about infant sleep behaviours. However, the interesting feature of these results was the numbers of problem group parents remaining relatively unperturbed by their infant’s chronically poor sleep. At 6 months, 45% of these parents were unwilling to concede even mild concern about their infant’s sleep patterns. While a level of trepidation had set in by 12 months, almost a quarter of mothers refuted all degrees of apprehension over their persistently sleep-disturbed child’s sleep habits while about two-thirds were no more than mildly concerned. After essentially 12 months of unsettled infant behaviour, this is extraordinary and suggestive of either a lack of knowledge of normative infant sleep behaviour or refusal to acknowledge an anxiety-provoking reality (i.e., defence mechanism, denial). Given that some trepidation is a precursor to parent help-seeking behaviour, many of the chronically sleep-disturbed infants may have not only been deprived of the opportunity to learn self-soothing skills, but also assistance from a health professional.

In addition, there were significant group discrepancies in response to a parallel question about whether or not parents believed that their infant had a sleeping problem. The pattern of results almost mirrored that of the previous analysis. A little more than half of the parents of persistently sleep-disturbed infants believed that their child had a mild or moderate sleep problem at 6 months, which is probably reflective of the difficulties they had endured over a relatively short period. It is fathomable that none would endorse the existence of severely disturbed sleep in their infant at this early stage. However, a surprisingly high 35.0% of parents with an infant deemed chronically sleep-disturbed did not believe that their child had a sleeping problem at 12 months. Further, just 25% acknowledged a problem of at least moderate severity.

While the infants with unremittent sleep problems were not necessarily the worst sleepers at 6 and 12 months cross-sectionally, they certainly had serious long-term sleeping difficulties relative to the entire sample. The ignorance or denial of sleep disturbance severity among some sleep problem group mothers is disconcerting enough, but particularly so when the group discrepancy in 24-hour sleep totals discussed earlier is considered. Taken together, findings suggest that despite receiving substantially less than optimal levels of sleep, almost a quarter of caregivers with sleep-disturbed infants remained unperturbed about their child’s
sleep patterns at 12 months and more than a third were unwilling to concede the existence of even a mild sleep issue.

Similar findings have been reported earlier. For example, Scott and Richards (1990a) found that among mothers of 12-month-olds who were waking on five or more nights per week, 10% did not consider this to be a problem. Byars et al. (2012) recently concluded that parent interpretation and report of sleep problems in early childhood are often inconsistent with the clinical reality, particularly when assessed non-specifically. Indeed, parental perceptions appear to be highly subjective; what some view as part of a child’s normal development, others see as a major problem (Atkinson et al., 1995; Owens & Palermo, 2008). It would seem that how a problem impacts on a particular mother within her unique circumstances cannot be discerned from objective infant sleep behaviours.

Morrell (1999b) highlights the fact that mothers’ attitudes and emotional reactions to their children’s sleeping patterns are partly based on their own experience of sleep as infants and/or their parenting self-efficacy. Stores (2001) agrees, suggesting that insight into such influences might explain why the same degree of sleep disturbance is seen as a serious problem by some parents and not by others. It is also possible that some current study participants were naively confident mothers, failing to recognise the negative impact of their parenting strategies on the child’s development, and who also tend to baulk at any challenge to their preconceptions about the simplicity of parenting (Conrad, Gross, Fogg, & Ruchala, 1992). Findings underscore the importance of providing parents with evidence-based normative information about infant sleep behaviour and patterns at different points of development as part of any preventive program.

Parental Mood, Stress, and Relationship

Postnatal Depression

Outcomes in relation to postnatal depression symptomatology were intriguing. Mothers of persistently sleep-disordered infants had significantly higher pretest postnatal depression and anxiety scores than did mothers of healthy sleepers. Results suggest that early postnatal adjustment issues may be a risk factor for persistent infant sleep problems. Additionally, a link between chronic infant sleep disturbance and elevated levels of maternal depression at 6 months, and heightened depression and anxiety symptoms at 12 months

---

167 Recall that on this occasion, pretest does not mean pre-motherhood. Participants completed the EPDS within 120 days of childbirth, meaning that they had already begun life as a new parent.
postpartum was evident in comparison with mothers of optimal sleepers.

An important caveat on these results, however, is that the mean postnatal depression score of both experimental groups was below the thresholds for possible and probable depression. This suggests that while mothers of persistently sleep-disturbed infants may be more vulnerable to mood disorder than their healthy sleep group contemporaries, the symptomatology of many would be unlikely to prompt clinical concern. Nonetheless, when the established clinical thresholds were considered, a clear divergent pattern was evident at 6 months. An alarming 32.5% of poorly sleeping infant mothers reported postnatal depression symptomatology of clinical interest in a community sample compared with just 7.5% of those with optimally sleeping children.

As discussed in Chapter 4, careful consideration of the previous research investigating the relationship between infant sleep disturbance and postnatal depression reveals inconsistent results, particularly in community settings (Gress et al., 2010). Studies using prospective measures, such as the infant sleep diary integrated into the design of this study, have generally returned non-significant results. Logically, however, the mothers of persistently sleep-disturbed infants involved in the SNSP may have more in common with those seeking secondary and tertiary level assistance for infant sleep problems.

Among clinical populations, chronic maternal sleep deprivation and fatigue are almost universal, and significant mood disturbances affect between 21 and 48% of admissions (Don et al., 2002; Fisher et al., 2002; Rowe & Fisher, 2010; Rowe et al., 2012; Thunström, 1999). As such, a stronger differential between the present study groups on postnatal depression symptomatology might have been expected. In addition, the rate of probable postnatal depression among the mothers of sleep-disturbed infants did not approach those found previously in clinical samples. Interestingly, Karraker and Young (2007) found that although infant night-waking was only weakly correlated with postnatal depression, the rate of clinically significant depression was about double in mothers of chronically waking infants. This outcome is comparable with the current study where mothers of persistently sleep-disturbed infants clearly out-numbered the mothers of optimal sleepers in terms of probable major depression at 6 and 12 months. Anxiety symptoms may also be relevant, particularly after 12 months of chronically disturbed sleep.

Taken together, findings suggest that in the general community, postnatal depression symptoms are more common in mothers of infants with unremittent sleep disturbance, but probably not to the intensity found among those seeking professional assistance for unsettled infant behaviour. In particular, mothers of persistently sleep-disturbed infants appear to be at
increased risk of clinically significant postnatal depression compared to mothers of infants who rarely wake. It may be that in some women, sleep deprivation and fatigue (Errante, 1985; Fisher et al., 2002), and related problems with parenting self-efficacy, stress, and irritability in parent-child interactions (Cooklin, Giallo, & Rose, 2012) are vital explanatory factors impacting on the experience of postpartum mood disorders.

**Parenting Stress**

As anticipated, the parents of infants with persistent sleep disturbance reported higher levels of stress than parents of consistently healthy sleepers. Nevertheless, it is somewhat surprising that significant differences were found only at 6 months and that problem group parents were not considerably more stressed at 12 months. Parenting stress has been associated with infant sleep disturbance in several studies to date (e.g., Loutzenhisser & Sevigny, 2008; Sepa et al., 2004; Thunström, 1999), although much of the research has been with parents of older children (e.g., Byars et al., 2011; Gelman & King, 2001). However, current findings suggest that in terms of the subjective feelings of stress, this group of Australian mothers tended to cope reasonably well with the circumstances of chronic infant sleep disturbance in comparison with parents of optimally sleeping children.

While a persistently sleep-disturbed child may be extremely stressful in and of itself, it may be just one of the factors involved in the total stress experience of being a first-time parent. Other general contributors to parenting stress such as child illness, feeding issues, or lack of partner support may have made it more difficult to differentiate the groups. There might also have been a component of denial among some mothers in the sleep problem group, particularly considering the proportion that remained unconcerned and/or discounted a child sleeping problem after many months of difficulties. Mothers in denial may feel less stressed and be reticent to admit to more negative and less positive feelings about parenting.

A final possibility is that the measure of parenting stress employed has some psychometric short-comings. While the PSS was originally trialled using a very large validation sample, there have been relatively few studies incorporating this scale since its inception.

Notwithstanding these issues, the finding that parenting stress was significantly higher among mothers of 6-month-old infants with persistent sleep disturbance is worthy of concern. Indeed, the degree to which mothers experience parenting stress has long been recognised as one of the most important environmental contributors to the development of the child (Mulsow et al., 2002). Unduly stressed parents may be somewhat psychologically detached thereby impairing attentiveness and responsivity to the child’s needs, and ultimately
threatening their attachment security (Jarvis & Creasey, 1991; Marin, 2007; Vaughan et al., 2013). The children of parents with elevated parenting stress are more likely to exhibit social and emotional functioning problems (Abidin et al., 1992; Costa et al., 2006; Creasey & Jarvis, 1994; Nelson et al., 2007) while being at increased risk of maltreatment (Dopke et al., 2003; Rodriguez & Green, 1997). Current findings are a fitting reminder about the relevance of healthy childhood sleep patterns to family functioning and ultimately, child physical and emotional well-being.

**Parenting Alliance**

While mean scores differed in the expected direction, there was no significant group disparity in parenting alliance at 6 months. Perhaps this was because the PAI was designed for parents of children 12 months and older. A more likely explanation is that the parenting alliance holds up well in the first 6 months as first-time parents work hard to adjust to their new roles and meet individual and mutual expectations. However, the honeymoon period quickly subsides as their child continues to wake over a second 6-month period, long after they had expected him/her to settle. The co-parenting relationship suffers over time as parents unsuccessfully attempt to manage an increasingly frustrating situation.

In support of this speculation, mothers of 12-month-old infants with persistent sleep problems reported a significantly less sound working relationship with their child’s other parent than did mothers of children without sleep disturbance. The strength of this relationship was in the small to medium range. Findings are broadly consistent with those of Scott and Richards (1990a) who discovered that mothers of sleep-disturbed infants were significantly more likely to describe their partner as someone who could do more to help with the baby’s sleep-related care. Further, the majority of mothers admitted to a popular Victorian day stay or residential program for assistance with caregiving issues, including persistent sleep problems, report insufficient practical and emotional support in the work of mothering (Rowe & Fisher, 2010; Rowe et al., 2012).

PAI scores are reflective of the couple’s shared commitment and communication in relation to child rearing (Abidin & Brunner, 1995). Results suggest that persistent sleep problems are associated with diminished perceptions of the co-parenting relationship in terms of mutual investment, involvement, cooperation, interaction, and respect (Cohen & Weissman, 1984). Relative to the bond between caregivers of optimal sleepers, the working relationship of parents with chronically sleep-disturbed infants appears to slowly depreciate when sleep problems are not resolved. Problems may be magnified by diversity of
philosophical approach, disagreements over night-time parenting practices, personality differences, and chronic sleep loss.

CONCLUDING COMMENTS

This study has contrasted the individual and family characteristics associated with persistent sleep disturbance and enduring healthy sleep patterns in infants. It has taken a practical, clinical approach in investigating the individual biological make-up, and parental characteristics, strategies, and behaviours associated with the best and worst case scenarios in the development of infant sleep behaviours. The report has further built on the multitude of more narrowly-focussed correlational studies within the paediatric sleep literature to determine a wide range of predominantly malleable risk and protective factors associated with childhood sleep outcomes.

A number of key findings are apparent. In particular, this study has highlighted the relationship between extreme infant sleeping patterns and a variety of important factors at 6 and 12 months. The temperament dimensions of rhythmicity and irritability have emerged as relevant innate factors while prolonged breastfeeding is also implicated in persistent sleep-disturbance, despite its fundamental role in child development and health. Infants sleeping in their own bedrooms from birth have an increased likelihood of achieving optimal sleep patterns, presumably supported by adaptive maternal cognitions about limit-setting, doubt, and feeding. Active physical comforting at bedtime and following night-wakings were strongly related to persistent infant sleeping difficulties. Additionally, while maternal depression, anxiety, and stress, and the co-parenting alliance were variously associated with chronic paediatric sleep problems, their connection may be less than straightforward, with symptoms and reports impacted by a variety of other factors (Zuckerman et al., 1987).

The final chapter is the General Discussion which recapitulates the research program by examining outcomes regarding the written preventive intervention in light of findings from the second and third studies. It will also explore the potential for universal dissemination of the Baby Sleep parent tip sheet, and discuss the methodological issues, theoretical matters, implications for clinical practice, and suggestions for future research.
CHAPTER 10

General Discussion

You look at where you’re going and where you are and it never makes sense, but then you look back at where you’ve been and a pattern seems to emerge. And if you project forward from that pattern, then sometimes you can come up with something. (Pirsig, 1974, p. 168)

The objective of the final chapter is to synthesise findings from the three studies comprising the SNSP and reflect on the major themes and implications for paediatric sleep problem prevention. This research is comprised of two important overarching, interlinked concepts. The first is the examination of written anticipatory guidance in the prevention of infant sleep disturbance, the subject matter of the first study. The second is an investigation of some of the risk and protective factors thought to be associated with paediatric sleep problems, encapsulated by the second and third studies (also referred to as the risk and protective factor studies throughout this synopsis). These reports were aimed at shedding light on the pathways to infant sleep disturbance for theory, research, and practice within the paediatric sleep field.

This chapter will recapitulate the major findings of the program. Rather than simply reiterating earlier conclusions, however, it will contemplate how the results of the risk and protective factor studies may be used to improve the project’s cornerstone, the Baby Sleep parent tip sheet, and by extension, future prevention activities. In addition, this final essay will consider the requirements for dissemination of a universal preventive intervention, as well as the methodological and theoretical issues, the implications for clinical practice, and suggestions for future research.

Research Theme 1: The Efficacy of Written Anticipatory Guidance

Study 1 in this series was the first research undertaking to establish that written preventive interventions can be efficacious in the prevention of sleep problems in early childhood. This is significant because infant sleep disturbance represents a substantial burden on society in terms of individual development, family life, and community health costs. Parents rarely seek help with their baby’s sleep patterns before 3 months because there is
little expectation that they will settle during this time (Scott & Richards, 1990a). Yet this same period has been highlighted as critical for establishing appropriate proximal cues for the development of sleep self-initiation skills (France & Blampied, 1999; Henderson et al., 2010) and, in fact, approximately 50% of infants demonstrate the ability to sleep regularly through the night by 8 weeks (Adams et al., 2004).

The challenge is to develop population-level strategies aimed at preventing sleep problems and thereby enhancing the competence and confidence of parents in this crucial aspect of childcare. The Baby Sleep parent tip sheet appears to provide much of the information required to do this, in an easy to read format that is applicable from birth. If universal programs designed to prevent infant sleeping problems are to be included in routine health services, they must be cost-effective, and acceptable to healthcare staff and parents (Nikolopoulou & St James-Roberts, 2003). Unfortunately, the majority of prevention trials developed to date have involved expensive individual or group training components that render population-level implementation cost-prohibitive in today’s health funding climate.

For example, an Australian study by Symon et al. (2005), which was described earlier as cost-effective relative to other published preventive interventions, returned good results at 6 and 12 weeks postpartum. However, it involved advice that may not be acceptable to many parents, requires a training session with a nurse, and the provision of a 50-page book. This program, which has no demonstrated evidence that it is capable of reducing night-waking, nor follow-up beyond 12 weeks, would cost in excess of $2.25M to implement in Victoria and more than $10M nationally per year (excluding nurse training and materials costs) just to intervene with first-time mothers.

A recent Australian prevention program (also using a Victorian sample population recruited from M&CH Centres) by Hiscock et al. (2014) may be even more expensive to implement. Despite the provision of a 27-page booklet and a 23-minute DVD (at 4 weeks), a telephone consultation (8 weeks), and 90-minute parent group session (13 weeks), findings were considerably inferior to those in the SNSP, with no significant group differences in infant crying or sleeping problems reported at 4 or 6 months. Other programs described in

---

168 In 2011/12 the Victorian M&CH Service enrolled 70,470 neonates (16,676 rural) of which 34,479 (7,164 rural) had first-time mothers (DEECD, 2012b). The cost of providing a 45-minute session with a nurse is $67.32 in metropolitan areas and $76.30 in rural areas (DEECD, 2012a). If Symon et al.’s (2005) preventive nurse consultation was provided to a conservative 95% of enrolments (offered to first-time mothers only, assuming attendance is compulsory for receipt of family tax benefit, allowing for multiple births, non-attendees) the total cost of the program for one year (excluding nurse training, practitioner resources, practitioner technical support, client materials and cost of non-arrivals/rescheduled appointments) would be in excess of $2,266,000 in Victoria and at least $10M Australia wide (likely to be much more when the cost of services to rural and remote areas in much larger states and territories is considered).
Chapter 5 were also cost-prohibitive as a population level approach to the prevention of infant sleep disturbance. In contrast, the written intervention investigated in this thesis requires little additional expense beyond the printing and distribution of a parent tip sheet.\textsuperscript{169} In addition, it may be that changes suggested by the risk and protective factor studies elevate it to the most efficient and effective sleep problem prevention intervention conceived to date.

In its current form, the Baby Sleep parent tip sheet appears to hold a lot of promise for such a minimalist intervention. After all, the provision of a six-page pamphlet, regardless of its content, brings no guarantee that it will be utilised as a parent resource. Certainly, there is little previous support for the efficacy of information-only preventive approaches. While there is evidence that parents can effectively utilise written information to reduce childhood behavioural problems (Markie-Dadds & Sanders, 2006; Morawska, Stallman, Sanders, & Ralph, 2005), no study has adequately demonstrated the efficacy of written anticipatory guidance in the prevention of childhood sleep disturbance. Further, a meta-analysis by Durlak and Wells (1997) suggested that prevention programs targeting parents have been generally unsuccessful. The current intervention was successful in adaptively influencing both maternal cognitions about infant sleep and parental night-time interactive behaviours, factors considered pivotal to paediatric sleep outcomes (Hiscock, 2010).

Indeed, cognitions were a fundamental consideration. The parent tip sheet was aimed at changing parental beliefs and thinking about aspects such as the relationships between limit-setting and autonomous infant sleeping; problematic feeding strategies and infant sleep regulation and consolidation; and self-efficacy and adaptive sleep-related caregiving practices. Specifically, access to the written intervention was associated with fewer problematic cognitions about setting limits at both 6 and 12 months. Among the domains identified by Morrell (1999a), limit-setting cognitions have consistently been the most strongly associated with active physical comforting methods and disturbed sleep in infants (Morrell & Steele, 2003; Tikotzky & Sadeh, 2009; Tikotzky & Shaashua, 2012), are a key consideration in clinical settings (Hiscock, 2010), and represent the defining factor in sleep disorders among older children (Mindell et al., 2006). Findings from the first study suggest that left to their own devices, more than half of first-time parents will routinely assist their 6-month-old child to fall asleep at bedtime and about two-thirds will habitually respond to night-waking with stimulatory practices.

Consistent with more adaptive maternal cognitions about limit-setting, beneficiaries

\textsuperscript{169} Generic difficulties involved in the dissemination of empirically validated interventions are discussed later in this chapter.
of the written advice were significantly less prone to engaging in the maladaptive infant settling strategies of holding/rocking or feeding at bedtime and following night-wakings, more inclined to have their infant sleeping in his/her own bedroom sooner, and more likely to phase out night-feeding earlier, than control parents. Given the Baby Sleep parent tip sheet’s efficacy in influencing these key areas of parent thinking and behaviour, it was not surprising that significantly healthier sleep patterns were evident among the infants of recipients. On both the prospective sleep diary and the retrospective parent questionnaire, intervention infants demonstrated significantly better overall sleep patterns at each data collection point than did controls.

Sleep habits improved markedly between 6 and 12 months. According to maternal retrospective report, however, the infants of mothers privy to the written advice had settled into a sleep-wake rhythm at 6 months that was superior to that of their control counterparts at 12 months, a remarkable outcome. Intervention infants woke on fewer nights per week and less times each night, on both measures, at each time of assessment. This is particularly important for reducing the amount of fragmented sleep experienced by parents. In addition, the rate of severe sleep disorders as defined by Morrell (1999a) was halved among the infants of mothers with access to the written anticipatory guidance at both 6 and 12 months.

These findings sit comfortably with the outcome of Adair et al.’s (1992) study which used written information distributed by a paediatrician at a 4-month scheduled visit. Participants completed a sleep chart after 5 months, and discussed the results with the paediatrician at 6 months. Although the extent of the specialist involvement was not fully specified, it appears that the assistance was considerably more intense than that of written-only advice. Moreover, endorsement by the paediatrician and the extent to which the participant valued their ongoing partnership may have been a motivating factor for adherence to the written information. At 9 months, the intervention infants experienced 36% less night-waking per week than those in the control group. In the current research, comparative data from the infants of mothers receiving the parent tip sheet were 38.0% less at 6 months, and 43.4% less night-waking per week at 12 months (see Figure 12).

The efficacy of the Baby Sleep parent tip sheet was further demonstrated by the risk and protective factor studies, albeit somewhat inadvertently. In the second study, the provision of written anticipatory guidance was responsible for a significant portion of the variance in sleep quality index scores after accounting for all other variables, in all three hierarchical regression analyses. This was unexpected and suggests that there are adaptive elements associated with the tip sheet design and content over and above that captured by the
multitude of variables under examination. In the third study, access to the parent tip sheet was shown to more than halve the risk of persistent infant sleep problems.

Findings suggest that the written format of Baby Sleep, including the layout, style, and content were functional, practical, and acceptable to many parents.\textsuperscript{170} This is in contrast to a relatively unsuccessful trial of written material by St James-Roberts et al. (2001) which involved an apparently poorly organised list of directives that may have been difficult for some parents to process. Interestingly, Ramchandani et al. (2000) assert that it is the content of parenting advice rather than the method of delivery that may be the most important predictor of effectiveness in sleep-related interventions. It is therefore important to build on the parent tip sheet’s strengths, rectify its weaknesses, and ensure that it is not lost to the paediatric sleep literature.\textsuperscript{171}

In summary, the Baby Sleep parent tip sheet fulfils the criteria of a brief, cost-effective preventive intervention suitable for universal distribution. Findings suggest that a written information-based strategy may be just as efficacious as potentially cost-prohibitive interventions requiring the contribution of a paediatric health specialist or substantial practitioner involvement in program delivery. Community-wide initiatives incorporating high levels of professional input are simply impractical, given the huge imbalance between the resources made available for prevention as opposed to treatment within the health budgets of modern societies. In addition, the parent tip sheet is suitable for distribution and verbal reinforcement using existing infrastructure (e.g., M&CH Nurses), a delivery mode likely to enhance its effectiveness at little extra cost to the community.

**Research Theme 2: The Key Factors Associated with Infant Sleep Disturbance: What Do They Mean for Preventive Interventions?**

It is important to not only identify viable preventive interventions, but to activate a program of continuous improvement. While the efficacy of the Baby Sleep parent tip sheet has been demonstrated, the results of the risk and protective factor studies suggest that further refinements are immediately possible. A fundamental consideration for any modification is the extent to which it develops, enriches, and strengthens healthy belief systems regarding infant sleep, and conversely addresses the possible threats to adaptive night-time parenting.

\textsuperscript{170} Intervention parents also completed detailed a feedback survey relating to the parent tip sheet as part of this study which has not been reported on due to space limitations.

\textsuperscript{171} Parent comments referred to in the previous footnote also require consideration as part of any future revision.
behaviours posed by maladaptive cognitive processes. Of course, prospective additions must also be balanced against the need to retain the brevity of the intervention. Relative to the six-page Baby Sleep parent tip sheet, the complexity and comprehensive nature of other educational material reported on to date (e.g., Hiscock et al., 2014) may have been to the detriment of their efficacy.

Infantile Colic

Questions about infantile colic were included in this research based on speculation that parents might be susceptible to a more vigilant and stimulatory style of parenting following its remission (e.g., Weissbluth, 1987, 2005). In the final study, more than a third of infants with persistent sleep disturbance had endured infantile colic, suggesting that colic may be a risk factor for chronic infant sleep problems in the first 12 months of life. Among all colic sufferers sample-wide, one in 6 endured unremittent sleep disturbance compared to one in 11 non-sufferers. The fact that colic symptoms were reported by one in four families suggests that this issue should be addressed by the written advice.

Since it is probably not possible to prevent unsoothable crying, there is a need to direct attention towards parental containment and coping strategies (St James-Roberts, 2007). Information aimed at normalising colic events, including when to seek help, may be advantageous in preventing some parents from being overly anxious, stressed, and/or angry amidst this phenomenon, and reduce the probability of longer term effects (St James-Roberts, 2001b). Parents who have been overwhelmed by infantile colic may feel that they cannot influence their child’s behaviour regarding crying and sleeping going forward. It is important that parents dispense with the soothing techniques used during the most difficult periods (e.g., swaddling, distraction, rhythmic motions) and utilise adaptive strategies to help their post-colicky infants to establish healthy sleep habits (Weissbluth, 2005). Future editions of the parent tip sheet may need to play a role in normalising the experience and helping parents to adjust to life after remission.

Infant Temperament

On reflection, a criticism that might be made about the Baby Sleep parent tip sheet is that it contains broad advice without considering the innate differences in behavioural style that make infants unique. The risk and protective factor studies have demonstrated that these temperamental traits, which encompass the whole of personality in infancy (Shiner & Caspi, 2003), have relevance to the prevention of infant sleep disturbance. In particular, findings
suggest that tendencies towards arhythmicity and irritability are associated with sleep problems, including those of a chronic nature. While the direction of these relationships is unknown, perhaps it is not critically important. The goal is simply to support parents in the facilitation of healthy infant sleep patterns, regardless of whether arhythmic and irritable infants are the cause of poor sleep or the reverse.

In any event, modern ideas about temperament as a more dynamic concept which incorporates social experiences into neurobiology and behaviour (Curley et al., 2011; Rothbart & Bates, 2006) are an endorsement of parenting techniques that provide a scaffold, supporting autonomous infant adaptation to the environment (St James-Roberts, 2007; Winnicott, 1953). The parents of particularly unsettled infants may be faced with a variety of trying circumstances. In terms of preventive sleep advice, parents may benefit from a forewarning that infants have differing “personalities”, and that this may pose additional challenges for the facilitation of infant sleep regulation and consolidation. Above all, it is important that caregivers do not resort to strategies that seem effective in the short-term but which may be problematic over the longer term.

**Child Illness**

In a similar vein, the risk and protective factor studies provided some indication that the experience of child illness may increase the risk of future unsettled paediatric sleep. Alternatively, children who do not sleep well may be more susceptible to illness over time. Specific advice about the reality of responding as often as is necessary to an unwell child, while being mindful of the importance of readjusting night-time parenting strategies upon a return to full health may be a useful addition to the preventive information.

**Infant Sleep Location**

The setting of the infant’s crib has rarely been discussed in the paediatric sleep literature. Findings reported in this thesis suggest that an infant sleep location away from the parental bedroom is associated with healthier sleep patterns. In general, infants sleeping within the parental bedroom encountered more pervasive levels of active physical comforting and developed poorer sleeping patterns. Further, infants who slept in their own room from shortly after birth were less likely to exhibit persistently unsettled sleep. These seemingly robust results represent one of the most fascinating outcomes of the research program. They provide prevention researchers and clinicians with clear and practical advice for parents which is not only justified scientifically, but easily attainable.
It is probable that nocturnal mother-baby interactions are affected qualitatively and quantitatively by the immediacy of their sleeping locations. While proximity may be convenient for providing night-time care, sleeping infants are also apt to producing non-distressful noises which may needless awaken anxious and vigilant new parents (Lee & Gay, 2011; Scott & Richards, 1990a). This, in turn, affects the basic probability of parent-infant interaction; conversely, increasing distance from the parental bed affords the infant additional opportunity for self-settling (Hayes, Fukumizu, Troese, Sallinen, & Gilles, 2007; Sadeh, 2004). For example, Burnham et al. (2002a) found that a separate infant sleep location was associated with a greater delay in parental response to night-waking and increased infant self-soothing throughout the first year of life. Presumably, the longer attending delays reported by tip sheet recipients and parents of optimal sleepers in the current series were similarly related to infant sleeping setting.

Findings suggest that more optimum conditions for adaptive mother-infant interactions may be created when the infant’s prime sleeping location is away from the parental bedroom. This is consistent with research suggesting that mothers rooming-in with their infant tend to be less well-adapted to their child’s sleep behaviours, reporting less satisfaction with sleeping arrangements and more criticism from partners, more problematic bedtime settling and night-wakings, and increased symptoms of maternal depression (Countermine, 2012; Countermine & Teti, 2010). Moreover, in a follow-up of their earlier work, Gaylor, Burnham, Goodlin-Jones, and Anders (2005) found crib location within the parental bedroom at 12 months to be associated with parent-infant co-sleeping at 2, 3, and 4 years of age. The contrary notion that babies are more likely to sleep physically closer to their parents because they are poor sleepers (Burnham et al., 2002a) does not appear to have been addressed in the literature.

Importantly, the results reported in this thesis suggest that it is possible to encourage a swifter move to independent sleeping arrangements via written anticipatory guidance, although any success in this area was somewhat unintentional. The parent tip sheet does have a section about choosing a place for the baby to sleep, essentially describing it as a personal decision. The phrasing infers, however, that parents tend to either have the baby sleeping in its own room from birth or in the parental bedroom for no more than a few months. This information was provided with the overarching goal of encouraging independent sleeping. Coupled with the results of Sadeh (2004), Scott and Richards (1990a), and Burnham et al. (2002a), the implication is that the written advice ought to be more directive in advising parents to locate their baby away from the parental bedroom from birth, or at the earliest time
they feel comfortable doing so. This strategy is likely to decrease the opportunity for overly solicitous parental involvement and promote infant self-regulation and autonomy.

It is worth keeping in mind that recommendations along these lines may contradict some parents’ predetermined plans for an initial sleeping location, as well as their ideas about newborn care. New parents who have night-time parenting schemas involving greater stimulation may be more likely to initially locate their child within the parental bedroom. As such, the intervention might be augmented by some stronger assertions about the potential lasting benefits for infants who sleep in their own space from an early age. Given that parents typically choose the infant’s sleep location based on intuition (Ball, Hooker, & Kelly, 1999), tackling inherent anxiety about infant remoteness upfront (i.e., asking parents to take a “calculated risk”) may have therapeutic benefits over and above the increased opportunity for improved infant sleep patterns, including enhanced parenting self-efficacy.

A major stumbling block, however, is that such advice may be contrary to contemporary infant health and safety guidelines. The taskforce on SIDS (AAP, 2005) advocate a separate but proximate sleeping environment for mother and infant. They contend that the risk of SIDS is reduced when the infant sleeps in the same room as the mother although the length of stay is not specified, and nor is the applicable research identified. Given the standing of this organisation and the direct nature of the recommendation, it would be irresponsible to take a contrary position until the situation is more thoroughly clarified. Coincidentally, St James-Roberts (2007) and Cook et al. (2012) have suggested the possibility of a preventive strategy which may provide a satisfactory solution. It incorporates proximal care methods to reduce overall amounts of crying and fussing early in the baby’s life, before moving to a more structured approach at about 12 weeks.

**Maternal Cognitions about Infant Sleep**

Findings from the risk and protective factor studies implicate a variety of problematic maternal cognitions in the development of infant sleeping problems. Baby Sleep was efficacious in influencing cognitions about limit-setting, and to a lesser extent, doubts about parenting competence. However, the consistently strong relationships between concurrent and persistent infant sleep disturbance and the dimensions involving anger, doubt, and feeding in the second and third studies suggest that the intervention requires additional emphasis in these areas. In other words, there are specific types of problematic maternal cognitions that have been shown to be associated with poor infant sleep but which the written advice has been less effective or unsuccessful in influencing.
The MCISQ Anger items mostly assess the level of frustration experienced in response to infant crying during the night. According to Morrell (1999b), high scores indicate maternal feelings of anger, regret, and helplessness in the face of infant demands. While the parent tip sheet does aim to normalise the experience of night-time parenting, counterintuitive findings in relation to MCISQ Anger in the first study, its consistency as a unique predictor of concurrent infant sleep problems in the second study, and its association with persistent infant sleep problems in the final report suggest that considerable additional accentuation is required. From a preventive stance, assisting the parent to feel more empowered though increased knowledge of adaptive sleep-related cognitions and practices should lead to more objective situational appraisals of infant sleep behaviours. In particular, it would seem that supplementary information aimed at creating more realistic expectations, and normalising the feelings of frustration that parents may encounter if night-waking does not settle down as expected, may be warranted.

An emphasis on empowerment and parenting self-efficacy is also relevant to sleep cognitions involving doubt. High scores on the MCISQ Doubt subscale imply reservations and uncertainty about the adequacy of the respondent’s parenting (Morrell, 1999b). Examination of the item content suggests that this may be due to a somewhat neurotic outlook in which the mother blames herself for the child’s waking, or feels that her status as a good parent is precarious and dependent on the level of attention she provides to her infant throughout the 24-hour period. Whilst a parent tip sheet may not alter neurotic personality traits, it can at least provide statements that bolster the mother’s confidence about her strategic approach, and address unhelpful cognitions about her parenting competence.

Robust relationships between prolonged night-feeding and infant sleep disturbance in the second and third studies suggest that addressing feeding-related problematic cognitions is also critical for any preventive intervention within the paediatric sleep field. Elevated MCISQ Feeding scores indicate that parents are more likely to regard feeding as an important soothing method, and harbour ongoing concerns about the child remaining hungry during the night (Morrell, 1999b). Item content involves perceptions about adequacy of daytime feeding and the inevitability of night-feeding to fully satiate the infant. Although the parent tip sheet does contain useful information to counter some of these maladaptive thought processes, findings suggest that this section also requires further attention.
Parent Sleep-Related Behaviours

Another critical issue for prevention programs is the impact of night-time parenting strategies and behaviours on infant sleep outcomes. Baby Sleep was generally successful in adaptively influencing caregiving practices at the infants’ bedtime and following night-wakings. In effect, the written advice is quite prescriptive in terms of the most insidious of these behaviours; the tendency to interfere with the normal sleep onset process by holding, rocking, or feeding the child to sleep. Findings from the risk and protective factor studies underscore the detrimental impact of active physical comforting.

In the second report, parent interactive behaviours at bedtime and over the course of the night were robust, unique predictors of infant sleep outcomes in the three hierarchical examinations. The only exception was that a 6-month stimulatory response to night-waking did not predict 12-month infant sleep quality. However, parent involvement at the beginning of the night was uniquely predictive of sleep outcomes 6 months later, highlighting the critical role of bedtime rituals. In the third study, very strong relationships were found between maladaptive settling strategies and persistent infant sleep problems, an important evidence-based fillip for research and practice in paediatric sleep medicine. Parents of infants with unremittent sleep disturbance responded more quickly to their night-waking infant, were less consistent in their approach, and more likely to respond with stimulation. Nonetheless, a number of parents receiving the tip sheet in the first study appeared to disregard the anticipatory guidance, suggesting that there is room for improvement. Parents may be less inclined to utilise ill-advised methods if they are aware of scientific research demonstrating a link with chronic infant sleep problems.

Alternatively, the outcome may be close to the best obtainable result from a minimalist intervention. Not every pamphlet will be read, and not every reader will be comfortable with its suggestions, motivated to follow recommendations, and capable of putting advice into practice without professional support. Perhaps a friend rocked her child to sleep each night and encountered few sleep problems; unusual outcomes such as this are certainly possible. In fact, additional analyses omitted from this thesis due to space limitations, revealed a small subgroup of parents who used active physical comforting methods at bedtime, but whose children slept almost as well as those devoid of stimulating rituals. These anomalies, which have been flagged by France and Blampied (1999; see Figure 5), may be confusing for parents who share their personal experiences.

The second study did uncover a minor relationship between parental presence during
the sleep onset process and infant sleep disturbance, particularly at 12 months. This is another challenging area for preventionists because treatment studies reveal that parental presence of a non-reinforcing intensity can be beneficial in teaching infant sleep self-initiation skills and reducing sleep problems (France, 2011). A quarter of the parents with persistently sleep-disturbed children were nearby when their child fell asleep at 12 months while similar numbers were present during the night until sleep resumption at 6 and 12 months. Taken together, findings suggest that at least some parents engage in stimulatory activities of a reinforcing nature while close by during sleep onset. Knowledge that a few parents reported gentle patting and massaging is further evidence of potentially reinforcing behaviour. The protocols of validated treatments would need to be carefully considered prior to any modifications to the parent tip sheet regarding parental presence.

**Pacifiers**

A further complex issue involves the utilisation of pacifiers. The Baby Sleep parent tip sheet advises against pacifier use, based on the premise that infants may become dependent on them for sleep onset and signal for assistance during the night following dislodgement. However, a small number of studies have found no relationship between pacifier use and infant sleep (R. Morley et al., 1989; Morrell & Cortina-Borja, 2002; Paret, 1983). The SNSP results were somewhat ambiguous, with little by way of a direct relationship between pacifiers and infant sleep, but some evidence of a unique maladaptive association at 6 and 12 months. Despite this, pacifier employment at bedtime did not increase the risk of persistent sleep disturbance. Although these findings are slightly orientated towards pacifier rebuff, there is not enough evidence to make a sound empirically-based judgement. Nevertheless, it is reasonable for new parents to expect guidance regarding pacifier use in a tip sheet about infant sleep.

It is specious logic to suggest that, due to a lack of research evidence, pacifier use should be a matter of personal preference; there are other critical factors involved. For example, pacifiers are considered a risk to breastfeeding exclusivity and duration by most major agencies and organisations (e.g., AAP, 2012; DoHA, 2009; WHO, the United Nations Children’s Fund, & Wellstart International, 2009)\(^{172}\) and may also be a marker for breastfeeding difficulties and/or reduced motivation to breastfeed (Jenik, Vain, Gorestein, &

---

\(^{172}\) Note that the evidence for this relationship is from a large number of observational studies; findings from randomised controlled trials do not support such a connection (O’Connor, Tanabe, Siadaty, & Hauck, 2009; Jenik & Vain, 2009).
Jacobi, 2009). A far more crucial issue, however, is mounting evidence linking pacifier utilisation with a reduced risk of SIDS (AAP, 2005; Hauck, Omojokun, & Siadaty, 2005; Li et al., 2006). For this reason, the AAP (2012) have taken a slightly different stance to the other key players by encouraging their use. An important caveat to this recommendation is that introduction of the pacifier be delayed until breastfeeding is well-established, typically at 3 to 4 weeks. On balance, this would seem to be the appropriate advice for future editions of the Baby Sleep parent tip sheet.

Transitional Objects

A less contentious issue is the use of soft toys, special blankets and other sleep aids. Although there was only a weak relationship between the use of attachment objects and good sleep patterns at 12 months, there seems no reason to withdraw their endorsement in the written advice. It was not surprising that the parent tip sheet was unsuccessful in influencing the use of these objects, since they are only briefly mentioned in a discussion about bedtime routines. This section may require stronger statements emphasising the possible advantages of transitional objects in encouraging infant self-soothing behaviours. Conversely, since other studies have also returned weak results (Anders et al., 1992; Burnham et al., 2002b; Paret, 1983), an argument could be made to remove this advice completely.

In hindsight, it may have been wise to ask parents whether they perceived their infant as having bonded with the object in question. While attachment object usage was down slightly among enduring healthy sleepers relative to the entire sample, it is possible that many of the poor sleepers had soft toys or the like within their cribs without gaining advantage from them, thus confounding the results. Another point made earlier is that infants may have been offered sleep aids in addition to regular night-feeds, as found in the third study among the persistently sleep-disordered group. It is also conceivable that sleep attachment objects are more functional with older children but that early habits may assist in this process. While this thesis adds little to the very small literature on the impact of transitional objects, all findings in regard to infant sleep patterns were in the expected direction.

Breastfeeding and Phasing Out of Night-Feeding

It is clear from the second and third studies that many parents were unable to appreciate the connection between ongoing night-feeding and persistent infant sleep problems. In addition, parent tip sheet recipients may have been unable to grasp the concept of learned hunger, despite this issue having been directly addressed. Close examination of
the MCISQ items reveals the potential issue to be rectified.\textsuperscript{173} It is possible that some tip sheet readers have misinterpreted a section about phasing out night-feeding to mistakenly believe that their night-waking 3- to 4-month-old was not developmentally ready to receive enough nourishment during the day to sustain a long unbroken period of sleep at night.\textsuperscript{174}

Prolonged night-feeding is a challenging issue for preventionists. Mothers often believe that it is a “natural instinct” to feed a crying child, while finding it difficult to comprehend the potential long-term effects of this strategy (i.e., the behaviour trap) without external assistance. Any conflicting advice from M&CH Nurses about continuing to feed on demand will further cloud the issue for mothers (Buchanan, 2005; Buckner, 2000; Walker, 1993). The very strong relationship between prolonged night-feeding and persistent sleep problems highlights the importance of this matter for prevention advice content.

**Emphasis on Night and Day Differences**

Entrainment to the 24-hour geophysical cycle is an important developmental task for neonates. A useful initial strategy for parents is to emphasise the difference between night and day throughout their caregiving activities (Mirmiram et al., 2003; Wolfson, 1998; Wolfson et al., 1992). On reflection, although Baby Sleep deals quite well with this issue in terms of night-time strategy, daytime information appears to be lacking. For example, Recio et al. (1997) propose that newborns be kept in a brightly lit room during daylight hours, whether or not they are asleep. Although day and night practices were not specifically measured in the SNSP, the work of Recio et al. and others (e.g., Brandon et al., 2002; Rivkees et al., 2004; Tsai et al., 2011) highlights the importance of parental sensitivity to this issue in order to encourage sleep consolidation and optimal development.

**Postnatal Depression and Parenting Stress**

The exasperation of caring for a poorly sleeping child is intuitively linked to the postnatal depression and parenting stress constructs. However, little by way of a direct relationship has been demonstrated empirically in the postpartum adjustment literature to date, particularly in community-based studies incorporating prospective measures of infant sleep. The risk and protective factor studies reported in this thesis revealed a similar picture to that of previous research—maternal depression and stress do not seem to have well-defined

\begin{flushleft}
\textsuperscript{173} This item is: “When my child wakes at night, I think I might not have fed him/her enough during the day.”
\end{flushleft}

\begin{flushleft}
\textsuperscript{174} In support of this speculation, an unreported post-hoc analysis revealed that at 6 months, Study 1 Intervention group parents scored significantly higher on the aforementioned item than controls.
\end{flushleft}
or robust relationships with infant sleep disturbance, at least during the first 12 months of life.

In Study 2, there were significant but weak relationships between problematic infant sleep and symptoms of both postnatal depression and parenting stress, but these relationships disappeared once the predictive effect of other variables had been taken into account. In the third study, mothers with persistently sleep-disturbed infants recorded higher levels of postnatal depression symptomatology at pretest, 6 months, and 12 months compared to mothers of optimal sleepers. At 6 months, the groups also differed significantly in terms of the recommended thresholds for possible and probable depression, with the pattern of results suggesting that mothers of chronically sleep-disturbed children may be at increased risk of symptoms worthy of professional concern.

While the results are interesting, more than two-thirds of the mothers with chronically sleep-disturbed infants at pretest and 6 months, and eight out of ten at 12 months, were below the recommended threshold for possible depression, ordinarily a meaningful mark in community samples. Further, the rates of probable clinical depression among these mothers was well below those found in other community settings (Hiscock & Wake, 2001; Karraker & Young, 2007) and in clinical populations (Don et al., 2002; Fisher et al., 2002; Phillips et al., 2007; Rowe & Fisher, 2010; Rowe et al., 2012). Mothers of problematic and optimal sleepers differed significantly on parenting stress symptomatology only at 6 months. A moderate effect size in this analysis might be expected given the extreme group differences in infant sleep behaviours. The lack of a connection at 12 months is inconsistent with previous findings of higher stress among parents with severe and/or persistent cry/fuss and sleep problems at about this time (Sepa et al., 2004; Thunström, 1999; Wake et al., 2006). Taken together, these results suggest that infant sleep disturbance is in some way related to postpartum adjustment in terms of depression and parenting stress, but the connection is likely to be multifaceted.

More research using retrospective sleep instruments to identify persistently sleep-disturbed children is required to properly clarify the potential relationships with subclinical and clinical postnatal depression symptomatology and parenting stress in community samples. The sleep deprivation, despondency, exasperation, and ambivalence associated with a child who does not settle through the night as originally envisaged may be the defining feature in many mothers with high parenting stress and many others with postnatal emotional difficulties.

---

175 However, comparisons are difficult due to differences in infant sleep (Hiscock & Wake, 2001) and postnatal depression assessment (Karraker & Young, 2007), and the additional psychosocial risk factors often associated with clinical populations (Rowe & Fisher, 2010; Rowe et al., 2012).
disturbance, particularly when poor maternal sleep quality is also reported (Bayer, Hiscock, Hampton, et al., 2007; Hiscock & Wake, 2001). However, the definitive factors for others may be many and varied, including maladaptive cognitions involving the overarching themes identified by C. T. Beck (2002); poor childcare and social support from partners and extended family (Leigh & Milgrom, 2008; Rowe & Fisher, 2010; Rowe et al., 2012); coincidental distressing life events (Rowe & Fisher, 2010; Rowe et al., 2012); and differences in psychological characteristics; which render some women more vulnerable to stressors during the postnatal period (Milgrom & Beatrice, 2003).

For example, 55% of highly distressed mothers presenting to an early parenting service for outpatient treatment of sleeping and/or feeding difficulties rated the level of support from their partner in childcare activities and household management as low or very low (Rowe et al., 2012). Additionally, pregnant mothers with very high expectations of childcare assistance from their partner and/or support from their extended family tend to have a more difficult adjustment to parenthood, independent of the assistance or support they actually receive (Kalmuss, Davidson, & Cushman, 1992). Varied pathways involving these additional important factors may effectively obscure the true relationship between infant sleep problems and postpartum adjustment in those affected. Interestingly, Baird et al. (2009) found psychological distress prior to conception to be a strong predictor of infant night-waking at 6 and 12 months, independent of whether or not mothers experienced postnatal depression.

Research clearly shows that maternal depression and stress associated with the parenting role have a deleterious effect on the well-being of parents, children, and parent-child relationships, particularly when present early in development (Crnic et al., 2005; Milgrom et al., 2006). In particular, the paediatric mental health field emphasises the role of positive and nurturing relationships with primary caregivers and early intervention to address identified challenges as key aspects of optimal infant development and reducing the risk of adverse outcomes (Salisbury et al., 2012). Parenting is more stressful for those who have limited knowledge, lower perceived competence, fewer emotional and instrumental supports, and perceptions of their child as behaviourally difficult (Deater-Deckard, 1998; Mash & Johnston, 1990). As such, interventions with new parents are perfectly placed to offer advice aimed at normalising the difficulties associated with the transition to parenthood and encouraging overwhelmed caregivers to be proactive in seeking early assistance.

Realistically, the Baby Sleep parent tip sheet written advice might only be expected to moderate maternal depression and stress symptoms to the extent that it is successful in
reducing infant sleep disturbance and, in turn, to the degree that infant sleep problems are related to postpartum adjustment. Regardless, a recent prevention study by Hiscock et al. (2014) found that it was possible to adaptively influence depression symptomatology despite being unsuccessful in improving infants’ night-time sleep. Results suggested that when parents have more knowledge and appropriate expectations about infant sleep they feel more confident, and less prone to postpartum distress.

In terms of the SNSP, this implies that the parent tip sheet may have an important “good practice” role in normalising the postnatal experience, at least where infant sleep is concerned. An important by-product is the provision of maternal self-care advice. The Baby Sleep parent tip sheet already contains extensive sections on *How to Look After Yourself* and *When to Seek Help*. Information is provided about taking opportunities for rest; meeting self-care needs; being realistic about household workloads and standards; and when to seek help, including how to recognise the symptoms of depression. These sections are very comprehensive and may require only minor wording changes.

**Parenting Alliance**

According to the findings of Study 2, the symptoms of postnatal depression and parenting stress were related to maternal perceptions of the co-parenting relationship (see Tables 18 & 20). A reasonable assumption is that when each spouse acknowledges, respects, and values the parenting roles and tasks of their partner, there is an increased likelihood of favourable postpartum adjustment, as evidenced by a connection between healthy co-parenting and reduced postnatal depression and parenting stress symptoms. The most interesting finding, however, was that a stronger parenting alliance was predictive of more adaptive maternal cognitions about infant sleep.

Considering this association and the vital role of adaptive beliefs and thoughts in facilitating healthy childhood sleep patterns, it seems odd that the parenting alliance was not directly associated with infant sleep outcomes. Moreover, according to the third study results, it appears to take up to 12 months of persistently disturbed infant sleep to differentiate affected parents from the parents of optimally sleeping children in terms of the co-parenting relationship. Considering the lack of a linear relationship between the parenting alliance and infant sleep, it was not surprising that the parent tip sheet had also been unsuccessful in

---

176 An additional explanation for Hiscock et al.’s (2014) positive result regarding postnatal depression may be that their intervention also involved self-care education for parents.

177 Key unhelpful cognitions identified by C. T. Beck’s (2002) could possibly be incorporated while Ngala (2004) have provided comprehensive inspiration regarding maternal self-care routines and activities.
influencing the perception of this construct.

In hindsight, there was probably not enough relevant information collected in this research program to make realistic judgements about the possible connection between infant sleep outcomes and the parenting alliance. For instance, some couples may have endured vigorous disagreements on the management of paediatric sleep issues which undermined their co-parenting bond, while others may have been drawn closer as they searched for a solution together. The combined outcome would be the obscuring of a predictive relationship. As discussed in Chapter 7, the PAI may also be encumbered with a ceiling effect among new parents, a psychometric shortcoming which would similarly decrease the likelihood of a meaningful relationship being uncovered. Alternatively, childhood sleep disturbance may be a relatively minor factor among numerous more influential predictors of the parenting alliance (e.g., beliefs about the division of childcare responsibilities, personality factors, communication skills).

Given the above findings, together with the dearth of directly relevant research, implications for preventive interventions and the Baby Sleep parent tip sheet appear to be minimal at this point. However, findings do not detract from the suggestion that the involvement of both partners in learning about, discussing, and supporting each other regarding effective night-time parenting practices may lead to increased opportunity for overall success, as well as improved postnatal adjustment. In addition, they infer commonalities between a healthy working relationship and adaptive maternal cognitions about infant sleep.

**Universal Dissemination of the Baby Sleep Parent Tip Sheet**

Although preventive parent education programs for childhood sleep problems have strong empirical support (Mindell et al., 2006), wide-scale implementation of efficacious interventions is yet to be realised (Mason, Fleming, Thompson, Haggerty, & Snyder, 2014; Miller & Shinn, 2005). In fact, this is symptomatic of long-standing general concerns about the gap between science and practice in many parts of the United States health sector (McHugh & Barlow, 2012; Wandersman et al., 2008) which are echoed in Australia (Turner, Nicolson, & Sanders, 2011). Historically, clinical researchers have paid little attention to whether practitioners adopt evidence-based approaches, with the distribution and application of successful interventions often an afterthought (Mason et al., 2014).

Consequently, there are limited examples of psychological interventions being
successfully translated into real world situations for public health impact (Glasgow, Lichtenstein, & Marcus, 2003; Goode, Owen, Reeves, & Eakin, 2012; Sanders & Turner, 2005) and a consequent shortage of information about dissemination strategy and practice (Glisson & Schoenwald, 2005; La Greca, Silverman, & Lochman, 2009). What is known, however, is that researchers attempting to translate evidence-based interventions within the varied environments and nature of healthcare and community settings are quickly confronted with a series of common issues, which may be amplified in rural areas (Glisson & Schoenwald, 2005). These include obtaining buy-in from stakeholders; misinformation, myths and resistance among staff about the proposed intervention; conflict with established systems and infrastructure; preservation of the scientifically validated components of the program; and maintenance of training effects over time, particularly when resources are limited (McHugh & Barlow, 2012; Mendel, Meredith, Schoenbaum, Sherbourne, & Wells, 2008; Sanders, Turner, & Markie-Dadds, 2002).

Moreover, a successful clinical trial is not the conventional prelude to wide-scale implementation (Mason et al., 2014). The features of an intervention trial that promote efficacy178 may run counter to the longer range intent of promoting dissemination (Glasgow et al., 2003). For instance, the Baby Sleep parent tip sheet was successfully trialled with first-time mothers of healthy, normally developing newborns, who volunteered to participate in a study. There is no guarantee that findings would generalise to parents outside these parameters, or even outside the state of Victoria. A suitable strategy going forward may involve further efficacy trials using an improved parent tip sheet with all mothers of healthy, normally developing newborns.

A subsequent course of action would be to determine the likely disseminators of the intervention and conduct effectiveness research. Whereas efficacy concerns the degree to which a program works under controlled conditions, effectiveness refers to how well a program functions in real-world settings (Flay et al., 2005). In effectiveness trials, an intervention must be robust across a diversity of participants, settings, and conditions, while appealing to a broad target audience (Glasgow et al., 2003). A legitimate strategy would be to trial a revised version of the Baby Sleep parent tip sheet in a small number of Victorian LGAs (e.g., four metropolitan, two rural) under everyday circumstances and report on the findings. Following a successful trial an argument could be formulated for the merit of universal dissemination.

178 i.e., methodological reductionism, efforts to enhance internal validity and control extraneous factors.
Dissemination Agents

Routine primary care services represent a credible and convenient access point for universal prevention programs beginning in early childhood (Bayer, Hiscock, Morton-Allen, et al., 2007). Given that M&CH Nurses are the most frequently consulted health professionals during the early months and throughout the first year of life by a considerable margin (Goldfeld, Wright, & Oberklaid, 2003)\(^{179}\) it would seem logical to involve them in distributing the parent tip sheet. The intervention effects may be greater utilising the M&CH Service because regular repeated contacts with parents enable nurses to consolidate any advice given in the early weeks (Kerr et al., 1996). Other realistic possibilities include obstetricians, midwives, private marketing, and birthing class facilitators.

Obstetricians or midwives would provide a useful distribution conduit although it might be difficult to coordinate. It also seems unlikely that they would have much professional interest in the post-birth experiences of mothers well into the first year. Private marketing is a feasible alternative, but would require financial input from parents or government funding, and does not have the systemic access to the desired population available with other options. An advantage of introducing the Baby Sleep parent tip sheet at birthing classes is that they are specific educational events, and compared to other health appointments, there is an increased likelihood that both parents will be present. In addition, a number of mothers involved in the SNSP volunteered additional comments that included disappointment about a lack of infant sleep information at these very classes. The availability of an evidence-based parent tip sheet might encourage prenatal educators to offer such training. This should also increase the efficacy of the intervention, particularly if a complementary training protocol was developed.

Development of a Clinical Guide

Regardless of the eventual dissemination agent, it is important to develop a resource for professionals who may be involved in distributing the parent tip sheet as a preventive intervention. This clinical guide should be suitable for a multidisciplinary audience and would provide an empirical foundation for the written advice. Although the parent tip sheet is designed as a stand-alone intervention, it is valuable to have the distributors of this resource

\(^{179}\) In Melbourne, Australia, first-time parents average 35.7 visits to a health service (including medical, hospitals, M&CH Service, pharmacists, allied health and naturopathic) during the first year of life. Approximately 40.1% (14.3 visits) involve the M&CH Service and these are more common in the first 6 months. Apart from General Practitioner consultations (30.5%, 10.9 visits), no other service provider receives more than about 3.5% of the total attendances.
aware of its scientific underpinning, and feeling confident about its recommendations. Long and complex clinical guides are known to reduce clinician acceptability and compliance (Grilli & Lomas, 1994). The idea would therefore be to provide just enough instruction and support to place average practitioners across disciplines in a position to implement the intervention and provide secondary consultations as required.

**Barriers to Effective Dissemination**

One of the main impediments to effective dissemination is the potential for opposing views about infant sleep from people with different academic backgrounds, including treatment providers with strong commitments to existing methods of service delivery (Hayes, 2002). For example, it is possible that many nurses harbour beliefs akin to the proximal care philosophy (Buchanan, 2005). Successful roll-out depends on practitioners being able to recognise the relevance and benefits of the program, and integrate it seamlessly into their clinical practice (Sanders & Turner, 2005). The parent tip sheet may be less effective if health practitioners undermine the written content by, for example, comparing it unfavourably to their own anecdotal practice experience. The idea is to reduce, rather than increase the number of mixed messages that parents receive. Interestingly, Sanders and Murphy-Brennan (2010) highlight the need for an internal organisation “champion” to foster program support and the development of strategies for informing administrators about the procedures, the distinguishing features of the intervention, and its potential benefits.

**The Advantages of Universal Implementation**

Since the Baby Sleep parent tip sheet has been evaluated as a stand-alone resource, findings may represent a conservative estimate of its actual preventive worth. In reality, it is doubtful that a universal roll-out would see the pamphlet mailed to new parents with M&CH nurses unaware of its existence as was the case here. The most likely scenario would see distribution by child health nurses at a mandatory early home visit, or during the baby’s second or third health consultation. Having the Baby Sleep parent tip sheet freely available at health centres would be advantageous for brief training, discussion, and reinforcement of strategies with the incumbent M&CH Nurse. As explained in the General Method, Triple P Parent Tip Sheets were designed with a dual purpose in mind. In addition to the provision of universal anticipatory guidance, these resources have been considered invaluable as handouts and educational tools for health professionals in both prevention and treatment activities. Parents involved in Triple P interventions have reported returning to written resources as a
prompt, or reminder of key information (Turner & Sanders, 2006).

Given that the provision of written information led to an improvement over routine care by the M&CH Nurse, it follows that nurses might themselves benefit professionally from the written advice. For example, a small study by Buchanan’s (2005) indicated that some M&CH Nurses have firm views about infant sleep practices while conceding little knowledge of the research base. In fact, inconsistent information and service delivery is one of the most common problems that parents have with the Victorian M&CH Service (Goldfeld et al., 2003). Widespread availability of Baby Sleep should reduce the likelihood of parents receiving misinformation, or direction inconsistent with contemporary paediatric sleep literature.\(^{180}\) Increasing parent knowledge in a uniform manner will improve discourse around adaptive strategies and sleep problem solutions, and provide a sound scientific foundation from which parents may contemplate anecdotal advice from family and friends.

To conclude, the universal dissemination of this resource has the potential to impact the incidence of childhood sleep disturbance, at little additional cost to the community. The use of existing infrastructure and staffing is appealing as an efficient method of health service delivery which may increase the utility and efficacy of the parent tip sheet. A minor reduction in the demand for services such as the M&CH parent helpline and mother-baby day-stay or inpatient programs is likely to result in significant savings. This is in stark contrast to previously documented successful prevention programs involving costly training and monitoring which renders them impractical for community level implementation.

**Final Reflections: Method, Theory, Practice, and Future**

**Methodological and Conceptual Considerations**

Random allocation of participants to the experimental groups in the first study would have raised the quality of the design and led to greater confidence in the findings. However, pure randomisation was not viable due to the possibility of between-group contamination. The proliferation of organised mothers’ groups, the large numbers of small communities involved, and the characteristic baby-centred nature of conversations between new parents meant that unmodified random allocation may have rendered the study invalid. Ultimately, it was felt that quasi-experimental allocation of all participants from any one M&CH Centre (or LGA in some country regions) to the same group would achieve a reasonable compromise

\(^{180}\) Ironically, even the original tip sheet from the University of Queensland was deemed inadequate in terms of the most important aspects of current thinking on the prevention of infant sleep disturbance.
between risk and integrity.\textsuperscript{181} While no control parent requested a parent tip sheet, it remains unknown whether sharing of information did occur, as it was impossible to control for every possible contingency. Nevertheless, any between-group leakage could only have made both groups more homogeneous, and therefore the results would represent a conservative estimate of the true effect of the Baby Sleep parent tip sheet.

Some may argue that the first study was effectively a cluster-randomised trial,\textsuperscript{182} given that participants were allocated to groups at the level of M&CH Centre. In cluster-randomised trials, groups (or clusters) of subjects are randomised rather than individuals, yet data is collected from individual participants. In contrast to a fully randomised design, a cluster randomised trial assumes and adjusts for systematic similarities at baseline based on the premise that the responses of individuals within a cluster tend to be more similar than those of individuals from different clusters. Alternative methods of statistical analysis are therefore required to account for potential within-cluster homogeneity of observations (Austin, 2007).

Cluster-randomised trials often involve a relatively small number of clusters (e.g., GP practices, child health centres, schools) usually containing at least 20, but sometimes upwards of 100 subjects each (e.g., Lavender et al., 2005; Lee et al., 2009; Roberts-Gray et al., 2016; Taddio et al., 2015; Taft et al., 2015). In the current study, there were 173 “clusters” and these contained an average of 2.0 participants. A large number of mothers (\(n = 95\)) were the only subject drawn from their particular M&CH Centre, while 34 centres had two participants; at the other end of the spectrum three M&CH Centres had nine participants while one had 12. It is also worth noting that as the variability in cluster size increases, the power of a cluster-randomised trial is reduced compared to a trial with no variation (Lauer, Kleinman, & Reich, 2015). In effect, close to half of the participants (48.9%) were randomly assigned to groups, suggesting that this study was not truly randomised, but nor was it an archetypal cluster trial. An additional major issue with cluster-randomised trials, an increased potential for selection bias, was also removed from the SNSP as nurses were unaware that the research involved an intervention condition.

Interestingly, Gilbody, Bower, Torgerson, and Richards (2008) found no baseline imbalances between intervention and control conditions among 14 cluster-randomised trials examining enhanced primary care for depression. Further, they did not produce results

\textsuperscript{181} A consultant’s proposition that the unit of analysis should be the M&CH Centre (i.e., as opposed to the individual) was dismissed because it was felt that any methodological gains would be outweighed by a considerable loss of information.

\textsuperscript{182} For an excellent review of this methodology see Barbui and Cipriani (2011).
substantially different from randomised trials and adjustment for clustering had minimal effect on clinical and statistical significance. Nevertheless, the fact that no adjustments have been made for randomisation at the level of M&CH Centre needs to be considered when weighing up the contribution of the first study of the current research program.

A further statistical issue to keep in mind is that no adjustment has been made for multiple hypothesis testing. Given that Type I error accumulates with each executed test (Moyé, 1998), there is a possibility that at least some of the significant findings may have occurred by chance. However, any (Bonferroni or the like) correction in the current research would increase the probability of Type II error to a degree far exceeding the accepted maximum rate of 20% (Machin, Campbell, & Walters, 2007) as well as precluding comparison with the similar aspects of previous research. Rothman (1990) reminds us that the p value is an indicator of the relative compatibility between the data and the null hypothesis; it does not indicate whether the null hypothesis is a correct explanation for the data. He stresses that it is preferable to risk Type I error that may be discounted by further research than to erroneously discard potentially useful observations because of Type II error.

It is possible that parents from the first study who received information and advice may have felt obligated to report parenting strategies and/or infant sleep behaviours consistent with the educational material or perceived as favourable to the researchers (Kerr et al., 1996). However, intervention subjects ought to have been unaware of the central role of the parent tip sheet and the fact that half of their fellow participants were not privy to it. Moreover, having two methods of recording child sleep patterns provides some insurance, since it is surely more confronting for parents to embellish the results of a running record, such as sleep diary. Be that as it may, there is no way of knowing whether the internal validity of the study was compromised in this fashion.

The participants in this research program were drawn from a larger and more representative sample of up to 4200 first-time mothers of healthy, normally developing babies. For logistical reasons, no data was collected on those deciding against being involved, whether or not they received an information pack. Overall, subjects were slightly older than most first-time mothers; well-educated with almost 50% having a university level degree; and more often than expected, from a rural location. It is conceivable that the study participants were more intelligent, mature, organised, and motivated than the non-responders, and that these types are more likely to gain advantages from written preventive information.

\[183\] For an excellent review of this issue see Streiner (2016).
There can be no guarantees that the results pertaining to the parent tip sheet will generalise to a more representative sample or to the general population.

Different results may have emerged using an objective method of sleep report, such as actigraphic or video recording. An advantage of objective assessment is the propensity to detect inconspicuous or unsignalled wakings during the night (Anders et al., 1992) since mothers using sleep diaries tend to overestimate their infant’s sleep duration and underestimate the number of night-wakings compared to actigraphy (Sadeh, 1996; So et al., 2007). Notwithstanding the cost, design, logistical, and validity issues which rendered the use of objective recording impractical,\(^{184}\) parental subjective report is a more meaningful measure in this type of research. Knowledge that an infant exhibited a partial arousal (i.e., without signalling) is largely irrelevant in terms of the study aims; rather, night-wakings requiring parental intervention were of greater interest and consequence. Further, parents tend to seek clinical assistance on the basis of their own perception and awareness of their child’s sleep regulation and consolidation (Sadeh et al., 2007).

Parental observations in both questionnaire and diary format have historically been the main source of information on children’s sleep schedule, night-wakings, and sleep-related behaviours (Sadeh, 2008a). Moreover, parents have been shown to be valid and reliable observers of children’s sleep (Henderson et al., 2010), particularly when investigations are focussed on sleep scheduling and the impact of perceived sleep problems on caregivers (Atkinson et al., 1995; Minde et al., 1993; Sadeh, 2004) rather than the measurement of sleep quality (Sadeh, 2008a). As Henderson et al. (2011) have pointed out, discrepancies between videosomnography and diary information are generally reflective of a difference in the data source rather than a lack of validity in parental recordings.

The SBS and ISQ were originally developed for use with infants 12 months old and above. An inference is that the composite sleep scores and thresholds indicating a severe sleep problem may not be relevant to younger children, or might overestimate the severity of infant sleep disturbance. However, that a theoretical assumption of this project is that healthy, normally developing children have the potential to be self-soothing and settling through the night by 4 months. This expectation is conservative compared with the views of others (Henderson et al., 2010; Henderson et al., 2011; Nikolopoulou & St James-Roberts,\(^{184}\) The use of actigraphy would have involved a substantially revised design with fewer participants, and data collection and travel commitments not commensurate with a student project. In addition, actigraphic measures have multiple validity concerns including low specificity for detecting wakefulness within sleep periods (Sadeh, 2008a, 2011) and inadequacies in detecting nocturnal awakenings and total sleep duration when evaluated against video observations and polysomnography (Insana, Gozal, & Montgomery-Downs, 2010; Sitnick, Goodlin-Jones, & Anders, 2008).
2003; Pinilla & Birch, 1993; Schmitt, 1981, 1986; St James-Roberts et al., 2001; Wolfson et al., 1992) and supported by knowledge that 50% of infants regularly sleep through by 8 weeks and 75% by 12 weeks (Adams et al., 2004). It is also consistent with the prevailing guidelines indicating that sleep disorders are typically diagnosed from 6 months onward, with provision for an earlier diagnosis if the problematic sleep is clearly identifiable (AASM, 2005).

A further aspect worthy of reflection is theoretical structure of the SBS and the ISQ. The authors of these scales had slightly different conceptualisations of problematic infant sleep, with some dimensions unique to one measure and others overlapping. One point of contention is that on both scales, each dimension is given equal weight in terms of its presumed contribution to poor infant sleep. However, some factors may be more important than others in parents’ subjective experience of problematic sleep behaviour. For example, parents may find infant night-waking on five occasions per week (i.e., [their own] sleep fragmentation) more distressing than a later bedtime and less overall night sleep hours (i.e., [their own] partial sleep loss). These could be given equal weighting according to the SBS scoring criteria. Conversely, an early rising parent whose own bedtime is 9.00 p.m. may prefer their infant to sleep from 7.00 p.m. through to 5.00 a.m. (with the child therefore technically waking every night between midnight and 6.00 a.m.) rather than remaining unsettled until midnight before sleeping through to 6.00 a.m. (and hence does not night-wake according to the criteria).

This methodological problem, which involves individual preference and subjective family experience and circumstances, has not been adequately addressed by the empirical literature. Interestingly, Henderson et al. (2010) suggest the possibility of using an 8-hour stretch, regardless of when it occurs, as indicative of sleeping through the night. In hindsight, this may have been a more valid method of identifying infant night-waking in the SNSP. It is conceivable that certain patterns of SBS and ISQ dimensional scores, including sleep scheduling, relate differently to parental levels of concern about their child’s sleeping patterns and subjective ratings of sleep problem severity.

A fundamental precept of this research is that the developmental goals of autonomy and independence may be disrupted by parent-infant co-sleeping (Keller & Goldberg, 2004). Parents of particular cultural or family tradition may proactively engage in this practice as a lifestyle choice, but parents in Western cultures often resort to reactive co-sleeping because

---

185 Ironically, Henderson, et al. ultimately settled on a family congruent option (10:00 p.m. to 6:00 a.m.) as the most developmentally and socially valid criterion for sleeping through the night.
they are unable to cope with attending to their waking child on numerous occasions during
the night (Sadeh, 2008b). Regardless, some may find it troubling that the SBS scoring
procedure automatically assumes that co-sleeping is problematical. The ISQ avoids this issue
by specifically asking about the frequency of relocating the child to the parental bed because
he/she is upset and will not sleep. Given that Richman’s (1981) co-sleeping interpretation
affects just one dimension on one of the two multidimensional sleep scales employed in this
sample, it is unlikely to have substantially affected results. It is possible that some parents
co-slept with their infant by choice rather than reactively, and these were interpreted as
problematic according to the SBS scoring criteria. However, perusal of the sleep diaries
relating to children with high levels of co-sleeping revealed that these infants were rarely
settled off to sleep in the parental bed.

The cross-sectional design of this research is somewhat limiting in terms of the
conclusions that may be drawn, precluding any decisive statements about causality or the
direction of effects. In the foregoing discussions, any language of influence or inferred
assumptions about causal relationships is for heuristic purposes only—it is intended as
representative of the theoretical models presented in Chapter 4 rather than the outcome of
statistical analyses. Moreover, the data collection phases of pretest, 6 months, and 12 months
were not chosen with any specific theoretical subtext in mind. Rather, 6 months was thought
to be a reasonable target for infants to be settling through the night while 12 months was
considered a realistic time for follow-up, given the nature of the research. Findings at 9
months, for example, may have been completely different, there is no way of knowing. Only
longitudinal research will provide a more thorough picture of the developmental course of
infant sleep problems and the impact of efficacious preventive programs over time.

Theoretical Implications

The results reported in this thesis suggest that universal approaches can be effective in
assisting parents to facilitate the development of healthy infant sleep patterns. In the past,
written approaches have been reasonably unsuccessful as a stand-alone option (St James-
Roberts et al., 2001) or have been used an adjunct to more intensive preventive interventions
(e.g., Hiscock et al., 2014; Symon et al., 2005). Unfortunately, the unique effects of any
written advice have rarely been considered. Other attempts at using printed information have
involved the treatment of children with well-established sleep problems (Scott & Richards,
1990b; Seymour et al., 1989).

Findings contribute to the substantial body of evidence supporting the efficacy and
structure of the Triple P–Positive Parenting Program (Sanders, 1999; Sanders, Markie-Dadds, & Turner, 2003). As indicated, Baby Sleep was originally published as a Triple P parent tip sheet; regrettably, these resources are no longer available via primary health services in Victoria.\textsuperscript{186} Triple P is a multilevel system of parenting and family support (see Appendix A), consisting of a five-tiered continuum of increasing strength and narrowing reach, varying from broad universal approaches (Level 1) to intensive behavioural family intervention (Level 5). To the author’s knowledge, this research is the first to demonstrate the efficacy of a Triple P parent tip sheet as a stand-alone resource, providing support for the theoretical structure of the program and the value of Level 1 interventions. This is important, since evidence for the first three levels of the five-tiered parenting and family support strategy is extremely limited (Nowak & Heinrichs, 2008). The inference is that universal interventions, which have the greatest potential to impact at a population level, may be an important yet underdeveloped aspect of the Triple P model.

Triple P parent tip sheets are intended to have additional utility as an adjunct to professional health service provision. As such, the format and evidence-based nature of Baby Sleep lends itself to a collaborated approach in developing adaptive routines and dealing with specific concerns that a parent might have about their child’s sleep. Theoretically, the parent tip sheet would be elevated within the Triple P multi-level model to form part of a Level 2 intervention in this scenario. For example, \textsl{Brief Primary Care} involves opportunistic service delivery by a practitioner providing regular support to parents. It comprises a brief consultation of up to 30 minutes, targeting a specific issue and may include follow-up in person or by telephone. This would be valuable for clarifying and enriching the information presented in the parent tip sheet for those who need it, increasing its effectiveness. In addition, some parents prefer verbal delivery of anticipatory guidance over written materials (Magar, Dabova-Missova, & Gjerdingen, 2006). A theoretical challenge is to identify which families are likely to benefit from higher levels of intervention.

While this research has contributed in a positive way to the literature on infant sleep problems, some key theoretical questions remain unanswered. In particular, the underlying reasons for the tip sheet working for some parents but not others have not been established. It may be, for example, that certain personality traits are influential in determining which

\textsuperscript{186} Previously, the Victorian Government’s Department of Human Services published its own series of 40 Triple P parent tip sheets, including Baby Sleep, which addressed common issues relating to the parenting of infants, toddlers, preschoolers, and primary school children. These were based on similar resources developed by the University of Queensland. While the Victorian tip sheets are no longer available to parents via M&CH Centres and other primary health care providers, at the time of writing they can still be obtained from the Parenting Research Centre (http://www.parentingrc.org.au/index.php/resources/positive-parenting) in electronic format.
parents are willing and able to employ parenting strategies communicated in written format. Do certain personality factors render people more likely to trust (e.g., agreeableness), read (e.g., conscientiousness), or engage with (e.g., openness to experience) printed material? Does personality impact on whether or not parents are able to implement strategies which at times may appear to conflict with their natural instincts and which seem unrelated to long-term outcomes? Did some parents receive strong advice about infant sleep from their M&CH Nurse or another professional which was contrary to tip sheet recommendations? What influence did extended family members, and particularly grandparents have in shaping parental approaches to infant sleep?

Following on from the unknown influence of these factors, it is clear that much of the variance in childhood sleeping patterns is yet to be accounted for. In the hierarchical regression analyses in Study 2, for example, the incorporated variables accounted for 58% of the variance in concurrent 6-month infant sleep quality scores and 56% at 12 months. While these are admirable results for research of this nature, at least 42% of the variability remained unexplained by the models. Although a solid picture of the critical role of parent cognitions and behaviours in child sleep outcomes was presented, improved theoretical conceptualisations and subsequent theory-driven and/or innovative exploratory trials are required before a more complete picture will emerge.\(^\text{187}\)

This project provides interesting support for the relevance of feeding and safety cognitions among mothers of infants during the first 12 months of life. Despite face validity for parents of younger children, the MCISQ was originally trialled on a small sample of toddlers, a somewhat curious decision. Lack of a relationship between the above subscales and child sleep problems in Morrell’s (1999b) validation study has led subsequent research teams (e.g., Johnson & McMahon, 2008; Morrell & Cortina-Borja, 2002) to abandon these concepts, albeit in additional investigations using older children. The current project supports the salience of the MCISQ Feeding and Safety items among mothers of infants, and the inclusion of these dimensions in future studies involving children in the first year of life.

Nonetheless, there was little evidence that the Safety subscale belongs theoretically within Morrell’s concept of problematic maternal cognitions about infant sleep. The question remains as to whether the unexpected relationships between healthy sleep and maternal safety concerns was an artefact of the particular intervention as speculated in the first study, or

\(^{187}\) Recent studies outside the paediatric sleep field also underscore the vital role of parent cognitions in child outcomes and provide valuable insight for theoretical reflection and endeavour. For example, Ferrier-Lynn and Skouteris (2008) were surprised to find parent cognitions to be more strongly associated with infant development than were parent-infant interactions.
perhaps more plausibly, the circumstances of reduced contact during the night. Findings from the third study suggest that differences in cognitions about SIDS are not borne out between groups of mothers with persistently sleep-disturbed and optimal sleepers, further clouding the issue. Replication of significant results will necessitate an adequate theoretical explanation for the association of apparently maladaptive maternal cognitions with adaptive sleep outcomes.

A final notable theoretical connotation involves findings relating to the primary location of the infant’s crib. It is not completely clear why infants sleeping within the parental bedroom should be at increased risk of problematic or persistently disturbed sleep patterns. Whether parents with infants sleeping close by are more likely to be aware of and respond to brief arousals, or have personality traits which predispose them to more active night-time involvement, these results are important for prevention theory. In particular, future preventionists should incorporate this factor into their theoretical models of paediatric sleep disturbance.

Implications for Clinical Practice

The results of the SNSP inform and support clinical practice in a number of areas. The ultimate goal is that parents have access to the latest culturally appropriate information and advice about childhood sleep. In particular, first-time parents ought to feel confident that the recommended strategies and practices will increase the likelihood of healthy sleep pattern development in their child. There is a real opportunity for primary care practitioners to incorporate findings into their clinical practice, with the written material complementing empirically-based verbal recommendations. This will increase the likelihood of a universal message being disseminated within and across health services.

Clinicians with varying backgrounds and ideas must be able to champion the merit of the information provided amid conflicting recommendations that are not supported by the empirical literature. The ability to effectively challenge maladaptive or inaccurate beliefs among parents about night-time parenting and childhood sleep in a manner consistent with the resource content, and by extension, the evidence base, is essential. This will have flow-on effects to community discourse, with parents less conflicted by inconsistent advice among consultant health professionals and lay people. Additional practical advantages of parent tip sheets include the potential to extend the advice to partners who may not be present during the consultation, their convenience and ease of accessibility, and their availability for repeated use (Markie-Dadds & Sanders, 2006).
The studies comprising this research provide further solid evidence of the role of maladaptive parent cognitions and behaviours in the development and maintenance of paediatric sleep problems. Interestingly, Coulombe and Reid (2012) recently found mothers to be more ambivalent in their thinking about common night-waking strategies (including limit-setting and active comforting) than has been previously reported, possibly reflective of ambiguity and uncertainty. Most clinical interventions for sleep-disturbed infants tend to ignore the cognitive component underlying excessive parental night-time involvement, despite the need for a dramatic shift in thinking in many cases (Gelman et al., 1998; Sadeh et al., 2007). Moreover, prevention studies using quite prescriptive, behavioural approaches (e.g., St James-Roberts et al., 2001) have generally been unsuccessful. It seems that parents require information on the overall reasoning supporting any advice provided.

Given the well-established relationship between parent behaviours and child sleep problems, efforts to instil healthy beliefs and correct maladaptive cognitions about sleep may be one of the most important aspects of clinical practice in this area. In addition, the third study provides scientific verification of the increased likelihood of persistent sleep problems emerging from ill-advised parenting practices. This was previously poorly understood and may also be useful for consultative dialogue with new parents. Of particular concern is that chronic sleep problems in early childhood have been linked to subsequent internalising and externalising behavioural problems (Lam et al., 2003; Owens & Burnham, 2009; Wake et al., 2006). Consistent findings regarding the adaptive impact of having the child sleep in his/her own room from an early age appears to be of additional practical benefit. The training of all health practitioners involved in the provision of paediatric sleep advice needs to emphasise the important issues outlined above. This may be most efficiently achieved via professional development courses, including face-to-face and online education.

**Future Directions**

Issues relating to the revision and dissemination of the Baby Sleep parent tip sheet have been outlined and will not be discussed further. However, in addition to deployment of the intervention contents in written format, it would be interesting to investigate other modes of delivery, such as the internet, including applications for mobile devices. For example, Mindell and colleagues have demonstrated the concurrent and long-term efficacy of a web-based treatment for infant sleep disturbance and express their belief in the value of these widely accessible forms of intervention within the healthcare system (Mindell et al., 2011).

A central feature of the SNSP has been the close examination of factors within the
caregiving environment that might contribute to infant sleep problems. Nevertheless, some important questions about the pathways to healthy sleep remain unanswered. As discussed, the cross-sectional design is somewhat limiting in terms of the conclusions that may be drawn, particularly in relation to causality. There is solid basis for the contention that infant sleep outcomes are influenced by parental behaviours as well as for the opposite assertion that parental behaviours may be influenced by the child’s sleep patterns. Carefully planned longitudinal research is required if this age-old question within the paediatric sleep literature is to be finally resolved.

An important aspect is to gain a greater perspective on the role of temperament in the development of infant sleep self-regulation and consolidation. At present, there is limited understanding about the relative influence of the infant’s disposition on his/her sleeping patterns, and conversely, the impact of sleep-wake patterns in shaping the infant’s behavioural repertoire; it is difficult to distinguish cause from effect (Spruyt et al., 2008; Touchette et al., 2009). The exact relation between infant temperament and sleep routines will only be clarified when researchers adopt a consistent approach in terms of construct definition, assessment, and sample age range, in carefully designed studies (Kaley et al., 2012). As such, the now widely-accepted three broad temperament dimensions of negative reactivity, approach/inhibition, and self-regulation (Sanson et al., 2009) should be the starting point for impending studies. A further important consideration is to account for possible parental biases due to fatigue or depression via the objective measurement of infant temperament (Karraker, 2008)—or more optimally, by incorporating multiple measures (Rothbart & Bates, 2006; Sanson, Hemphill, Yagmurlu, & McClowry, 2011)—particularly since behaviourally-assessed temperament seems to have superior predictive validity for later sleeping problems (Morrell & Steele, 2003).

The SNSP has focussed on the central role of maternal beliefs and thoughts about infant sleep in terms of night-time parenting strategies and infant sleep outcomes. However, little is known about paternal cognitions, and their potential role in childhood sleep behaviour. In fact, there is a dearth of research exploring the impact of fathers in general on infant sleep pattern development. The evolution of fatherhood has seen a scholarly reconceptualisation of the role of fathers in child development (Lamb, 2010) as men assume a more active part in daily caregiving activities (Fägerskiöld, 2008; McBride & Rane, 1998). Accordingly, it will be important to evaluate a broad range of paternal factors in future studies of infant sleep (Loutzenhisier & Sevigny, 2008). This is a fertile area for future research which may unlock key information about the developmental pathways of infant
sleep disturbance. For example, it has been suggested that mother-infant relationships are often complex and fathers may offer a more forthright or dispassionate perspective on problematic interactions (Minde, Faucon, & Falkner, 1994; Sadeh et al., 2007).

Moreover, the child’s primary sleep location has rarely been considered within the paediatric sleep literature to date. Further investigation is required to determine whether sleeping location has a unique impact on infant sleep patterns or whether poorly sleeping babies are more likely to be kept in close proximity to their caregivers. Parents choosing to locate their child separately from birth had more maladaptive sleep-related cognitions and were less likely to assist their child to sleep at bedtime and following night-wakings, particularly at 12 months. This implies a fundamental difference in the thought processes, attitude, and approach of these parents. In all likelihood, the decision of where the baby should sleep at night and other sleep-related discernments and inclinations involved personality and adult attachment factors which were not measured by this project. It is presumed that these constructs would have absorbed some of the unexplained variance in the prediction of infant sleep outcomes throughout the research. Future studies should also consider the parental mindset and thought processes underlying the choice of sleep setting from birth, what factors prompt movement to an independent location, and the degree to which these issues are associated with infant sleep outcomes. To take this a step further, the registration process is an excellent opportunity to ask parents about their reasonable expectations for their child’s sleep over the first 12 months (Jimmerson, 1991). Forthcoming investigations might consider contrasting early parent forecasts with the clinical reality over time and also explore whether parents are able to readjust their goals if necessary.

A practical starting point for future research may be to examine the categories highlighted in the introduction to Chapter 8—the predisposing conditions, precipitating circumstances, perpetuating factors (Spielman, 1986), and protecting processes associated with infant sleep disturbance. It would be interesting to categorise what is known about these areas and investigate how they interact to influence infant sleep patterns. This, in turn, might be used to inform the timing of preventive intervention strategies and programs (H. Hiscock, personal communication, February, 2016). To develop this idea further, there is the need to learn more about proximal risk and protective factors beyond the scope of this research.

Areas of interest include personality traits, family attachment relationships, history of psychopathology, and parent cognitions other than those captured by the MCISQ. For example, studies have found childhood sleep problems to be related to maternal traits such as introversion and neuroticism (Gelman et al., 1998) and openness to experience (Benoit et al.,
However, the role of parental personality factors in paediatric sleep disturbance remains poorly understood. The report of a relationship between maternal preconceptual psychological distress and night-waking in the first 12 months is worthy of further study and might also be relevant to this discussion (Baird et al., 2009). A comprehensive exploration of 24-hour feeding practices, including parental thinking and/or motivations regarding the initial introduction of solid foods may also yield interesting results.

Several authors have additionally speculated about insecure adult attachment styles (Anders, 1994; Benoit et al., 1992; Morrell, 1999b) and maternal separation anxiety (Paret, 1983; A. Scher, 2008; Sadeh et al., 2010) as risk factors for the development of infant sleep disturbance. The degree to which the mother experiences anxiety about separation has potentially enormous implications for her night-time caregiving behaviour (A. Scher, 2008). Gaylor et al.’s (2005) findings of a relationship between infant crib location within the parental bedroom at 12 months (suggesting that independent sleeping is valued) and co-sleeping at 2, 3, and 4 years of age are also relevant here. Conversely, there have been findings linking infants who are more distressed by separation from their parents to increased signalling behaviour upon awakening (DeLeon & Karraker, 2007; McNamara, Belsky, & Fearon, 2003; Morrell & Steele, 2003; Paret, 1983; Scher & Asher, 2004). For example, Morrell and Steele (2003) found insecure ambivalent attachment to be a small but significant independent contributor to persistent infant sleeping problems. A more thorough understanding of parent-infant attachment issues as they relate to night-waking behaviours is imperative if a more complete picture of problematic childhood sleep is to emerge. A separate but related issue is the use of pacifiers and transitional objects which appear to exert unique influences on infant sleep behaviours. Only carefully designed research will uncover the exact nature of these relationships. In particular, it would be interesting to identify the potential adaptive impact of pacifiers when they are used by parents as an alternative to active physical comforting.

These additional areas of future study are inter-related with the questions posed earlier about what leads some parents to trust and engage with written preventive advice and others

188 In fact, A. Scher (2008) has demonstrated that the caregiving needs of the parents may play a greater role in the maintenance of fragmented infant sleep than does than the perceived psychological distress of the infant itself. This is consistent with the success of graduated extinction programs which, in theory, ought to lead to the entrainment of longer periods of infant crying but may be more about the management of parent anxiety and the extinction of parent response behaviours.

189 Uncertainty about maternal responses resulting from low or inconsistent maternal availability leads to an overexpression of attachment behaviours. The ambivalently attached infant shows extreme distress on separation, with marked clinging behaviour and anger upon the mother’s return (Ainsworth et al., 1978; Cassidy, 1994).
to dismiss it, or fail to implement it consistently. A greater knowledge of these underlying mechanisms is essential for prevention theory and more pragmatically, to assist primary care practitioners to identify which parents may need more intensive levels of guidance and support about infant sleep. Once further light is shed in these important areas, it will be possible to develop more comprehensive theories, supported by statistical techniques such as structural equation modelling, to investigate causal relationships.

A final key area for future study involves the maintenance of treatment effects. In this research, the early provision of written anticipatory guidance was associated with superior sleep at 6 and 12 months. However, it is unknown whether children who developed healthy sleep patterns during the first 12 months will continue to sleep well through early and middle childhood. The SNSP was founded on the principle that the promotion of healthy sleep habits and routines from birth would assist in the child’s early development and prepare the child favourably for the years ahead. It is commonly believed, for example, that children with problematic sleep early in life often have ongoing sleep disturbance (Morrell, 1999a; Priddis, 2009; Sadeh, 2008c), with associated risk to the individual’s physical, behavioural, and emotional health and well-being (Alfano & Gamble, 2009). An assumption of this project is that the reverse is true for those who sleep well from an early age.

For instance, Jenkins et al. (1984) demonstrated that children who did not have a night-waking problem at 12 months had a 95% chance of remaining a non-waker at 2 years. At present though, too little is known about the stability childhood sleep patterns to make definitive statements about the long-term adaptive advantages of healthy sleep during the first 12 months. Well-designed longitudinal investigations are required to determine whether there are meaningful connections between early sleeping patterns, and child sleep, health, and development over the longer term. Any such research should additionally aim to identify a meaningful range of optimal childhood sleep requirements by suitably accounting for poor sleepers.

**FINAL CONCLUDING COMMENTS**

The research program reported in this dissertation has successfully demonstrated that the provision of written anticipatory guidance early in the postnatal period can be successful in reducing problematic sleep patterns during the first 12 months of life. The Baby Sleep parent tip sheet was effective in adaptively influencing parenting cognitions and behaviours, the key proximal factors associated with infant sleep disturbance. There were consequential
benefits in the sleep patterns of intervention infants at both 6 and 12 months according to both prospective and retrospective indices of infant sleep. Considering the minimalist nature of the intervention, this is an excellent outcome. There is little or no previous empirical evidence supporting the efficacy of information-only preventive approaches to problematic paediatric sleep.

In addition, this program of research has investigated the relationship between infant sleep and a comprehensive range of associated concepts and constructs. A number of interesting findings were revealed in terms of infant sleep disturbance and its connection with obstetrics variables, infant temperament, children’s primary sleep location, infantile colic, child illness, pacifier use, feeding practices, postnatal depression, parenting stress, and the co-parenting alliance. This project is also among the first to comprehensively examine the factors linked to persistent sleep problems during the first year of life. Investigating the risk and protective factors associated with childhood sleep problems is important, not only for providing insight into the developmental pathways associated with disturbed infant sleep, but as a means of identifying the specific areas in which the written advice used in this program may be further improved. This should also be of benefit to the work of other preventionists. It is hoped that the wide-ranging nature of the Silent Night Sleep Project will provide valuable information to inform future theory, research, and practice in the prevention of paediatric sleep disturbance.

The End


Albee, G. W. (1999). Prevention, not treatment, is the only hope. *Counselling Psychology Quarterly, 12,* 133–146. doi: 10.1080/09515079908254084


Nikolopoulou, M., & St James-Roberts, I. (2003). Preventing sleep problems in infants who are at risk of developing them. *Archives of Disease in Childhood, 88*, 108–111. doi: 10.1136/adc.88.2.108


Scher, M. S. (2008). Ontogeny of EEG-sleep from neonatal through infancy periods. *Sleep Medicine, 9*, 615–636. doi: 10.1016/j.sleep.2007.08.014


Please note that many of the documents presented in this section have been reformatted to suit the reduced page area available in a dissertation layout. Some original documents, and particularly the parent tip sheet which is borderless, were much larger.
APPENDIX A

THE TRIPLE P–POSITIVE PARENTING PROGRAM
The Triple P–Positive Parenting Program

Triple P is a contemporary form of behavioural family intervention which draws on social learning, functional analysis, and cognitive-behavioural principles. The aim is to prevent serious behavioural, emotional, and developmental problems in children and adolescents by augmenting the knowledge, skills, and confidence of parents (Sanders, 2008b; Sanders & Murphy-Brennan, 2010). It functions as a multilevel system of parenting and family support consisting of a tiered continuum of increasing strength and narrowing reach. The developers have acknowledged that the pathways to dysfunction are complex and that no single program can efficiently address the differing needs and preferences of families and individuals. Families present with varying degrees of parenting knowledge, problem severity (mild to severe), access to support, preference for intervention modality, motivation, and often with the presence of additional risk factors such as marital conflict, parental mood disturbance, and low socioeconomic status (Sanders et al, 2003).

The multi-tiered approach of the Triple P model uses the principle of program sufficiency (Sanders, 1999) tailoring the strength of the intervention to the assessed needs and preferences of individual families. It aims to provide the minimally sufficient level of support parents that require to solve the problem, and no more (Prinz & Sanders, 2007; Sanders, 2010). The Triple P model is not intended to involve a sequential progression through the various levels of intensity. Parents may enter the system at whichever level is most appropriate for their circumstances and move up or down if required. For example, parents may initially receive a high-level of intervention and move to universal level support for maintenance or further inspiration.

The Triple P levels of intervention are designed to integrate seamlessly across the mental health spectrum (see Figure 8) from universal prevention through to treatment, as advocated by Weisz, Sandler, Durlak, and Anton (2005). Application of the sufficiency principle is important in terms of optimising the use of program resources, limiting overservicing, and encouraging sustainability. In encompassing a population-based prevention strategy, the systematic approach of Triple P differs from other parenting programs, making it the most elaborate and structured parenting support system available (Nowak & Heinrichs, 2008). The Triple P model contains five levels of parenting and family support as shown in Table 41.
### Table 41

**The Triple P–Positive Parenting Program Model of Parenting and Family Support**

<table>
<thead>
<tr>
<th>Level of Intervention</th>
<th>Target Population</th>
<th>Intervention Methods</th>
<th>Practitioners</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LEVEL 1</strong></td>
<td><strong>Media-based parent information campaign</strong></td>
<td>Coordinated media and health promotion campaign raising awareness of parent issues and encouraging participation in parenting programs. May involve electronic and print media (e.g., community service announcements, talk-back radio, newspaper and magazine editorials).</td>
<td>Typically coordinated by area media liaison officers or mental health or welfare staff.</td>
</tr>
<tr>
<td></td>
<td><strong>Universal Triple P</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>All parents interested in information about parenting and promoting their child’s development.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>LEVEL 2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Health promotion strategy/brief selective intervention</strong></td>
<td>Health promotion information or specific advice for a discrete developmental issue or minor child behaviour problem. May involve a group seminar process or brief (up to 20 min) telephone or face-to-face clinician contact.</td>
<td>Parent support during routine well-child health care (e.g., child and community health, education, allied health, and child care staff).</td>
</tr>
<tr>
<td></td>
<td><strong>Selected Triple P</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Parents interested in parenting education or with specific concerns about their child’s development or behaviour.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Selected Teen Triple P</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>LEVEL 3</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Narrow-focus parent training</strong></td>
<td>Brief program (about 80 min over 4 sessions) combining advice, rehearsal, and self-evaluation to teach parents to manage a discrete child problem behaviour. May involve telephone or face-to-face clinician contact or group sessions.</td>
<td>Same as for Level 2.</td>
</tr>
<tr>
<td></td>
<td><strong>Primary Care Triple P</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Parents with specific concerns (as above) who require consultations or active skills training.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>LEVEL 4</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Broad-focus parent training</strong></td>
<td>Broad-focus program (about 10 hr over 8–10 sessions) focusing on parent-child interaction and the application of parenting skills to a broad range of target behaviours. Includes generalization enhancement strategies. May be self-directed or involve telephone or face-to-face clinician contact or group sessions.</td>
<td>Intensive parenting interventions (e.g., mental health and welfare staff, and other allied health and education professionals who regularly consult with parents about child behaviour).</td>
</tr>
<tr>
<td></td>
<td><strong>Standard Triple P</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Parents who want intensive training in positive parenting skills.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Group Triple P</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Typically, parents of children with behaviour problems, such as aggressive or oppositional behaviour.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Group Teen Triple P</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Self-Directed Triple P</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Self-Directed Teen Triple P</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Stepping Stones Triple P</strong></td>
<td>A parallel 10-session, individually tailored program with a focus on disabilities. Sessions typically last 60–90 min (except 3 practice sessions, of 40 min).</td>
<td>Same as above.</td>
</tr>
<tr>
<td></td>
<td>Families of preschool children with disabilities at risk of behavioural or emotional disorders.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>LEVEL 5</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Intensive family intervention modules</strong></td>
<td>Intensive individually tailored program with modules (sessions last 60–90 min) including practice sessions to enhance parenting skills, mood management and stress coping skills, and partner support skills.</td>
<td>Intensive family intervention work (e.g., mental health and welfare staff).</td>
</tr>
<tr>
<td></td>
<td><strong>Enhanced Triple P</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Parents of children with behaviour problems and concurrent family dysfunction (e.g., parental depression or stress) or conflict between partners.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Pathways Triple P</strong></td>
<td>Modules include attribution retraining and anger management.</td>
<td>Same as above.</td>
</tr>
<tr>
<td></td>
<td>Parents at risk of maltreating their children. Program targets anger management problems and other factors associated with abuse.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

APPENDIX B

THE BABY SLEEP PARENT TIP SHEET

191 Note additionally that all Victorian parent tip sheets included a statement indicating that they were written by the Parenting and Family Support Centre (Triple P), the University of Queensland, Brisbane, Australia. With respect to the Baby Sleep parent tip sheet at least, this statement is incorrect. As explained previously, Triple P developed the original concept, not the final published resource.
Positive Parenting of Infants

Baby Sleep

Caring for a newborn baby is rewarding and exciting, but it can also be tiring and challenging. Most parents look forward to their baby sleeping through the night. For most babies this occurs between three and six months of age. When this does not happen as expected, parents are vulnerable to increasing stress and exhaustion. From early in infancy, however, there is much that parents can do to ensure that their children develop healthy, independent sleep patterns. This tip sheet also provides some suggestions on how you can cope with lack of sleep while you care for your baby.

About Baby Sleep

In the first month of life babies spend much of their time asleep. It is not uncommon for newborn babies to spend a total of 15–17 hours or more asleep in each 24 hour period. Newborn babies sleep in blocks of up to four hours at a time. Much of their awake time will be taken up with feeding. Play time is very short and young babies are soon ready to return to sleep after feeding.

Young babies also spend a lot of their awake time crying—as much as two hours or more each day. Crying is often worse in the late afternoon or early evening when long periods of crying may occur. After three months of age, there is a decrease in the evening peak and the overall amount of crying.

By around three months, babies are beginning to sleep for longer periods at night, and are staying awake longer between daytime sleeps. By five or six months, babies are likely to stay awake for three to four hours at a time with two to three sleeps during the day. They will now have most of their sleep during the night.

By six months of age, most babies are sleeping through the night. Let’s look at what happens when a baby who has learned to sleep through the night goes to sleep. You might have thought that the baby goes to sleep and stays in a deep sleep all night until you wake them in the morning. In fact a normal sleep pattern involves frequent brief awakenings that occur throughout the night. The independent sleeper has learnt to put themselves back to sleep following these brief awakenings.

Is Your Baby Getting Enough Sleep?

It is a myth that babies sleep when they need to. Babies can get overtired and this can lead to more crying and more difficulties getting them to settle. It is up to parents to make sure that babies are getting the sleep they need. It may sound contradictory, but the more sleep your baby gets, the better they will sleep.

In his book, Solve Your Child’s Sleep Problems, Dr Richard Ferber, an American paediatrician and sleep specialist, has noted the total number of hours babies generally sleep each day (see over). These are general guidelines and some babies will sleep more while others will sleep less than expected. Some babies will sleep more because they are easier to settle, fit more quickly into a daily routine and sleep for longer periods. Others sleep less because they are more difficult to settle and more irregular in their sleeping pattern. However, if your baby’s sleep differs by more than one or two hours from these guidelines, they may not be getting the sleep they need and you may need to consider making changes to your baby’s sleep pattern.
<table>
<thead>
<tr>
<th>Age</th>
<th>Total Number of Hours</th>
<th>Number of Hours at Night</th>
<th>Number of Hours in the Day</th>
<th>Number of Daytime Naps</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 week</td>
<td>16</td>
<td>8</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>1 month</td>
<td>15</td>
<td>9</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>3 months</td>
<td>15</td>
<td>10</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>6 months</td>
<td>14</td>
<td>11</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>9 months</td>
<td>14</td>
<td>11</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>12 months</td>
<td>13</td>
<td>11</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>18 months</td>
<td>13</td>
<td>11</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>2 years</td>
<td>13</td>
<td>11</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3 years</td>
<td>12</td>
<td>11</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>4 years</td>
<td>11</td>
<td>11</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>


**Helpful Hints From the Start**

**Choose a Place for Your Baby to Sleep**

Where your baby sleeps is a decision that you have to make depending on what you are most comfortable with and what best suits your family. Some parents have their baby in a bassinet or cot near their bed for the first three months or so. This means they can hear their baby waking and get to them quickly to feed. Some parents prefer not to have their baby in their room because they find their own sleep is disturbed by the sounds of their sleeping baby.

Studies show that both parents and infants tend to sleep better when they sleep in separate beds. Co-sleeping, however, is a choice made by some families. If you choose to bring your baby into your own bed, there are safeguards to consider. Make sure your mattress is firm and your baby will not get too hot. It is also important to be aware of the risks of rolling onto a baby or trapping a baby under pillows or near a wall. The danger of accidental suffocation is increased on water beds and if parents use drugs or alcohol. Bed sharing is not advised for parents who smoke as the risk of Sudden Infant Death Syndrome (SIDS) is increased.

Finally, be aware that when you are ready to move your child into their own bed, they may not be ready to leave. A child who has shared their parent’s bed may strongly resist your attempts to move them to their own bed, and it can be difficult to help them learn to sleep independently. See the Parent Tip Sheet *Bedtime* in this series for information on managing sleep problems such as this.

**Make Your Baby Safe and Comfortable**

Make sure your baby’s mattress is firm, clean and fits tightly into the bottom of the cot. Never use electric blankets, quilts, doonas, pillows, cot bumpers or have lots of soft toys in your baby’s cot—these practices are not safe and increase the risk of SIDS. Place your baby on their back to sleep, with their feet near the bottom of the cot, so that they cannot wriggle down under the covers. Tuck your baby’s bedclothes in securely as this also helps to ensure that your baby’s head remains uncovered during sleep. Your baby’s room should be well ventilated and smoke-free. Dress your baby so they will not be too hot or too cold—a good idea is to use what you are wearing and what you have on your bed as a guide to the clothing and number of blankets to put on your baby.

**Make Sure Your Baby is Not Hungry**

Babies who feed well tend to sleep better. A trap to be avoided is snacking through the day and night. Babies who snack tend to sleep for shorter periods because they soon get hungry again and wake up to be fed. You will be advised by your Maternal & Child Health Nurse to feed your baby when your baby seems hungry. In practical terms the newborn needs to be fed every two to four hours. Your baby may be snacking if they are feeding more frequently than every two hours. Sometimes babies who have fed well and are not hungry will accept the breast or bottle if offered simply because it is soothing. This can lead to a baby becoming dependent on feeding in order to settle into sleep. If your baby has been fed in the last two hours and seems unsettled, allow them a little time to go off to sleep by themselves or offer other forms of comfort or attention. If you are unsure whether your baby is feeding well discuss this with your nurse.
Use Comforters, Avoid Dummies

Babies who learn to settle themselves with their thumb, a favourite object or toy sleep better than babies who become dependent on their parents to settle them. The presence of a favourite toy or object may become a signal that it is time for sleep at bedtime and during the night. Babies also learn to use these objects to soothe themselves. Dummies do not work like these other comforters. Although dummies can help soothe a crying baby, they have some disadvantages. When they are used every night the baby can become dependent on the dummy to get to sleep. When the dummy becomes dislodged during the night the young baby often needs the parent to replace it before they can return to sleep. This can happen many times during the course of a night. Aim to settle the baby at night without a dummy if you can.

How To Help Your Baby Develop a Healthy Sleep Pattern

Over the first three months, the aim is to develop a regular sleeping routine. All babies benefit from a predictable routine. A routine ensures babies get the sleep they need and helps them to feel secure.

Work Towards a Regular Pattern

Babies are not born with a ready made day and night schedule. In the first six weeks your aim is to set up a pattern. While your newborn baby's sleep and feed times may vary from day to day, it is helpful to do things in about the same order. For example, when your baby wakes during the day, offer a feed, change their nappy, have a short play time and then your baby will be ready to sleep again. During play time follow your baby's signals. Glenching fists, yawning, frowning, jerky movements and grizzling can all be signs that your baby is ready for another sleep.

When you put your baby into their bed, do not be concerned if they cry or grizzle. This does not mean that the baby does not want or need sleep. Babies need time to fall asleep. Attend to your baby only if they really start complaining and it is clear that they are not going to settle.

Emphasise the Difference Between Night and Day

Unlike adults who have one longer period of sleep at night, newborn babies' sleep is roughly evenly distributed over 24 hours. In fact, it is not uncommon for very little babies to be wakeful during the night and sleepy during the day.

From the first week, you can help your baby learn to distinguish night from day. During the night, keep your baby's room dark and quiet. When you attend to your baby, use a dim light, speak quietly and avoid playing—your goal is to feed or settle your baby, and then allow them to go back to sleep as quickly as possible. During the day, talk to and play with your baby when they wake.

Keeping your baby awake all day will not help them sleep better at night. Daytime sleep is important too. See the table (opposite) for a general guideline on number of sleeps and amount of sleep during the day. Allow uninterrupted daytime sleep, however, it is not a good idea to let a baby sleep for more than four hours at a time during the day because they will need to be fed.

Put Your Baby to Bed Awake

If you routinely hold, rock, or feed your baby to sleep, they will learn to associate sleep with your presence. This means that when they wake during the night, your baby will depend on you to perform the same routine to help them get back to sleep. This is a trap for parents. It means that you will have to be up to your baby each time they wake to help them get back to sleep. To be an independent sleeper, your baby needs to learn to settle into sleep without your help.

Whenever possible, put your baby to bed while they are still awake and allow them to fall asleep on their own. Try to avoid holding, rocking or feeding your baby to sleep. Put your baby in their cot, tuck them in, say goodnight and leave the room before your baby falls asleep.

Remember, the goal is for your infant to learn to go to sleep in their cot without your help. If you need to check, look at your baby from the doorway, but try not to pick them up. It's okay to try to keep your baby awake if they are dropping off to sleep during their last feed. If this proves to be difficult, try to put them down earlier next time, before they fall asleep. If you are concerned that your baby is starting to rely on feeding to fall asleep, try to separate the two. You can feed your baby a little earlier so feeds are not just before day or night sleeps.

Wait and Listen When Your Baby Wakes

A newborn baby's sleep can be noisy and restless. To understand the reason for this, you need to know that there are two different types of sleep—active sleep and quiet sleep. In the active sleep state a baby's breathing is irregular, they may twitch, make sounds, grizzle, change facial expressions, open their eyes and move their eyes
under their eyelids and wake temporarily. Because the baby moves and cries, it is easy to mistakenly think that they are awake when they are still asleep. During quiet sleep a baby breathes regularly, lays still and is harder to wake.

Very young babies spend about half the time in active sleep, typically alternating between quiet and active sleep every 40 or 50 minutes. As babies get older they spend more and more time in quiet sleep. By adulthood, we spend only a quarter of our sleep time in active sleep.

Typically, a baby wakes briefly after a period of active sleep. They may lift their heads, cry out, grizzle or look around, then they put themselves back to sleep and start the cycle all over again. Once babies are independent sleepers, this cycle of quiet sleep, active sleep and brief awakenings is repeated many times each night without any help from parents.

Rushing to comfort babies who are in active sleep or briefly awake may reassure them further rather than settle them, and may prolong night waking. If you hear your baby stirring or grizzling, listen and wait for a short time to see if they will settle themselves. Wait until they are really complaining before going into them, because going to your baby too quickly may disturb them unnecessarily and prevent them from going back to sleep.

**Helping Your Baby Resettle When They Wake**

In the first few months your baby may need help to resettle when they wake during the night. Remember that the goal is for babies to learn to resettle themselves. Do the least necessary to help them resettle. You could start with gentle back rubs or quiet talking. Try not to pick them up. This may actually stop your baby from going back to sleep. If your baby does not respond and you need to pick them up, aim whenever you can to put them back into their cot settled but awake. The Parent Tip Sheet Crying has some suggestions for soothing unsettled babies if you are looking for more ideas.

**Things You Can Do From Three Months**

**Develop a Bedtime Routine**

By three months babies who sleep well have a predictable bedtime routine. Routines help children settle for bed and prepare a child for sleep. A routine involves having a number of simple activities that are completed in the same way and at the same time each night or before each daytime sleep.

A night time routine might involve quiet play, a bath, a new baby, changing into night clothes, a story or songs, providing a favourite mug or teddy, kisses and saying good night. Loud or active play activities that excite your baby should be avoided just prior to bedtime as this will make it more difficult for your baby to settle.

Use simple routines before each daytime sleep as well (e.g., a clean baby, cuddle, putting the baby in their cot, pulling down the blind and leaving the room). Remember, you can use a similar routine when you go out with your baby, even though you may be putting them down in a pram or portable cot.

Once a daily routine has been developed, try to keep to it as much as possible and avoid disrupting your baby's usual sleep times unnecessarily.

**Phasing Out Night Feeding**

Your baby is ready to sleep through the night when they no longer need night feeds. By three to four months of age healthy babies that are gaining weight and growing normally, are eating enough during the day to satisfy their needs. Around this time many babies begin to sleep through the night without waking for a feed. Some babies may continue to accept night feeds, but do so out of habit rather than hunger.

There are two ways that you can stop night feeds. One option is to drop the night feed completely. You may encounter some protesting. Simply offer comfort but do not return to feeding. Another option is to phase out the night feed gradually. Continue to give the last feed before bedtime as normal. When your baby wakes during the night, offer a shorter feed than usual if you are breast feeding. Offer slightly less milk if bottle feeding, or try diluting the milk with cooled boiled water. Each night, make the feeds slightly shorter and stretch out the time between feeds by about half an hour (e.g., four to four and a half hours; four and a half to five hours and so on) until your child is sleeping through until morning. If your baby wakes outside of this new schedule offer attention and comfort, but avoid feeding. Where it is possible, a baby may settle more rapidly by being comforted by a caregiver who does not normally feed them.


**Early Mornings**

Because they tend to go to bed early, babies who are sleeping through the night commonly wake to start their day as early as 5:30 am. Treat waking earlier than this as described above. If you wish, after 5:30 am allow a short time for your baby to settle back to sleep or to play quietly by themselves before getting up. When you do go to your baby in the morning, signal the new day and wake up time with a happy, enthusiastic greeting, opening the curtains and lots of talk. Trying to keep a baby awake later at night so they wake later in the morning is not helpful. This tends to make the baby more tired and more difficult to settle at night time.

**How to Look After Yourself**

Lack of sleep can make for tired, irritable parents who are less patient with their children during the day. It is important to care for yourself as much as possible during this demanding time. Try the following suggestions.

**Rest When You Can**

Take opportunities throughout the day to rest. Even short naps can make a difference to the way you feel. Have a nap while your baby sleeps. If you have older children, put them down for naps as well.

If you cannot sleep during the day, at least try to spend some time sitting with your feet up. Make the most of these breaks by relaxing yourself. Take some deep, slow breaths. Concentrate on how your body feels—identify muscles that are tense and tight and relax them one by one (for more information on relaxation see the Parent Tip Sheet Coping with Stress).

**Meet Your Own Needs Too**

It is much easier to look after your baby if your own needs are being met. Each day, try to make time to do at least one thing you enjoy doing by yourself, like going for a walk, having a relaxing bath or reading a magazine—half an hour can make a big difference. Ask your partner, a relative or a friend to look after your baby so you can have some time to yourself. Remember your partner may also need a break, so try to do the same for them. If you can’t arrange a sitter for the baby, make the most of opportunities when the baby is asleep, or find things that you enjoy doing that you can do with the baby, like putting your baby in a pram and walking or visiting.

**Be Realistic About What You Can Get Done**

Meeting your baby’s needs will take a great deal of time, and you will need to take time to rest and regain your energy. So be realistic about what you can achieve in a day. You may need to ask for help when you need it or lower your expectations in relation to work, housework, community activities and cooking. Take the phone off the hook and put Do not disturb signs on the door when you need time alone with your baby. Discourage visitors who expect to be entertained and encourage helpers who provide practical assistance and do not outstay their welcome. Do not hesitate to turn down invitations or to say no to requests from others that place you under unnecessary pressure.

**When To Seek Help**

Consider getting some advice at any time that your baby’s sleeping patterns cause concern for you or your family. See the Parent Tip Sheet Bedtime in this series for more information on suggested programs for managing sleep problems in children older than 6 months.

Illness may occasionally be a cause of sleep problems. If your baby is not feeding, has a temperature or has been unwell, you may be up during the night until the illness passes. If you are concerned about your baby’s health, see your family doctor. If your child has been ill, you may face some sleep problems when your baby gets better, as they may want the same attention they had when they were ill.

Being a parent can involve a range of feelings from joy to sadness. Seek help if you find yourself struggling with persistent feelings of sadness, helplessness or loss of interest as you may be experiencing postnatal depression.

Help is available from your local Maternal and Child Health Nurse or family doctor. Ask about day stay and residential programs offered by early parenting centres.

If you are having problems or feel unable to handle things, contact the centre where you received this tip sheet. Outside of business hours, call the Maternal and Child Health After Hours Service on 132 220 (for city callers) and FREECALL 1800 134 883 (for country callers). You can also contact PARENTLINE, a parenting information and advice service on FREECALL 132 289.
Key Steps

- Make your baby safe and comfortable.
- Place your baby on their back to sleep.
- Make sure there is a clear difference between night and day.
- Work on a regular pattern for sleeping and feeding, even if the times vary a little each day.
- At each opportunity, put your baby to bed while they are still awake.
- Avoid being present when your baby falls asleep.
- When your baby stirs or cries out in the night, wait and listen before tending to them, so they can learn to settle themselves.
- In the first few months, you may need to comfort your baby if they wake during the night—attend to them with little fuss and keep the light low.
- Develop a bedtime routine.
- From three months you can begin to phase out night feeding.
- Encourage your baby to rest or play quietly if they wake too early in the morning.
- Rest when you can and look after your own needs.

See the booklet 'Positive Parenting' for more information. If you have any questions or have tried these strategies and are concerned about your baby, contact the centre where you were given this tip sheet.

Acknowledgments

Some of the information used for this tip sheet was adapted from Dr Richard Ferber, Solve Your Child's Sleep Problems: The Complete Practical Guide for Parents, Penguin Books, 1985. This is recommended reading for parents. Thank you to Dr Karyn France and Miss Jacki Henderson from the Canterbury Sleep Program (New Zealand); Prof Alan Hudson and Mr Steven Watts, Department of Psychology and Intellectual Disability Studies; and Karen Houghton, Director of Nursing, Tweedale Child and Family Health Service for their significant contributions to this tip sheet.

Written by the Parenting and Family Support Centre (Triple P), The University of Queensland, Brisbane.

Published by the Victorian Parenting Centre 2005.


Permission is granted for this material to be printed, copied and distributed for non-commercial purposes within the State of Victoria.

Code: PPT1004
APPENDIX C

M&CH NURSE INFORMATION
Information for
Maternal & Child Health Nurses

Background

The Silent Night Sleep Project is aimed at finding the best ways of helping infants to develop healthy sleep patterns from a very early age. We are seeking the involvement of approximately 600 first-time parents from throughout Victoria. The project team believes that this is a significant piece of research, particularly since about one third of children experience serious sleeping problems within the first three years of life.

The Silent Night Sleep Project team consists of Steven Watts, doctoral student, RMIT University; Professor Alan Hudson, Head, Department of Psychology and Disability Studies, RMIT University; and Warren Cann, State Coordinator, Positive Parenting Program, Victorian Parenting Centre.

Your Role

We are interested in recruiting first-time mothers of healthy, normally developing newborn babies at one of their early visits to your health centre. You are asked to find out whether members of this target group are interested in participating in a research project about infant sleep. Parents showing an interest would then be handed an information package. No further involvement from you is required since all future correspondence will be directly with the researchers.
What are Mothers Asked to do?

Participation in the Silent Night Sleep Project will firstly involve completion of a Registration form. When the baby reaches six months of age, and once more at twelve months, participants will be asked to complete a five-day infant sleep diary and a short parenting questionnaire. On both occasions, a postage-paid envelope will be provided for the return of documents.

What will Happen to the Information Collected?

The results of the study may eventually be published in pamphlets, books, and/or professional journals. A new Parent Tip Sheet (Positive Parenting Program) about infant sleep will be available for distribution immediately after the study.

Finally, we would like to express our thanks for your assistance in distributing information for our project. We understand how busy you are and really appreciate your involvement. A regular newsletter will provide you with feedback on the progress of the study and the numbers of subjects registering from your particular area. If you require further information about this project or additional information packages, please do not hesitate to call Steven Watts during office hours on (03) 9925 7376 or email s9800380@student.rmit.edu.au

Steven Watts 
RMIT University

Professor Alan Hudson 
RMIT University

Warren Cann 
Victorian Parenting Centre
APPENDIX D

INFORMATION KIT/REGISTRATION CORRESPONDENCE
Participant Information Sheet

Background

Hi! My name is Steven Watts and I am a postgraduate student working at the Department of Psychology and Disability Studies, RMIT University. I am conducting some research as part of my Doctoral studies under the supervision of Professor Alan Hudson. The project team also includes Warren Cann, State Coordinator, Positive Parenting Program, Victorian Parenting Centre.

The Silent Night Sleep Project is aimed at finding the best ways of helping newborn babies to develop healthy sleeping routines. To achieve this goal, we are seeking the involvement of a large number of first-time parents from throughout Victoria. As a first-time parent, you are invited to participate. This sheet provides you with information to help you decide whether you wish to be involved.

Sleep Problems in Infants and Children

As a new parent, your friends and family will often ask you about whether your child is sleeping through the night. In fact, surveys show that one of the most common difficulties faced by parents involves children's sleeping problems, especially in the first few years of life. The Silent Night Sleep Project aims to learn more about infant sleeping habits and then to use this knowledge to
investigate the best methods of helping children to sleep through the night from a very young age.

We believe that if parents can be taught how to promote healthy sleeping patterns in their children from soon after birth, many later family problems may be avoided. The emphasis here is on prevention, and therefore on ending much of the disruption, conflict, and stress faced by Australian families when a child has difficulty sleeping.

What will I be Asked to do?

Participation will involve the completion of a short parenting questionnaire and an infant sleep diary on two separate occasions: once when your baby is six months old and again at twelve months. We appreciate that raising a new baby is not an easy task and so we have tried to make both items as easy as possible to complete.

The infant sleep diary consists of a 24-hour daily chart on which you are asked to shade in the times when your baby is sleeping, leave blank the times when your baby is awake, and use some other symbols to record special activities, such as feeding. You would need to fill in the diary for five days, beginning on a day which suits you. Easy to follow instructions will be supplied with each diary.

The parenting questionnaire will take only about 15-20 minutes to complete. It will ask you about your baby's feeding and sleeping habits, your impressions of your infant's "personality", your opinions regarding some aspects of parenting, and generally about how you have been coping with, and are enjoying the parenting experience. Each question will require you to read a statement and either tick a box, or circle a number corresponding to your answer.
The sleep diary and parenting questionnaire will be mailed to your home just prior to the times they need to be completed. On both occasions, a postage paid envelope will be provided so that there will be no cost to you.

**What will Happen to the Information?**

Name and address details will be stored in a separate file and are only required for mailing purposes. Information supplied at six and twelve months will be matched by the researchers using a code numbering system, developed to ensure that all details remain anonymous. Your responses will then be combined with those of approximately 600 other participants on a computerised data file so as to provide collective information. No individual data will be provided to anyone.

The results of the study may eventually be published in pamphlets, books, or journals so that health professionals, other parents, and maybe even yourself in future years may learn more about the best ways of helping infants and children to develop healthy sleep patterns.

Participation in this project is entirely voluntary and you are under no obligation to be involved. If you are interested, it is important to note that you may withdraw your consent to participate and discontinue your involvement at any time. You may also withdraw any unprocessed data previously supplied.

**How do I Participate?**

If you would like to be involved, please complete all four pages of the green registration form and return it in the postage paid envelope supplied. You should retain this information sheet for your records.
After we have received your registration details, we will also send you a photocopy of the consent form (back page of the green form). Please note that the RMIT University Human Research Ethics Committee requires this form as standard practice and we are therefore unable to include you in the study unless it has been signed. You will receive the first sleep diary and questionnaire in the mail just prior to your infant turning six months old.

Finally, congratulations on the birth of your first child. I hope you find your new role as a parent to be an extremely rewarding and fulfilling experience.

If you require further information about the Silent Night Sleep Project, please call Steven Watts during office hours on (03) 9925 7376 or email at: s9800380@student.rmit.edu.au


Any queries or complaints about your participation in this project may be directed to the Secretary, RMIT Human Research Ethics Committee, University Secretariat, RMIT, GPO Box 2476V, Melbourne, 3001. The telephone number is (03) 9925 1745.
Yes I am/we are interested in participating in the research into children's sleeping problems being conducted by RMIT University and the Victorian Parenting Centre.

PARENT INFORMATION

Parent(s) Name(s): ___________________________ Age: _____

__________________________ Age: _____

Phone Number: ___________________________

Address for Correspondence: ____________________________ (street number and name or P.O. Box)

__________________________ (town/suburb) (post code)

Municipality or Shire: ___________________________

Maternal & Child Health Centre: ___________________________
ABOUT YOUR INFANT

Baby's Name(s): ________________________________

Baby's Sex (circle): Male/Female

Date of Birth: ______ / ______ / ______

Approximate Hours in Labour: _____

Please refer to page 15 of your Child Health Record (yellow book) for answers to the following questions:

Type of Delivery (circle one): Normal/Breach/Forceps/Caesarean/Vac./Ext.

Estimated Gestation: ______

Agpar: 1 min: ____ 5 min: ____

Admission to Intensive Care Nursery (circle one): Yes/No

Reason: __________________________________________

Baby's Birth Weight: _____ grams OR _____ lbs _____ oz
Please tick the box next to the answer which comes closest to how you have been feeling IN THE PAST 7 DAYS, not just how you feel today.

In the past 7 days:

1. I have been able to laugh and see the funny side of things:
   - [ ] As much as I always could
   - [ ] Not quite as much now
   - [ ] Definitely not so much now
   - [ ] Not at all

2. I have looked forward with enjoyment to things:
   - [ ] As much as I ever did
   - [ ] Rather less than I used to
   - [ ] Definitely less than I used to
   - [ ] Hardly at all

3. I have blamed myself unnecessarily when things went wrong:
   - [ ] Yes, most of the time
   - [ ] Some of the time
   - [ ] Not very often
   - [ ] No, never

4. I have been anxious or worried for no good reason:
   - [ ] Hardly ever
   - [ ] Yes, sometimes
   - [ ] Yes, very often
   - [ ] No, not at all

5. I have felt scared or panicky for no very good reason:
   - [ ] Yes, quite a lot
   - [ ] Yes, sometimes
   - [ ] Yes, very often
   - [ ] No, not at all

6. Things have been getting on top of me:
   - [ ] Yes, most of the time I haven’t been able to cope at all
   - [ ] No, most of the time I have been able to cope quite well
   - [ ] Yes, sometimes I haven’t been coping as well as usual
   - [ ] No, I have been coping as well as ever

7. I have been so unhappy that I have had difficulty sleeping:
   - [ ] Yes, most of the time
   - [ ] Some of the time
   - [ ] Not very often
   - [ ] No, not at all

8. I have felt sad or miserable:
   - [ ] Yes, most of the time
   - [ ] Yes, quite often
   - [ ] No, not at all

9. I have been so unhappy that I have been crying:
   - [ ] Yes, most of the time
   - [ ] Yes, quite often
   - [ ] Only occasionally
   - [ ] No, never

10. The thought of harming myself has occurred to me:
    - [ ] Yes, quite often
    - [ ] Sometimes
    - [ ] Hardly ever
    - [ ] Never
Prescribed Consent Form For Persons Participating In Research Projects Involving
Interviews, Questionnaires or Disclosure of Personal Information

DEPARTMENT OF PSYCHOLOGY AND INTELLECTUAL DISABILITY STUDIES
FACULTY OF APPLIED SCIENCE

Name of participant (parent): ________________________________________________

Project Title:  The Silent Night Sleep Project

Names of investigators: Steven Watts  Tel: (03) 9925 7376 (BH); Warren Cann  Tel: (03) 9639 4111 (BH)

1. I have received a statement explaining the interview/questionnaire involved in this project.

2. I consent to participate in the above project, the particulars of which - including details of the interviews or questionnaires - have been explained to me.

3. I authorise the investigator or his or her assistant to interview me or administer a questionnaire.

4. I acknowledge that:
   (a) Having read the Participant Information Sheet, I agree to the general purpose, methods and demands of the study.
   (b) I have been informed that I am free to withdraw from the project at any time and to withdraw any unprocessed data previously supplied.
   (c) The project is for the purposes of research and/or teaching. It may not be of direct benefit to me.
   (d) The confidentiality of the information I provide will be safeguarded. However should information of a confidential nature need to be disclosed for moral, clinical or legal reasons, I will be given an opportunity to negotiate the terms of this disclosure.
   (e) The security of the research data is assured during and after completion of the study. The data collected during the study may be published, and a report of the project outcomes will be provided to Maternal and Child Health Nurses. Any information which will identify me will not be used.

Participant’s Consent

Signature: __________________________ Date: __________________________

(Participant)

Participants will be sent a photocopy of this consent form after it has been signed and returned.

Any queries or complaints about your participation in this project may be directed to the Secretary, RMIT Human Research Ethics Committee, University Secretariat, RMIT, GPO Box 2476V, Melbourne, 3001. The telephone number is (03) 9925 1745.
APPENDIX E

6-MONTH PARENT CORRESPONDENCE
Dear «FirstName»,

Thank you for participating in the Silent Night Sleep Project. Enclosed is a booklet sent to all participants just before their child reaches six months of age. The booklet is divided into two main parts: an infant sleep diary and a questionnaire. While these tasks may seem a little daunting at first, you will be surprised by how easy it is to fill in the sleep diary and also by how quickly the questionnaire can be completed.

An instruction sheet for the sleep diary has been included on a separate single page in this package. The diary should ideally be completed over five consecutive days and begins at midnight on the first day and finishes at midnight at the end of the fifth day. Please aim for a time interval as close as possible to the date on which your infant turns six months old. However, you should also choose a time which is the most convenient for yourself and in which «BabyName»’s sleep is not likely to be affected by unusual circumstances (e.g. parties, holidays).

When filling in the questionnaire, please think about each question but don’t spend too long on any one item—initial reactions are probably the best. It is also important not to allow your answer to any one question influence your answer to any other questions. There are definitely no right, wrong or preferred answers; it is your reflective and honest responding which is most important to the researchers. Finally, do not be concerned if aspects of your completed sleep diary do not match some answers on the questionnaire. Experience shows that differences between diaries and questionnaires often occur and the project team is well aware of this fact.

Please do not write your name or any other identifying information on the answer booklet. Your details will be matched with those previously supplied using the code number written on the front page. This is to ensure a high level of privacy and confidentiality.
Once everything has been filled in, we would ask you to check that no pages or individual questions have been missed, and return the completed booklet in the envelope provided. No postage stamp is required.

The project team aims to gather valuable information about the sleeping patterns of infants during the first year of life, as well as insight into other important aspects of the overall parenting experience. Hopefully, findings will lead to an improved knowledge of infant sleep among health professionals with the ultimate aim of a reduction in childhood sleeping problems in the community.

If you have any further questions about the sleep diary, the questionnaire, or any part of this research, please do not hesitate to call me on 9925 7376. I can also be contacted via email at the following address: s9800380@student.rmit.edu.au

Thank you again for your assistance, we really do value your contribution and understand that the time of new parents can be extremely limited.

Kind regards,

Steven Watts
Principal Researcher
Infant Sleep Diary and Questionnaire
INFANT SLEEP DIARY INSTRUCTIONS

This is a five day diary, used to record your infant’s feeding and sleeping patterns over this time. A sample diary for one day with completion instructions is shown below. Please note that this example was put together for illustrative purposes only. Your own child’s typical daily routine may be very different from that shown.

Try to update the diary as often as you can, since it is usually difficult to remember details at a later time. Most parents prefer to use a grey lead pencil so that any mistakes can be easily erased. Boxes should be shaded to the nearest 15 minutes with other symbols (arrows & “F”s) drawn in the 15 minute block closest to when they occur. You may use any other symbols you feel are necessary to illustrate your child’s sleep patterns as long as you explain what they represent. Thank you.

Use a "down" arrow when you put your infant into the cot for a sleep
Shade in the times your infant is asleep
Use an "up" arrow when you take your infant out of the cot
Leave blank the times your infant is awake

Mark "F" at the start of each feed (milk or solid foods but ignore between-meal snacks)
If your infant sleeps outside the cot, write the location below the shaded area (don’t worry about down or up arrows, they are just for cot sleeps)
Erase or clearly cross out any mistakes
INFANT SLEEP DIARY

Day 1

Date:______________

Noon 1pm 2pm 3pm 4pm 5pm 6pm 7pm 8pm 9pm 10pm 11pm Midnight

[Graph showing sleep patterns for Day 1]

Day 2

Date:______________

Noon 1pm 2pm 3pm 4pm 5pm 6pm 7pm 8pm 9pm 10pm 11pm Midnight

[Graph showing sleep patterns for Day 2]

[Continues for 2 additional days]
Questions about Feeding and Infant Health over the First 6 Months

1. What type of milk are you giving your infant now?
   - Breast milk only
   - Breast milk and formula/cow’s milk
   - Formula/cow’s milk only, stopped breastfeeding at ____ months
   - Formula/cow’s milk only, never breastfed (go to question 3)

2. Have you experienced any problems/difficulties with breastfeeding (e.g., supply, mastitis)?
   - No
   - Yes (please describe) ___________________________________________

3. Do you usually feed your child during the night (i.e., between normal bedtime and rising time)?
   - No, my infant stopped night feeds at about ____ months
   - Yes, I usually feed him/her ____ time(s) during the night

4. Has your child suffered any major illnesses during the first six months?
   - No
   - Yes (please describe) ___________________________________________

5. Has your child been diagnosed with or suspected of having any developmental problems (e.g.,
   developmental delay, vision or hearing impairment, physical or intellectual disability)?
   - No
   - Yes (please describe) ___________________________________________

6. Did your infant have colic or colicky symptoms (unexplained crying or fussing for several hours,
   usually in the early evening, during which it is almost impossible to settle the child)?
   - No
   - Yes, the colic or colicky symptoms lasted for about ____ hours each night and continued
     over a _____ week period. The colic stopped at about _____ weeks of age.

7. Have there been any other problems/disruptions which may have affected your child’s sleeping
   patterns?
   - No
   - Yes (please describe) ___________________________________________
8. Over the first six months, where has your infant mainly slept? (choose one)
   □: Cot/bassinette in parents' room since birth
   □: Cot/bassinette in own room since birth
   □: Cot/bassinette in parents' room for ____ months, own room for ____ months
   □: Other (e.g., parents' bed since birth) _________________________________________

Questions about your Infant’s Sleep over the Past Month

Here are a number of questions about your infant’s sleeping patterns/behaviours. Please base your answers on what you have noticed over the last month.

9. My child usually sleeps a total of about _____ hours at night and _____ hours during the day in ______ (number of) nap(s).

Going to Bed/Sleep

10. When placing your child in the cot at bedtime is he/she usually:
    □: Awake  □: Asleep

11. How does your infant usually fall asleep each night?
    □: Alone (i.e., you put him/her to bed awake and leave the room)
    OR:
    With parental/caregiver assistance (choose one or more):
    □: In parent’s arms/gently rocked until asleep
    □: Fed (breast or bottle) until asleep
    □: Parent stays in room with child until asleep
    □: Music or musical toy used to soothe the child
    □: Other (please describe) ________________________________________________

12. Does your child normally fall asleep with a dummy in his/her mouth?
    □: No  □: Sometimes  □: Often

13. Does the child have a favourite toy/object (such as a teddy bear, doll, or special blanket) which he/she sleeps with each night?
    □: No  □: Yes
14. How long does it usually take to settle your infant off to sleep (at bedtime) on average?
- ☐ Less than 10 minutes
- ☐ 10 to 20 minutes
- ☐ 20 to 30 minutes
- ☐ 30 to 40 minutes
- ☐ 40 to 50 minutes
- ☐ 50 to 60 minutes
- ☐ 1 hour or longer

15. How many times per week do you have problems settling your infant (at bedtime) on average?
- ☐ Problems less than once a week
- ☐ Problems 1 night a week
- ☐ Problems 2 nights a week
- ☐ Problems 3 nights a week
- ☐ Problems 4 nights a week
- ☐ Problems 5 nights a week
- ☐ Problems 6 nights a week
- ☐ Problems every night of the week

16. How long have you had these settling difficulties? ______ months ☐ Does not apply

_Waking at Night (between midnight and 6.00 a.m._)

17. Do you use an infant monitor during the night?
- ☐ No
- ☐ Sometimes
- ☐ Usually
- ☐ Does not apply

18. If you (or your partner) hear your child crying during the night, do you usually
- ☐ Ignore the crying
- ☐ Wait for _____ minutes and then attend to the child
- ☐ Attend to the child immediately

19. If you (or your partner) do attend to the child during the night, what usually occurs?
- ☐ I/we very rarely attend to the child during the night

OR (choose one or more):
- ☐ Reassure child and return to bed
- ☐ Replace his/her covers
- ☐ Feed him/her
- ☐ Use medicine/teething gel
- ☐ Change the infant's nappy
- ☐ Play music or use musical toy
- ☐ Hold or rock the infant back to sleep
- ☐ Replace the infant's dummy
- ☐ Wait with him/her until asleep again
- ☐ Bring the infant to parents' bed
- ☐ Other (please describe) __________________________________________
  __________________________________________
20. How often do you end up taking your infant into your bed because he/she is upset and won't sleep?
   - ☐ Never, or less than once a week
   - ☐ 1 night a week
   - ☐ 2 nights a week
   - ☐ 3 nights a week
   - ☐ 4 nights a week
   - ☐ 5 nights a week
   - ☐ 6 nights a week
   - ☐ Every night of the week

21. For approximately how long has this been happening? ______ months ☐ Does not apply

22. How many nights per week does your infant wake (between midnight and 6.00am) on average?
   - ☐ None or less than once a week
   - ☐ 1 night a week
   - ☐ 2 nights a week
   - ☐ 3 nights a week
   - ☐ 4 nights a week
   - ☐ 5 nights a week
   - ☐ 6 nights a week
   - ☐ Every night of the week

23. How many times each night does your infant wake and need resettling on average?
   - ☐ Does not wake/need resettling
   - ☐ Once a night
   - ☐ Twice a night
   - ☐ 3 times a night
   - ☐ 4 times a night
   - ☐ 5 or more times a week

24. If your infant wakes, how long does it take for him/her to go back to sleep on average?
   - ☐ Does not wake or less than 10 min
   - ☐ 10 to 20 minutes
   - ☐ 20 to 30 minutes
   - ☐ 30 to 40 minutes
   - ☐ 40 to 50 minutes
   - ☐ 50 to 60 minutes
   - ☐ 1 hour or longer

25. How long has your infant been waking at night? ______ months ☐ Does not apply

26. Do you believe that your child has a sleeping problem?
   - ☐ No
   - ☐ Yes, mild
   - ☐ Yes, moderate
   - ☐ Yes, severe

27. How concerned are you about your child's sleep patterns/behaviour?
   - ☐ Not at all concerned
   - ☐ Mildly concerned
   - ☐ Moderately concerned
   - ☐ Very concerned
28. Are you currently (tick the box that describes you at the moment)

☐: Single/never married  
☐: Married  
☐: In a de facto relationship  
☐: Divorced or separated  
☐: Widowed

29. What was the highest year of school you completed? (choose one)

☐: Year 10 or less  
☐: Technical/TAFE certificate/diploma  
☐: Year 11  
☐: Tertiary degree  
☐: Year 12  
☐: Post graduate degree  
☐: Trade apprenticeship  
☐: Other (please specify) ____________________________

Here are a series of statements about thoughts and feelings that mothers may have when faced with a child that won't sleep. After reading each statement, circle the response that most closely represents how you yourself would feel with your child. Try not to take too long thinking about any one answer and don’t hesitate to use the extreme responses if appropriate.

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Moderately Disagree</th>
<th>Mildly Disagree</th>
<th>Mildly Agree</th>
<th>Moderately Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA 1.</td>
<td>When my child cries at night, I think something awful might have happened to him/her.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>When my child wakes at night, I think I might not have fed him/her enough during the day.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>My child might die unexpectedly in his/her sleep.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>My child will feel abandoned if I don’t respond immediately to his/her cries at night.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>My child might go hungry if I don’t give him/her a feed at night.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>It’s alright to allow my child to cry at night.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>When my child cries at night, I think I might lose control and harm him/her.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>When my child wakes at night, I think I might not have given him/her enough attention during the day.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
9. I should be getting up during the night to check that my child is still alright.  
   | Strongly Disagree | Moderately Disagree | Mildly Disagree | Mildly Agree | Moderately Agree | Strongly Agree |
   | 1 | 2 | 3 | 4 | 5 | 6 |

10. If I try to resist my child's demands at night, then I think I might get very angry.  
   | 1 | 2 | 3 | 4 | 5 | 6 |

11. When my child wakes crying, I always know what he/she needs.  
   | 1 | 2 | 3 | 4 | 5 | 6 |

12. When my child cries at night and needs me, I wish he/she wasn't so demanding.  
   | 1 | 2 | 3 | 4 | 5 | 6 |

13. If I try to resist my child's demands at night, then he/she will get even more upset.  
   | 1 | 2 | 3 | 4 | 5 | 6 |

14. When my child doesn't sleep at night, I doubt my competence as a parent.  
   | 1 | 2 | 3 | 4 | 5 | 6 |

15. If I say no to my child's demands at night, then that means I'm a bad mother.  
   | 1 | 2 | 3 | 4 | 5 | 6 |

16. I am able to let my child sleep on his or her own.  
   | 1 | 2 | 3 | 4 | 5 | 6 |

17. When my child cries at night, I can find myself thinking I wish I never had a child.  
   | 1 | 2 | 3 | 4 | 5 | 6 |

18. I should respond straight away when my child wakes crying at night.  
   | 1 | 2 | 3 | 4 | 5 | 6 |

19. I am able to resist my child's demands when he/she wakes at night.  
   | 1 | 2 | 3 | 4 | 5 | 6 |

20. If I give up feeding at night, then he/she will never sleep.  
   | 1 | 2 | 3 | 4 | 5 | 6 |

[Questionnaire continues with the Edinburgh Postnatal Depression Scale (see Appendix D)]
The questions listed below are about how you feel in your role as a new parent. Please circle the answer that comes closest to describing your feelings. Remember, there are no right or wrong answers.

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I am happy in my role as a parent.</td>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Not Sure</td>
</tr>
<tr>
<td>2</td>
<td>There is little or nothing I wouldn’t do for my child if necessary.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Caring for my child sometimes takes more time and energy than I have to give.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>I sometimes worry whether I am doing enough for my child.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>I feel close to my child.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>I enjoy spending time with my child.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>My child is an important source of affection for me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>Having a child gives me a more certain and optimistic view of the future.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>The major source of stress in my life is my child.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>10</td>
<td>Having a child leaves little time and flexibility in my life.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>11</td>
<td>Having a child has been a financial burden.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>12</td>
<td>It is difficult to balance different responsibilities because of my child.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>13</td>
<td>The behaviour of my child is often embarrassing or stressful to me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>14</td>
<td>If I had to do it over again, I might decide not to have children.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>15</td>
<td>I feel overwhelmed by the responsibility of being a parent.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>16</td>
<td>Having a child has meant having too few choices and too little control over my life.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>17</td>
<td>I am satisfied as a parent.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>18</td>
<td>I find my child enjoyable.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
For each of the following questions please circle the number which best describes your child’s recent and current behaviour. If any question does not apply to your child or cannot be answered, please draw a line through it.

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Almost never</td>
<td>Not often</td>
<td>Variable, usually does not</td>
<td>Variable, usually does</td>
<td>Almost always</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>11</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>12</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>13</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>14</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

1. The baby is fretful on waking up and/or going to sleep (frowns, cries).
2. The baby accepts straight away any change in place or position of feeding, or person giving the feed.
3. The baby is shy (turns away or clings to mother) on meeting another child for the first time.
4. The baby continues to fret during nappy change in spite of efforts to distract him/her with a game, a toy, or singing.
5. The baby amuses itself for 1/2 hour or more in cot or playpen (looking at mobile, playing with toy etc)
6. The baby moves a lot (kicks, grabs, squirms) during nappy-changing and dressing.
7. The baby makes happy sounds (coos, smiles, laughts) when being changed or dressed.
8. The baby is pleasant (smiles, laughts) when first arriving in unfamiliar places (e.g., friend’s house, shop)
9. The baby gets sleepy about the same time each evening (within 1/2 hour)
10. The baby accepts regular procedures (hair brushing, face washing, etc) at any time without protest.
11. The baby moves a lot (squirms, bounces, kicks) while lying awake in the cot.
12. For the first few minutes in a new place or situation (new shop or home) the baby is fretful (frowns, cries).
13. The baby continues to cry in spite of several minutes of soothing.
14. The baby keeps trying to get a desired toy, which is out of reach, for 2 minutes or more.
<table>
<thead>
<tr>
<th>TA 15. The baby greets a new toy with a loud voice and much expression of feeling (whether positive or negative).</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>16. At home, the baby's first reaction to approach by strangers is acceptance.</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>17. The baby wants daytime naps at differing times (over 1 hour difference) from day to day.</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>18. The baby cries when left to play alone.</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>19. The baby's daytime naps are about the same length from day to day (less than 1/2 hour difference).</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>20. The baby displays much feeling (strong laugh or cry) during changing or dressing.</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>21. The baby wants and takes feedings at about the same time (within 1 hour) from day to day.</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>22. The baby is content (smiles, coos) during interruptions of milk or solid feeds.</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>23. The baby accepts within a few minutes a change in place of bath or person giving the bath.</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>24. The baby's time of waking in the morning varies greatly (by 1 hour or more) from day to day.</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>25. The baby reacts strongly to strangers: laughing or crying.</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>26. The baby's period of greatest activity comes at the same time of day.</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>27. The baby is irritable or moody throughout a cold or stomach virus.</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>28. The baby can be distracted from fretting or squirming during a procedure (hair-brushing, nail-cutting etc) by a game, singing, TV, etc</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>29. The baby's first reaction to seeing a doctor or Maternal and Child Health Nurse is acceptance (smiles, coos).</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>30. The baby lies still during procedures like hair brushing or nail cutting.</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>1</td>
</tr>
</tbody>
</table>
The questions listed below concern what happens between yourself and your child's other parent, or the adult most involved in the care of your child. While you may not find an answer which exactly describes what you think, please circle the answer that comes closest to what you think. If you are a single parent, leave this sheet blank.

<table>
<thead>
<tr>
<th>Question</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Not Sure</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. My child's other parent enjoys being alone with our child.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2. During pregnancy, my child's other parent expressed confidence in my ability to be a good parent.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3. When there is a problem with our child, we work out a good solution together.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4. My child's other parent and I communicate well about our child.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5. My child's other parent is willing to make personal sacrifices to help take care of our child.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6. Talking to my child's other parent about our child is something I look forward to.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7. My child's other parent pays a great deal of attention to our child.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8. My child's other parent and I agree on what our child should and should not be permitted to do.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9. I feel close my child's other parent when I see him/her play with our child.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>10. My child's other parent knows how to handle children well.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>11. My child's other parent and I are a good team.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>12. My child's other parent believes that I am a good mother.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>13. I believe that my child's other parent is a good parent.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>14. My child's other parent makes my job of being a mother easier.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>15. My child's other parent sees our child in the same way I do.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>16. My child's other parent and I would basically describe our child in the same way.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>17. My child's other parent and I agree on how you should punish a misbehaving child.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>18. I feel good about my child's other parent's judgement about what is right for our child.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>19. My child's other parent tells me that I am a good parent.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>20. My child's other parent and I have some goals for our child.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
RE: Silent Night Sleep Project

Dear «FirstName»,

Thank you for participating in the Silent Night Sleep Project. On «DateSent», we sent you our infant sleep diary and questionnaire but to date have received no reply. I understand that being a new parent can be a difficult time and that you may have been unable to fit the requirements of our study into your busy schedule. If, however, you are still able to complete the tasks it is not too late to do so.

If you have partially filled in the diary and/or questionnaire and are not able to finish them, please return them anyway, since any information supplied may still be useful for our research. We really do value your contribution and any response will be helpful in some way.

If you have any queries about the diary and questionnaire please call me (or leave a message) on (03) 9925 7376 or email at s9800380@student.rmit.edu.au

If you have recently begun completing your diary or have posted your response in the past few days, please ignore this letter. Unfortunately, due to internal mail problems, some letters have been taking up to a week to reach me.

Thanks again for your involvement and may your nights be relatively silent!!

Kind regards,

Steven Watts
Principal Researcher
RE: The Silent Night Sleep Project

Dear «FirstName»,

Thank you for recently completing and returning our six month infant sleep diary and questionnaire. I appreciate the trouble you have gone to, and hope that it did not cause too much inconvenience. The valuable information that you have supplied will soon be combined with other participants’ data on our statistical database to provide us with an overall picture of sleeping patterns in six month old Victorian infants.

As previously mentioned, the twelve month old follow-up sleep diary and questionnaire will arrive just before «BabyName»’s first birthday. Please let us know if your address changes before then by calling me (or leaving a message) on (03) 5153 0383; email at steven.psych@bigpond.com; or normal mail (no stamp needed) at:

Reply Paid Permit No 23
Attention: Steven Watts
Dept of Psychology and Disability Studies
RMIT University
PO Box 71
BUNDOORA Vic 3083

Thanks again for your involvement and may your nights be relatively silent!!

Kind regards,

Steven Watts
Principal Researcher
12-MONTH PARENT CORRESPONDENCE

The 12 month parent letters, sleep diary, and questionnaire which were structurally similar to those presented earlier have not been repeated. A question about infantile colic was omitted from the 12 month questionnaire as it was no longer relevant.
Infant Sleep Diary
and Questionnaire
For Parents of 12-Month-Old Infants
RE: Silent Night Sleep Project: A Sincere Thanks

Dear «FirstName»,

Thank you for recently completing and returning our 12 month infant sleep diary and questionnaire. Projects such as this can only be carried out when new parents such as you, graciously offer their own time and energy as participants. We are so pleased that you were able to incorporate our diary and questionnaire into your busy daily schedule. Thanks especially to «BabyName», who helped us to learn about infant sleep without realising it!

The data that you have supplied has recently been added to our statistical database. This not only provides us with in depth information about many important aspects of sleep in twelve month old Australian infants, but also allows us to compare findings with the six month data and to track changes over time.

Results will be used in practical ways to teach both health professionals and families about the best ways of preventing sleep problems in infants and children. We hope that the results of this study will provide researchers, health professionals and the community with important information for about the prevention of sleep problems in infants and children.

Thanks again «FirstName» for being kind enough to participate in the Silent Night Sleep Project. Your involvement is greatly valued and appreciated. May your nights be silent and please accept my best wishes for a healthy and happy future to you and your family.

Kind regards,

Steven Watts
Principal Researcher
APPENDIX G

SUMMARY OF RESEARCH VARIABLES
Table 42  
Summary of Research Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Measure</th>
<th>Source/Item/Explanation</th>
<th>Scale/Code</th>
<th>Research Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Demographic</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maternal age</td>
<td>Questionnaire</td>
<td>Continuous</td>
<td>Pretest</td>
<td></td>
</tr>
<tr>
<td>Paternal age</td>
<td>Questionnaire</td>
<td>Continuous</td>
<td>Pretest</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>Questionnaire</td>
<td>0 No tertiary degree; 1 Tertiary degree</td>
<td>Pretest</td>
<td></td>
</tr>
<tr>
<td>Location (Metropolitan vs. rural)</td>
<td>Questionnaire</td>
<td>Address</td>
<td>0 Metropolitan; 1 Rural</td>
<td>Pretest</td>
</tr>
<tr>
<td>Income (Average by postcode)</td>
<td>Historical Data</td>
<td>Australian Tax Office Records</td>
<td>Continuous</td>
<td>Pretest</td>
</tr>
<tr>
<td>Marital status</td>
<td>Questionnaire</td>
<td>0 Not married; 1 Married</td>
<td>6 m</td>
<td></td>
</tr>
<tr>
<td><strong>Pregnancy and Birthing</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gestation period</td>
<td>Questionnaire</td>
<td>Child Heath Record</td>
<td>Continuous</td>
<td>Pretest</td>
</tr>
<tr>
<td>Estimated labour</td>
<td>Questionnaire</td>
<td>Retrospective maternal estimate</td>
<td>Continuous</td>
<td>Pretest</td>
</tr>
<tr>
<td>Caesarean birth?</td>
<td>Questionnaire</td>
<td>Child Heath Record</td>
<td>0 No; 1 Yes</td>
<td>Pretest</td>
</tr>
<tr>
<td>Sex of child</td>
<td>Questionnaire</td>
<td>0 Male; 1 Female</td>
<td>Pretest</td>
<td></td>
</tr>
<tr>
<td>APGAR score (1 min)</td>
<td>Questionnaire</td>
<td>Child Heath Record</td>
<td>0–10</td>
<td>Pretest</td>
</tr>
<tr>
<td>APGAR score (5 min)</td>
<td>Questionnaire</td>
<td>Child Heath Record</td>
<td>0–10</td>
<td>Pretest</td>
</tr>
<tr>
<td>Birth weight</td>
<td>Questionnaire</td>
<td>Child Heath Record</td>
<td>Continuous</td>
<td>6 m</td>
</tr>
<tr>
<td>Intensive care unit admission?</td>
<td>Questionnaire</td>
<td>Child Heath Record</td>
<td>0 No; 1 Yes</td>
<td>Pretest</td>
</tr>
<tr>
<td><strong>Study Group Allocation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study 1 group</td>
<td>Access to written anticipatory guidance</td>
<td>0 Control Group 1 Intervention Group</td>
<td>Pretest</td>
<td></td>
</tr>
<tr>
<td>Variable</td>
<td>Measure</td>
<td>Source/Item/Explanation</td>
<td>Scale/Code</td>
<td>Research Phase</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>--------------------</td>
<td>----------------------------------------------------------------------------------------</td>
<td>------------------------------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Study 3 group</td>
<td></td>
<td>Extreme group membership ($N = 80$)</td>
<td>0 Enduring healthy sleep; 1 Persistent sleep problem</td>
<td>Post-test</td>
</tr>
<tr>
<td>Infante Health</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infantile colic?</td>
<td>Questionnaire</td>
<td>“Did your baby have colic or colicky symptoms (unexplained crying or fussing for several hours, usually in the early evening, during which it is almost impossible to settle the child)?”</td>
<td>0 No; 1 Yes</td>
<td>6 m</td>
</tr>
<tr>
<td>Colic hours/night</td>
<td>Questionnaire</td>
<td>Approximate hours per night of unsettled behaviour</td>
<td>1–12 hours (Colicky infants only)</td>
<td>6 m</td>
</tr>
<tr>
<td>Colicky period</td>
<td>Questionnaire</td>
<td>Approximate length of colicky period (weeks)</td>
<td>1–52 weeks (Colicky infants only)</td>
<td>6 m</td>
</tr>
<tr>
<td>Age colic ceased</td>
<td>Questionnaire</td>
<td>Approximate age colic ceased (weeks)</td>
<td>Continuous (Colicky infants only)</td>
<td>6 m</td>
</tr>
<tr>
<td>Colic burden</td>
<td>Computation</td>
<td>Hours/night x Length of colicky period</td>
<td>Continuous (Colicky infants only)</td>
<td>6 m</td>
</tr>
<tr>
<td>Wessel colic? (Wessel et al., 1954)</td>
<td>Computation</td>
<td>Colic symptoms &gt; 3 hours/night &amp; &gt; 3 weeks duration. Note: nights/week statistic is not available as it was not included in the questionnaire.</td>
<td>0 No; 1 Yes</td>
<td>6 m</td>
</tr>
<tr>
<td>Child illness (0–6 months)?</td>
<td>Questionnaire</td>
<td>Has your child suffered any major illnesses during the past six months?”</td>
<td>0 No; 1 Yes (+ details)</td>
<td>6 m</td>
</tr>
<tr>
<td>Child illness (6–12 months)?</td>
<td>Questionnaire</td>
<td>Has your child suffered any major illnesses during the past six months?”</td>
<td>0 No; 1 Yes (+ details)</td>
<td>12 m</td>
</tr>
<tr>
<td>Other sleep disruptions?</td>
<td>Questionnaire</td>
<td>“Have there been any other problems/disruptions which may have affected your child’s sleeping patterns?”</td>
<td>0 No; 1 Yes (+ details)</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Developmental problems?</td>
<td>Questionnaire</td>
<td>“Has the child been diagnosed with or suspected of having any developmental problems?”</td>
<td>0 No; 1 Yes (+ details)</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Infant Temperament</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STSI</td>
<td></td>
<td></td>
<td>Note: all scale results on the STSI are computed using item mean scores</td>
<td></td>
</tr>
<tr>
<td>Variable</td>
<td>Measure</td>
<td>Source/Item/Explanation</td>
<td>Scale/Code</td>
<td>Research Phase</td>
</tr>
<tr>
<td>---------------------------------------------------------</td>
<td>-------------</td>
<td>----------------------------------------------------------------------------------------</td>
<td>-----------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Approach/Avoidance (7-item subscale)</td>
<td>Questionnaire</td>
<td>e.g., “For the first few minutes in a new place or situation (new shop or home) the baby is fretful (frowns, cries).”</td>
<td>1 Almost never....6 Almost always</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Rhythmicity (6-item subscale)</td>
<td>Questionnaire</td>
<td>e.g., “The baby gets sleepy at about the same time each evening (within ½ hour).”</td>
<td>1 Almost never....6 Almost always</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Cooperation/Manageability (6-item subscale)</td>
<td>Questionnaire</td>
<td>e.g., “The baby accepts regular procedures (hair brushing, face washing etc) at any time without protest.”</td>
<td>1 Almost never....6 Almost always</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Activity/Reactivity (6-item subscale)</td>
<td>Questionnaire</td>
<td>e.g., “The baby moves a lot (squirms, bounces, kicks) while lying awake in the cot.”</td>
<td>1 Almost never....6 Almost always</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Irritability (5-item subscale)</td>
<td>Questionnaire</td>
<td>e.g., “The baby continues to cry in spite of several minutes of soothing.”</td>
<td>1 Almost never....6 Almost always</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Easy-Difficult (Mean of 3 subscales)</td>
<td>Questionnaire</td>
<td>Mean of Approach, Cooperation/Manageability, &amp; Irritability subscales</td>
<td></td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Infant Sleep Location</td>
<td>Questionnaire</td>
<td>“Over the first six/twelve months, where has your infant mainly slept? (choose one)”</td>
<td>1 Crib in parents’ room since birth; 2 Crib in own room since birth; 3 Crib in parents’ room for __ months, own room for __ months; Other (please describe)</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Sleep location (First night at home)</td>
<td>Computation</td>
<td>Determined from retrospective maternal assessment</td>
<td>0 Within parents’ room; 1 Own room</td>
<td>Pretest</td>
</tr>
<tr>
<td>Sleep location (at 6 months)</td>
<td>Computation</td>
<td>Determined from retrospective maternal assessment</td>
<td>0 Within parents’ room; 1 Own room</td>
<td>6 m</td>
</tr>
<tr>
<td>Weeks in own room (0–6 months)</td>
<td>Computation</td>
<td>Determined from retrospective maternal assessment</td>
<td>0–26 weeks</td>
<td>6 m</td>
</tr>
<tr>
<td>Sleep location (at 12 months)</td>
<td>Computation</td>
<td>Determined from retrospective maternal assessment</td>
<td>0 Within parents’ room; 1 Own room</td>
<td>12 m</td>
</tr>
<tr>
<td>Weeks in own room (6–12 months)</td>
<td>Computation</td>
<td>Determined from retrospective maternal assessment</td>
<td>0–26 weeks</td>
<td>12 m</td>
</tr>
<tr>
<td>Weeks in own room (0–12 months)</td>
<td>Computation</td>
<td>Determined from retrospective maternal assessment</td>
<td>0–52 weeks</td>
<td>12 m</td>
</tr>
</tbody>
</table>

Feeding Practices
<table>
<thead>
<tr>
<th>Variable</th>
<th>Measure</th>
<th>Source/Item/Explanation</th>
<th>Scale/Code</th>
<th>Research Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breastfeeding problems</td>
<td>Questionnaire</td>
<td>“Have you experienced any problems with breastfeeding (e.g., supply, mastitis)?”</td>
<td>0 No; 1 Yes (+ details)</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Age stopped breastfeeding</td>
<td>Questionnaire</td>
<td>Retrospective maternal assessment</td>
<td>Continuous (0–12 months)</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Months breastfeeding (0–6 months)</td>
<td>Computation</td>
<td>Determined from retrospective maternal assessment</td>
<td>Continuous (0–6 months)</td>
<td>6 m</td>
</tr>
<tr>
<td>Months breastfeeding (0–12 months)</td>
<td>Computation</td>
<td>Determined from retrospective maternal assessment</td>
<td>Continuous (0–12 months)</td>
<td>12 m</td>
</tr>
<tr>
<td>Current milk type</td>
<td>Questionnaire</td>
<td>“What type of milk are you giving your baby now?”</td>
<td>1 Breastmilk only; 2 Breastmilk &amp; formula/cow’s milk only; 3 Formula/cow’s milk only; 4 Never breastfed</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Breastfeeding status</td>
<td>Computation</td>
<td>Is the mother currently breastfeeding?</td>
<td>0 Not currently breastfeeding; 1 Currently breastfeeding</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Exclusive breastmilk?a</td>
<td>Computation</td>
<td>Is the mother currently using breastmilk only?</td>
<td>0 No; 1 Yes</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Night-feeds?</td>
<td>Questionnaire</td>
<td>“Do you usually feed your child during the night (i.e., between normal bedtime and rising time)?”</td>
<td>0 No; 1 Yes</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Number of night-feeds</td>
<td>Questionnaire</td>
<td>“Yes, I usually feed him/her __ times during the night”</td>
<td>Continuous (current night-feeds only)</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Age night-feeds discontinued</td>
<td>Questionnaire</td>
<td>“My baby stopped night-feeds at about __ months”</td>
<td>0–6 months (if night-feeds ceased)</td>
<td>6 m</td>
</tr>
<tr>
<td>Age night-feeds discontinued</td>
<td>Questionnaire</td>
<td>“My baby stopped night-feeds at about __ months”</td>
<td>0–12 months (if night-feeds ceased)</td>
<td>12 m</td>
</tr>
<tr>
<td>Parenting Strategies at Bedtime</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sleep status upon entering cot</td>
<td>Questionnaire</td>
<td>“When placing your child in the crib at bedtime is he/she usually awake or asleep?”</td>
<td>0 Asleep; 1 Awake</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Parent assistance with sleep onset?</td>
<td>Questionnaire</td>
<td>“How does your infant usually fall asleep each night?”</td>
<td>0 Alone; 1 With caregiver assistance</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Rocked to sleep?</td>
<td>Questionnaire</td>
<td>“In parent’s arms/gently rocked until asleep?”</td>
<td>0 No; 1 Yes</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Fed to sleep?</td>
<td>Questionnaire</td>
<td>“Fed (breast or bottle) until asleep?”</td>
<td>0 No; 1 Yes</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Parental presence until asleep?</td>
<td>Questionnaire</td>
<td>“Parent stays in room with child until asleep?”</td>
<td>0 No; 1 Yes</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Play music/musical toy?</td>
<td>Questionnaire</td>
<td>“Music or musical toy used to soothe the child?”</td>
<td>0 No; 1 Yes</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Variable</td>
<td>Measure</td>
<td>Source/Item/Explanation</td>
<td>Scale/Code</td>
<td>Research Phase</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-------------</td>
<td>----------------------------------------------------------------------------------------</td>
<td>---------------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Other parental involvement?</td>
<td>Questionnaire</td>
<td>“Other (please describe) ________________”</td>
<td>0 No; 1 Yes (+ details)</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Any parent involvement</td>
<td>Computation</td>
<td></td>
<td>0 No; 1 Yes</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Use of Sleep Aids/Objects</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pacifier at sleep onset?</td>
<td>Questionnaire</td>
<td>“Does your child normally fall asleep with a dummy in his/her mouth?”</td>
<td>0 No; 1 Yes</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Sleep attachment object?</td>
<td>Questionnaire</td>
<td>“Does the child have a favourite toy/object (such as a teddy bear, doll, or special blanket which he/she sleeps with each night?”</td>
<td>0 No; 1 Yes</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Any transitional object?</td>
<td>Computation</td>
<td>Infant uses pacifier or attachment object?</td>
<td>0 No; 1 Yes</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Response to Infant Night-Waking</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attending delay</td>
<td>Questionnaire</td>
<td>“If you (or your partner) hear your child crying during the night, do you usually: 1 Ignore the crying; 2 Wait about __ minute(s) before attending to the child; 3 Attend to the child immediately”</td>
<td>Continuous</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Attend to child?</td>
<td>Computation</td>
<td>Do the parents attend to the child during the night?</td>
<td>0 No or rarely; 1 Yes</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td></td>
<td>Questionnaire</td>
<td>“If you (or your partner) do attend to the child during the night, what usually occurs? (choose one or more)”</td>
<td></td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Reassure &amp; leave?</td>
<td>Questionnaire</td>
<td>“Reassure the child and return to bed”</td>
<td>0 No; 1 Yes</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Feed the child?</td>
<td>Questionnaire</td>
<td>“Feed him/her”</td>
<td>0 No; 1 Yes</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Change nappy?</td>
<td>Questionnaire</td>
<td>“Change his/her nappy”</td>
<td>0 No; 1 Yes</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Hold or rock?</td>
<td>Questionnaire</td>
<td>“Hold or rock him/her back to sleep”</td>
<td>0 No; 1 Yes</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Parental presence until asleep?</td>
<td>Questionnaire</td>
<td>“Wait with him/her until asleep again”</td>
<td>0 No; 1 Yes</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Replace covers?</td>
<td>Questionnaire</td>
<td>“Replace his/her covers”</td>
<td>0 No; 1 Yes</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Medicine/teething gel?</td>
<td>Questionnaire</td>
<td>“Use medicine/teething gel”</td>
<td>0 No; 1 Yes</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Variable</td>
<td>Measure</td>
<td>Source/Item/Explanation</td>
<td>Scale/Code</td>
<td>Research Phase</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>---------------</td>
<td>---------------------------------------------------------------------------------------</td>
<td>--------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Play music/musical toy?</td>
<td>Questionnaire</td>
<td>“Play music or musical toy”</td>
<td>0 No; 1 Yes</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Give/replace pacifier?</td>
<td>Questionnaire</td>
<td>“Replace or give him/her dummy”</td>
<td>0 No; 1 Yes</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Take to parents’ bed?</td>
<td>Questionnaire</td>
<td>“Bring him/her to parents’ bed”</td>
<td>0 No; 1 Yes</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Other</td>
<td>Questionnaire</td>
<td>“Other (please describe) ________________”</td>
<td>0 No; 1 Yes (+ details)</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Any stimulatory response?</td>
<td>Computation</td>
<td>Do the parents respond to night-waking with stimulation?</td>
<td>0 No; 1 Yes</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Total stimulatory responses</td>
<td>Computation</td>
<td>How many different stimulatory strategies do the parents use?</td>
<td>Continuous</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Infants Sleep Behaviour (Sleep Diary)</td>
<td></td>
<td>All items scored 0–4&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bedtime sleep onset delay</td>
<td>Sleep Diary</td>
<td>Average time taken to settle to sleep at bedtime</td>
<td>0 = &lt; 15 min; 1 = 16–29 min; 2 = 30–44 min; 3 = 45–60 min; 4 = 60 min+</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Average bedtime</td>
<td>Sleep Diary</td>
<td>Average time sleep onset process begins each night</td>
<td>0 &lt;= 8.40 p.m.; 1 = 8.41 p.m.–9.20 p.m.; 2 = 9.21 p.m.–10.00 p.m.; 3 = 10.01 p.m.–11.00 p.m.; 4 = 11.01 p.m.+</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Bedtime issues (SBS 1)</td>
<td>Computation</td>
<td>Average sleep onset delay score or bedtime score</td>
<td>Settling or bedtime (whichever is worst)</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Total sleep (SBS 2)</td>
<td>Sleep Diary</td>
<td>Average total night sleep hours</td>
<td>0 = &gt; 12; 1 = 11–12; 2 = 10–11; 3 = 9–10; 4 = &lt; 9</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Nights waking (SBS 3)</td>
<td>Sleep Diary</td>
<td>Total nights waking (per 4-day sleep diary)</td>
<td>0–4</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Times waking per night (SBS 4)</td>
<td>Sleep Diary</td>
<td>Average wakings per night</td>
<td>0 = &lt; 0.3; 1 = 0.3–0.9; 2 = 1.0–1.9; 3 = 2–2.9; 4 = 3.0+</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Resetting delay (SBS 5)</td>
<td>Sleep Diary</td>
<td>Average time taken to settle to sleep after waking</td>
<td>0 = 0–5 min; 1 = 6–15 min; 2 = 16–30 min; 3 = 31–60 min; 4 = 60 min+</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Co-sleeping hours (SBS 6)</td>
<td>Sleep Diary</td>
<td>Average hours per week co-sleeping</td>
<td>0 = none; 1 = 1–6; 2 = 7–20; 3 = 21–34; 4 = 35 +</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>SBS full-scale score</td>
<td>Computation</td>
<td>Total of SBS items 1–6</td>
<td>Continuous (0–24)</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Variable</td>
<td>Measure</td>
<td>Source/Item/Explanation</td>
<td>Scale/Code</td>
<td>Research Phase</td>
</tr>
<tr>
<td>----------</td>
<td>---------</td>
<td>-------------------------</td>
<td>------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Infant Sleep Behaviour (Questionnaire)</td>
<td>Infant Sleep Questionnaire&lt;sup&gt;c&lt;/sup&gt; (ISQ)</td>
<td><strong>Bedtime sleep onset delay (ISQ 1)</strong> Questionnaire</td>
<td>“How long does it usually take to settle your baby off to sleep (at bedtime) on average?”</td>
<td>0 less than 10 minutes...6 One hour or longer</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Settling problems (ISQ 2)</strong> Questionnaire</td>
<td>“How many times a week do you have problems settling your infant (at bedtime) on average?”</td>
<td>0 Problems less than once a week....7 Problems every night of the week</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Settling problems period (ISQ 3)</strong> Questionnaire</td>
<td>“How long have you had these settling difficulties?”</td>
<td>0–6/12 months (or does not apply)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Nights waking per week(ISQ 4)</strong> Questionnaire</td>
<td>“How many nights a week does your baby wake (between midnight and 6.00 a.m.) on average?”</td>
<td>0 None or less than once a week....7 Every night of the week</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Times waking per night (ISQ 5)</strong> Questionnaire</td>
<td>“How many times each night does your baby wake and need resettling on average?”</td>
<td>0 Does not wake....5 Five or more times a night</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Resettling delay (ISQ 6)</strong> Questionnaire</td>
<td>“If your baby wakes, how long does it take for him/her to go back to sleep on average?”</td>
<td>0 less than 10 minutes...6 One hour or longer</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Night-waking period (ISQ 7)</strong> Questionnaire</td>
<td>“How long has your infant been waking at night?”</td>
<td>0–6/12 months (or does not apply)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Co-sleeping nights per week (ISQ 8)</strong> Questionnaire</td>
<td>“How often do you end up taking your infant into your bed because he/she is upset and won’t sleep?”</td>
<td>0 Never, or less than once a week....7 Every night of the week</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Co-sleeping period (ISQ 9)</strong> Questionnaire</td>
<td>“For approximately how long has this been happening?”</td>
<td>0–6/12 months (or does not apply)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>ISQ full-scale score</strong> Computation</td>
<td>Total of ISQ Items 1, 2, 4, 5, 6, 8</td>
<td>Continuous (0–38)</td>
</tr>
<tr>
<td>Maternal Opinion/Concern</td>
<td></td>
<td><strong>Belief in sleep problem (ISQ 10)</strong> Questionnaire</td>
<td>“Do you believe that your child has a sleeping problem?”</td>
<td>0 No....3 Yes, severe</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Concerned about sleep?</strong> Questionnaire</td>
<td>“How concerned are you about your child’s sleep patterns/behaviour?”</td>
<td>0 Not at all concerned....3 Very concerned</td>
</tr>
<tr>
<td>Maternal Cognitions</td>
<td></td>
<td><strong>MCISQ full-scale score</strong> Computation</td>
<td>Total of all items</td>
<td>Continuous (0–100)</td>
</tr>
<tr>
<td>Variable</td>
<td>Measure</td>
<td>Source/Item/Explanation</td>
<td>Scale/Code</td>
<td>Research Phase</td>
</tr>
<tr>
<td>----------</td>
<td>---------</td>
<td>-------------------------</td>
<td>------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Setting Limits (5-item subscale)</td>
<td>Questionnaire</td>
<td>e.g., “It’s alright to allow my child to cry at night.”</td>
<td>0 Strongly disagree....5 Strongly agree</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Anger (5-item subscale)</td>
<td>Questionnaire</td>
<td>e.g., “When my child cries at night, I think I might lose control and harm him/her.”</td>
<td>0 Strongly disagree....5 Strongly agree</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Doubt (5-item subscale)</td>
<td>Questionnaire</td>
<td>e.g., “When my child doesn’t sleep at night, I doubt my competence as a parent.”</td>
<td>0 Strongly disagree....5 Strongly agree</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Feeding (3-item subscale)</td>
<td>Questionnaire</td>
<td>e.g., “When my child wakes at night, I think I might not have fed him/her enough during the day.”</td>
<td>0 Strongly disagree....5 Strongly agree</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>Safety (2-item subscale)</td>
<td>Questionnaire</td>
<td>e.g., “When my child cries at night, I think something awful might have happened to him/her.”</td>
<td>0 Strongly disagree....5 Strongly agree</td>
<td>6 m, 12 m</td>
</tr>
<tr>
<td>MCISQ (Excluding Safety items)</td>
<td>Computation</td>
<td>Full-scale score, less items 1 &amp; 3</td>
<td>Continuous (0–90)</td>
<td>6 m, 12 m</td>
</tr>
</tbody>
</table>

Maternal Depression

<table>
<thead>
<tr>
<th>Variable</th>
<th>Measure</th>
<th>Source/Item/Explanation</th>
<th>Scale/Code</th>
<th>Research Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPDS</td>
<td>Questionnaire</td>
<td>e.g., “I have felt sad or miserable.”</td>
<td>0 No, not at all....3 Yes, most of the time</td>
<td>Pretest, 6 m, 12 m</td>
</tr>
<tr>
<td>EPDS Anxiety (3-item subscale)</td>
<td>Questionnaire</td>
<td>e.g., “I have been anxious or worried for no good reason.”</td>
<td>0 No, not at all....3 Yes, very often</td>
<td>Pretest, 6 m, 12 m</td>
</tr>
</tbody>
</table>

Maternal Parenting Stress

<table>
<thead>
<tr>
<th>Variable</th>
<th>Measure</th>
<th>Source/Item/Explanation</th>
<th>Scale/Code</th>
<th>Research Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parental Stress Scale (PSS)</td>
<td>Questionnaire</td>
<td>e.g., “I feel overwhelmed by the responsibility of being a parent.”</td>
<td>1 Strongly disagree....5 Strongly agree</td>
<td>6 m, 12 m</td>
</tr>
</tbody>
</table>

Co-parenting Relationship

<table>
<thead>
<tr>
<th>Variable</th>
<th>Measure</th>
<th>Source/Item/Explanation</th>
<th>Scale/Code</th>
<th>Research Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parenting Alliance Inventory (PAI)</td>
<td>Questionnaire</td>
<td>e.g., “My child’s other parent and I are a good team.”</td>
<td>1 Strongly disagree....5 Strongly agree</td>
<td>6 m, 12 m</td>
</tr>
</tbody>
</table>

Note. SBS = Sleep Behaviour Scale; MCISQ = Maternal Cognitions about Infant Sleep Questionnaire; EPDS = Edinburgh Postnatal Depression Scale; m = months (survey).

* Refers only to the type of milk provided to the baby; it takes no account of when solid foods were introduced and should not be confused with the concept of exclusive breastfeeding (WHO, 2008).
* Minor adjustments to Richman’s (1981, 1985) scoring system were made to accommodate a 4-day diary.
* Minor changes to the ISQ wording were made to better suit its integration into the flow of the questionnaire (e.g., “at bedtime” added in lieu of a redundant heading).