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Effectiveness of Play2Sleep with Mothers and Fathers of Infants: A Mixed Methods Study

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Effectiveness of Play2Sleep with Mothers and Fathers of Infants:

A Mixed Methods Study

by

Elizabeth Keys

A THESIS

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Abstract

Infant sleep disturbances distress approximately one in four Canadian families and are associated with poorer parental health, family wellbeing, and child developmental outcomes. Assisting families to manage infant sleep disturbances may improve wellbeing, as well as support child development. However, addressing only sleep-related parenting behaviors and interactions may be ineffective in improving broader parenting difficulties that may underlie infant sleep disturbances. *Play2Sleep* combines personalized infant sleep information with examples from a self-modeled video recorded structured parent-infant play session to provide feedback aimed at enhancing parental ability to identify and respond appropriately to their infant's specific sleep-related and social cues. This approach could help address broader parenting difficulties that may underlie infant sleep disturbances.

An explanatory sequential mixed methods design combining a randomized controlled trial with thematic analysis of semi-structured family interviews was used to answer the following research questions:

Quantitative - Does one dose of *Play2Sleep* delivered during home visits with mothers and fathers of 5-month-old infants with infant sleep disturbances reduce the number of night wakings at age 7 months?

Qualitative - What are parental perceptions of family experiences, processes, and contexts related to *Play2Sleep* and infant sleep disturbances?

Mixed Methods - How do parental perceptions of family experiences, processes, and contexts related to infant sleep explain the effectiveness of *Play2Sleep*?

Play2Sleep was not effective in reducing parent-reported night wakings; however, it was effective in reducing maternal-reported infant nocturnal wakefulness and the number of paternal-reported naps. With *Play2Sleep*, there were significant subjective improvements in problematic infant sleep that were not observed in the comparison group. Three themes (*information overwhelm, learning infant cues, and working together* with a subtheme of *father involvement*) were developed to propose a potential mechanism for *Play2Sleep*. Six themes describe broader parental experiences of infant sleep disturbances: *developing routines; changed attitudes and beliefs; fears, concerns, and anxieties; support; sleep associations; and context of infant sleep disturbance*. *Play2Sleep* shows promise to reduce infant sleep disturbances. Including fathers was novel and the qualitative analysis contributed to understanding the *how* and *why* of intervention effects. Areas for future research are prevention, precision-care models, workforce development, and parent engagement.

Keywords: infant, mothers, fathers, parent-child interactions, sleep

Preface

This thesis contains two published manuscripts (Chapters 2 and 3) and one manuscript ready for submission (Chapter 4). The first author (E. Keys) prepared these manuscripts with the guidance of her supervisor and committee members. All authors critically reviewed the final manuscript drafts and provided intellectual contributions.

- Chapter 2. Keys, E. M., & Benzies, K. M. (2018). A proposed nursing theory: Infant sleep and development. *Nursing Science Quarterly*, 31(3), 279-286.
doi:10.1177/0894318418774947
- Chapter 3. Keys, E. M., Benzies, K. M., Kirk, V., & Duffett-Leger, L. (2018). Play2Sleep: A mixed methods protocol using play to improve infant sleep. *Frontiers in Psychiatry*, 9, 109. doi:10.3389/fpsy.2018.00109
- Chapter 4. Keys, E. M., Benzies, K. M., Kirk, V., & Duffett-Leger, L. Effect of Play2Sleep for mothers and fathers of 5-month-old infants. Prepared for submission to *Pediatrics*.

All other chapters (Chapter 1, 4, 5, 6, and 7) are original, unpublished work by the author, E. Keys. The Calgary Conjoint Health Ethics Board approved the research study presented in the dissertation, “Play2Sleep: A sequential explanatory mixed methods study of using infant play to improve infant sleep in families experiencing infant sleep disturbance” on July 4, 2016 (REB15-2652).

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Dedication

To any parent who has worried about or had trouble with their baby's sleep.

To the parents who have accidentally backed their cars into garage doors or walked into walls because they were so tired.

To the parents who have taken yet another stroll at midnight or bounced for hours on exercise balls next to a running dryer.

To the parents who have sat waiting in the car in the driveway because your baby fell asleep just as you arrived home.

To those parents who have wondered if you will ever have more than 3 hours of sleep at a time, cried silently while rocking or feeding your baby to sleep yet again, asked their baby "why won't you sleep?", or hid in the bathroom because they felt trapped and just couldn't manage the tiredness anymore – but did anyways.

This work is for you.

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List of Abbreviations

BISQ	Brief Infant Sleep Questionnaire
CONSORT	Consolidated Standards of Reporting Trials
DAS-4	Dyadic Adjustment Scale, brief 4 item version
EPDS	Edinburgh Postnatal Depression Scale
IBQ-R VSF	Infant Behavior Questionnaire – Revised, Very Short Form
MCISQ	Maternal Cognitions about Infant Sleep Questionnaire
NCAST	Nursing Child Assessment Satellite Training
PCR Programs	Parent Child Relationship Programs (formerly NCAST)
PSOC	Parental Sense of Competence
PCITS	Parent-Child Interaction Teaching Scale
RCT	Randomized Controlled Trial
RM-ANCOVA	Repeated Measures ANalysis of COVAriance
RM-ANOVA	Repeated Measures ANalysis Of VAriance
SPIRIT	Standard Protocol Items: Recommendations for Interventional Trials
TIDieR	Template for Intervention Description and Replication

Epigraph

Mother and Baby

Tired at length of crying,
Laughing, cooing, sighing,
The baby lies so qui't and still,
Scarce breathing in his sleep;
The mother watches, half-inclined
To hide her face and weep.

- Alexander Posey, 1873 - 1908

Chapter 1: Introduction

Sleep is a crucial component of health. Until relatively recently, sleep has not received its due as a cornerstone of health. Both parents and infants experience significant changes in sleep behaviors and patterns during the first year of life. Accordingly, public health nurses are well-positioned to help families manage infant sleep difficulties.

This research project leverages infant sleep problems as an opportunity for public health nurses to engage parents in infant sleep education while developing parental capacity to foster high-quality parent-child interactions. As such, this dissertation describes the theoretical basis, evaluation, and findings of a sequential, explanatory mixed method study that examines the effectiveness of a novel family intervention (Play2Sleep) aimed at improving infant sleep disturbances by using parent-child interactions to optimize child development.

Prevalence of Infant Sleep Disturbances

Infant sleep disturbances occur in up to 46% of families worldwide (Field, 2017; Hiscock & Wake, 2001). In a survey of Canadian parents with infants aged 6 to 12 months, approximately one in four families reported experiencing infant sleep disturbances (Loutzenhiser, Ahlquist, & Hoffman, 2011). These problems can be long lasting; infants who were identified by their parents as having a sleeping problem at age 5 months were twice as likely to have a sleeping problem at age 20 months, compared to those with no sleeping problems (Schmid, Schreier, Meyer, & Wolke, 2010).

Defining “Infant Sleep Disturbances”

There is wide variation in infant sleep patterns across the first year. Typically, infants have the highest increases in consolidation to nighttime sleep between birth and age 6 months, then consolidation plateaus (Dias, Figueiredo, Rocha, & Field, 2018). While there are varying definitions of what constitutes independent ‘sleeping through the night’ (Henderson, France, Owens, & Blampied, 2010), New Zealand parents of infants aged 0 to 11 months indicated an ideal timeframe of independent sleep would range from 4 to 13 hours (Henderson, Motoi, & Blampied, 2013). Still, there is no standardized definition of what constitutes an infant sleep disturbance. An early definition provided by Richman (1981) suggested the presence of severe sleep problems in children aged 1 to 2 years and included parental reports of: (a) more than 3 wakings per night; (b) waking for more than 20 minutes per night; and/or (c) being moved into the parental bed. More recent conceptualizations include a broader set of parental-reported subjective indicators of the common characteristics which parents associate with infant sleep disturbances (Sadeh, Mindell, Luedtke, & Wiegand, 2009; Sadeh, Mindell, & Rivera, 2011). For this research, infant sleep disturbances were primarily defined by parental perceptions that their infant’s sleep was problematic for their family. This definition is rooted in a family-centered approach, an integral component of which is shared decision making (Coyne, Holmström, & Söderbäck, 2018) whereby the family’s perception is paramount to defining whether or not there is a problem within the family system. Parents often consider their infant’s sleep as problematic when their infant is unable to self-soothe to sleep, necessitating protracted parental involvement in helping the infant fall asleep, as well as returning to sleep upon subsequent wakings (Sadeh et al., 2011; Sadeh, Tikotzky,

& Scher, 2010). In terms of specific infant sleep patterns or characteristics, parental perceptions of problematic sleep are associated with more frequent night wakings, shorter sleep durations, nocturnal wakefulness, and difficulties getting the infant to fall asleep (Sadeh et al., 2009; Sadeh et al., 2011).

Causes of Infant Sleep Disturbances

There is no one single cause of infant sleep disturbances; infant sleep patterns (and problems) are posited to develop within a complex transactional system (Sadeh et al., 2010). Moreover, infant sleep disturbances can often be entangled with feeding, crying, and other regulatory difficulties, especially in the first 6 months of life (St James-Roberts, 2007). There are likely a wide range of contributors to the development of infant sleep disturbances; however, one of the most proximal contributors are parental practices that include some level of assisting their child to fall asleep (i.e., feeding, holding, rocking, patting, etc.). Such practices can develop and perpetuate parent-assisted sleep associations, which the infant may subsequently rely upon to fall and stay asleep (Morrell & Steele, 2003).

Other factors that may contribute both directly and indirectly to the development, severity, and perpetuation of infant sleep disturbances include intrinsic infant attributes (e.g., temperament, prematurity), parental and parenting characteristics (e.g., mood disorders, beliefs and knowledge about infant sleep, and separation anxiety) and caregiving behaviors and relationships, such as bedtime interactions and attachment relationships (Sadeh et al., 2010). Cultural, environmental, and family contexts interact with these factors to influence the development of infant sleep disturbances. The transactional nature of infant sleep patterns (and problems) suggests a bidirectional

pattern of influence, with infant sleep disturbances resulting from, and contributing to, these wide range of factors (Sadeh et al., 2010).

Outcomes Associated with Infant Sleep

Poorer sleep quality in infancy predicts attention difficulties in preschool age children (Sadeh et al., 2015); and increased sleep fragmentation is linked to decreased social competence (Mindell, Leichman, DuMond, & Sadeh, 2016). In terms of duration, shorter sleep duration is linked to increased toddler socioemotional (internalizing) difficulties (Mindell et al., 2016) and poorer cognitive development at age 2 years (Smithson et al., 2018), while longer sleep duration is associated with more positive child emotional and physical health outcomes up to age 4 years (Chaput et al., 2017). Children with escalating sleep problems from birth to age 5 years are more likely than those without sleeping problems to have difficulties at school when they are ages 6 and 7 years (Williams, Nicholson, Walker, & Berthelsen, 2016). Similarly, children who are characterized as having consistently shorter sleep durations from ages 1 to 6 years have lower scores on physical, emotional, and social quality of life indicators (Magee, Gordon, & Caputi, 2014).

When sleep problems occur in combination with other regulatory difficulties, the potential for negative outcomes are more pronounced. For instance, toddlers aged 15 to 18 months who had more severe sleep difficulties in combination with other severe regulatory difficulties (in feeding and crying), were more than 12 times more likely to have behavioral dysregulation between ages 4 and 9.5 years compared to those with low regulatory difficulties (Winsper & Wolke, 2014). In addition, infants aged 12 months, who were classified as being severely unsettled in sleeping, feeding, crying, temper

tantrums, mood swings, and overall temperament, were ten times more likely to score above the clinical referral range for difficulties on the Strengths and Difficulties questionnaire at ages 5 and 11 years compared to their settled counterparts (Cook et al., 2019).

Interventions to Prevent and Manage Infant Sleep Disturbances

Behavioral-based extinction strategies (commonly referred to as ‘cry-it-out’, the Ferber method, or ‘camping out’) that aim to modify parental practices that occur prior to and during the time the child is falling asleep (e.g., ‘sleep-related parenting practices’) have been shown to be effective in children under age 5 years (Meltzer & Mindell, 2014; Mindell, Kuhn, Lewin, Meltzer, & Sadeh, 2006). In a recent survey of American parents belonging to an online support group for using behavioral sleep interventions, more than 80% of parents reported success in using behavioral sleep strategies in their children ages 1 to 66 months (Honaker, Schwichtenberg, Kreps, & Mindell, 2018). However, parents have also reported reluctance in implementing behavioral interventions due to: (a) concerns that prolonged infant crying may be detrimental to development; and (b) stressfulness of the process (Loutzenhiser, Hoffman, & Beatch, 2014; Tse & Hall, 2008). Moreover, the use of behavioral-based extinction strategies with infants under age 6 months has been questioned due to concerns that these may negatively impact maternal-child outcomes (Whittingham & Douglas, 2014) and impair responsive and sensitive parent-child interactions and relationships (Blunden, Thompson, & Dawson, 2011). Still, both American (Honaker et al., 2018) and Canadian (Loutzenhiser et al., 2014) parents attempt behavioral-based sleep strategies in infants under age 6 months.

Alternatives to behavioral-based extinction strategies include prevention strategies and promotion of effective infant cue-based care. Yet, strategies to prevent infant sleep disturbances that focus on parent education have had mixed effects (Hiscock et al., 2014; Nikolopoulou & St James-Roberts, 2003; Stremmler et al., 2013; Stremmler et al., 2006). Parents of infants with sleep disturbances may experience heightened distress related to the added strain of sleep deprivation, which could diminish parental capacity to foster and perpetuate optimal parent-child interactions. While high quality parent-child interactions are crucial to providing effective-cue based relational care that maximizes child development potential and long-term outcomes (National Scientific Council on the Developing Child, 2007, 2010), programs focusing on infant cue-based approaches to improve infant sleep disturbances have not been experimentally examined (Ball, Douglas, Kulasinghe, Whittingham, & Hill, 2018; Priddis, 2009; Treyvaud, Rogers, Matthews, & Allen, 2009). As such, this research intends to extend sleep intervention research by creating a better understanding of how to situate infant sleep interventions into a broader relational family context.

Overview of Dissertation

The overall aim of this PhD dissertation was to better understand how promoting high-quality parent-child social interactions may influence a family's ability to improve infant sleep disturbances. In consultation with my primary supervisor, Dr. Karen Benzies, I developed an individualized video-feedback intervention, Play2Sleep. Play2Sleep integrates current science on infant sleep and child development to build parental capacity to read and respond to their infant's social and sleep-related cues. This research and the development of the Play2Sleep intervention was guided by a proposed nursing

theory for infant sleep and development, developed by Dr. Benzie and I (Chapter 2). The proposed theory synergistically combines Bronfenbrenner's (1977, 2005) Bioecological Theory of Human Development with the Barnard Model of parent-child interactions (Barnard, Eyres, Lobo, & Snyder, 1983; Oxford & Findlay, 2013). This approach integrates foundational parental knowledge on infant sleep within a relational context that supports sensitive and responsive caregiving. Due to the limited research on parent-child interactions and infant sleep disturbances, a mixed methods design was chosen to provide a comprehensive evaluation of Play2Sleep and better understand how to improve parent-child interactions in families experiencing infant sleep disturbances.

Research objective and questions. The purpose of this dissertation project was to evaluate and explore the effectiveness of Play2Sleep on families of infants with sleep disturbances. The overall objective was to use the experiences and perceptions of a subset of participant families (qualitative phase) to better understand the effectiveness of Play2Sleep in improving infant sleep disturbances (quantitative phase). The quantitative research question was: Does one dose of Play2Sleep delivered during home visits with mothers and fathers of 5-month-old infants with sleep disturbances reduce the number of night wakings at age 7 months? The qualitative phase focused on answering: What are parental perceptions of family experiences, processes, and contexts related to Play2Sleep and infant sleep disturbances? The overarching mixed methods research question was: How do parental perceptions of family experiences, processes, and contexts related to infant sleep explain the effectiveness of Play2Sleep?

Structure of dissertation. This PhD dissertation was prepared as a hybrid manuscript-based dissertation and describes the theoretical basis, study design, and

findings in three consecutive chapters formatted for publication or submission to journals. Following this introductory chapter, Chapter 2 describes the theoretical basis of the Play2Sleep intervention in a published manuscript entitled, “A proposed nursing theory: Infant sleep and development” (Keys & Benzies, 2018). This proposed theory informed the research design, methods, and published protocol outlined in Chapter 3, entitled, “Using Play to improve infant sleep: A mixed methods protocol to evaluate the effectiveness of the Play2Sleep intervention” (Keys, Benzies, Kirk, & Duffett-Leger, 2018). Chapter 4 features the manuscript entitled, “Effect of Play2Sleep for mothers and fathers of 5-month-old infants”, which describes the quantitative results of the randomized controlled trial that tested the effect of the Play2Sleep intervention compared to infant sleep information alone. Chapter 4 also describes the qualitative findings that explain the potential mechanism and effectiveness of Play2Sleep. Chapter 4 was written for submission to the journal *Pediatrics*. The remaining chapters have been written as traditional dissertation chapters and are not formatted for individual submission for publication. Chapter 5 describes themes from the broader common parental experiences of infant sleep disturbances that crossed intervention groups. Chapter 6 synthesizes quantitative and qualitative findings described in Chapters 4 and 5 to expand on the mixed methods integration by linking the study findings back to the theoretical foundation described in Chapter 2. Chapter 7 concludes this dissertation by outlining the potential impact and recommendations on future directions for research and practice.

Significance

Parent-child interactions are powerful influencers of child development. Infant sleep disturbances occur during a critical time of brain development and can cause

considerable amounts of distress for families. This distress may strain parent-child interactions, which could perpetuate sleep disturbances and distress. Parent-child interactions are modifiable and can be improved with support; public health nurses are well-positioned to provide this support. As such, there is a need to better understand the intersection between parent-child interactions and families experiencing infant sleep disturbances. The research presented in this dissertation is, to my knowledge, one of the first in-depth examinations of parent-child interactions in both mothers and fathers to provide a more comprehensive understanding of the interplay between family system and infant sleep.

Chapter 2: A Proposed Nursing Theory: Infant Sleep and Development

Keys, E. M., & Benzies, K. M. (2018). A proposed nursing theory: Infant sleep and development. *Nursing Science Quarterly*, 31(3), 279-286.

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Introduction

Sleep during infancy (0 to 2 years of age) is associated with a number of developmental outcomes (Field, 2017; Tham, Schneider, & Broekman, 2017). Supporting families to manage infant sleep could mitigate a cascade of sleep-related health and social challenges (Mindell et al., 2016). Interventions to reduce behaviors that reinforce parental involvement in sleep associations decrease infant night signaling and night wakings (Mindell et al., 2006). Although effective, parents in the community may have difficulties implementing these interventions (Loutzenhiser et al., 2014). Further, there is need to understand why certain interventions work for some families and not others (Kempler, Sharpe, Miller, & Bartlett, 2016; Meltzer & Mindell, 2014).

Registered nurses, particularly those in community settings, have competencies including the planning and evaluation of care, knowledge of child development, fostering role transitions, and relational skills that foster capacity building (e.g., Canadian Nurses Association, 2015; Community Health Nurses of Canada, 2011). Thus, nurses are well-equipped to assist families of young infants address concerns about infant sleep, while supporting the development of both the infant and their family. Yet, nurses do not yet have a theory that guides practice and research by relating infant sleep to child and family development.

A number of theories and models have been used to understand infant sleep, with a growing trend towards those rooted in social and ecological system perspectives (e.g., (El-Sheikh & Sadeh, 2015; Sadeh et al., 2010). While promising, these perspectives are not informed by a nursing standpoint. If nurses are to capitalize on their relational skills

to support families of infants, they should engage in further development of knowledge regarding how infant sleep relates to child and family development.

El-Sheikh and Sadeh (El-Sheikh & Sadeh, 2015) suggested Bronfenbrenner's (Bronfenbrenner, 1979) systems theory may have application when considering the complex network of biopsychosocial and cultural factors underlying sleep and development. Building on this perspective can situate infant sleep within the larger context of child development and may assist nurses to develop innovative strategies to support infant sleep with an ultimate goal of fostering optimal child and family development. Relying solely on Bronfenbrenner's theory provides insufficient depth related to the specific proximal processes, including the formative parent-infant interactions, which build the infant's immediate social and relational environment. As such, the purpose of this paper is to describe how the authors have complemented Bronfenbrenner's (1979, 2005) Bioecological Theory of Human Development with the Barnard Model of parent-child interactions (Barnard et al., 1983; Oxford & Findlay, 2013) to propose a new theory, with a corresponding visual framework, from which to understand infant sleep in nursing research and practice.

Bronfenbrenner's (2005) Bioecological Theory of Development forms the foundation of this proposed theory, while the Barnard Model (Barnard et al., 1983; Oxford & Findlay, 2013) informs understanding of the role of reciprocal and contingent parent-infant interactions. Fawcett and Desanto-Madeya's (Fawcett & Desanto-Madeya, 2013) criteria for evaluation of nursing theory guided us in synergistically combining the Barnard Model (Barnard et al., 1983; Oxford & Findlay, 2013) with Bronfenbrenner's Bioecological Theory of Development to develop a parsimonious theory of how nurses

can support infant sleep. Literature reviews and original research articles were purposively obtained from literature searches of Medline and CINAHL using “infant” and “sleep” as keywords and mapped to subject headings/terms, with priority given to recent literature.

Bronfenbrenner’s Bioecological Theory of Human Development

Bioecological Theory calls for a broader approach to investigating child development (Bronfenbrenner, 2005). Bronfenbrenner (1979, 2005) situates human development as a product of ongoing interactions occurring over periods of time using the concepts of Process-Person-Context-Time. The interactions among these concepts can influence development positively or negatively, depending on the dynamic and reciprocal influences of both individual and environmental characteristics on human development.

Development occurs when individuals demonstrate increasingly complex thoughts and behaviors that are maintained in a consistent pattern across periods of time, such as an infant’s ability to consolidate sleep periods by learning to transition independently between sleep cycles (Galland, Taylor, Elder, & Herbison, 2012). Building on El-Shiekh and Sadeh’s (2015) description of how Bronfenbrenner’s (1979, 2005) work explains the transactional nature of the child’s contexts, sleep, and development, Bronfenbrenner’s concepts of: (a) nested environments; (b) reciprocity of functional social systems within the microsystem; and (c) ecological validity are elaborated below.

Nested environments. Bronfenbrenner (1979, 2005) conceptualized environments within which humans develop as a nested series of a micro-system, mesosystems, exosystems, and macrosystem. These systems function within the

chronosystem, which represents how the passage of time, both historically and within an individual's lifetime, influences development. A microsystem refers to a person's immediate social and physical environment, as well as other persons who assume specific roles in an individual's development over a significant period of time and within a particular setting. Typically, the immediate family represents one of the most significant microsystems for infants (Bronfenbrenner, 1979, 2005). Parenting and parental characteristics within this immediate family play a crucial role in shaping infant sleep patterns (Field, 2017; Sadeh et al., 2010).

Mesosystems contain interrelations between an individual's microsystems (Bronfenbrenner, 1979, 2005). When an infant receives childcare from non-family members, one mesosystem would consist of the intersection between home life and the child's childcare experience. Nighttime sleep patterns at home may interact with childcare experiences, as evidenced by the association between fragmented nighttime sleep and child care provider perceptions of poorer daytime behavior (Scher, Hall, Zaidman-Zait, & Weinberg, 2010).

The exosystem is comprised of external environments that indirectly influence an individual's development and could include parental workplaces (Bronfenbrenner, 1979, 2005). Although an infant may not have direct contact with their parents' place of work, irregular work shifts, or mandatory overtime may impede parental ability to provide regular and consistent sleep routines. Alternately, parenting couples may negotiate who responds to infant night wakings differently depending on their employment situations. In some families experiencing infant sleep disturbances, having a workplace to go to (which

offers respite from childcare duties), as opposed to being on parental leave, may mitigate maternal stress related to infant sleep (Sinai & Tikotzky, 2012).

The macrosystem describes overarching principles and institutions that, formally and informally, inform the concrete patterns, activities, and structures of the first three environments (Bronfenbrenner, 1979, 2005). For instance, when mothers return to work, they often remain primary nighttime caregivers (Sinai & Tikotzky, 2012). In turn, this macrosystem shapes the microsystem, reinforcing mothers to fulfill the role of primary caregiver.

Reciprocity of functional social systems within the microsystem. Although considering all environmental levels may offer insight when working with families to address infant sleep, the microsystem is of immediate and significant interest. Reciprocity within the microsystem explains interactions between an individual and their microsystem, as well as the recognition of the entire functional social system in which the individual is involved (Bronfenbrenner, 1977). In recognizing reciprocity within parent-infant relationships, nurses should consider not only how parental behaviors shape interactions and relationships, but also how infant characteristics and behaviors shape the interaction and relationship (Bronfenbrenner, 1979, 2005). Bronfenbrenner and Ceci (1994) used the phrase “proximal process” (p. 568) to capture the way in which children interact with their environment to actualize or diminish their developmental potential. Thus, reciprocity situates humans as active agents of their own development, meaning that they can effect change within their own environments, which in turn affects their development (Bronfenbrenner, 1979, 2005). For example, although environmental factors explain a large proportion of infant sleep patterns, individual genetics still account for

almost a third of the variance (Brescianini et al., 2011). Parental perception of negative (Sorondo & Reeb-Sutherland, 2015) and reactive (Netsi, Evans, Wulff, O'Mahen, & Ramchandani, 2015) infant temperaments (thought to be genetically influenced) may be associated with poorer infant sleep.

Bronfenbrenner (1977) presumed all social systems within an individual's immediate environment are important to development. These social systems combine to represent the functional social system of the individual (1977). As such, nurses should consider how multiple family members combine to form a microsystem and account for how these multiple social relationships shape the resulting functional social system that shapes infant sleep patterns. Further, parental experiences and behaviors towards infants may be shaped by the presence or absence of other adults (Bronfenbrenner, 1977). For instance, higher engagement of fathers in child care activities can moderate and decrease maternal stress attributed to infant sleep disturbances (Millikovsky-Ayalon, Atzaba-Poria, & Meiri, 2015). Thus, nurses working with families to support infant sleep may wish to consider how parents may influence each other's experiences and behaviors.

Ecological validity. Bronfenbrenner (1977) considered much of child development research to be “the science of the strange behavior of children in strange situations with strange adults for the briefest possible periods of time” (p. 513). Bronfenbrenner (1977, 2005) urged individuals involved in child development research to move beyond typical approaches and contextualize development using real-life and everyday contexts in which children grow and develop. This approach would achieve ecological validity (Bronfenbrenner, 1977). Thus, in-home observations of sleep patterns over a designated period of time have greater ecological validity than brief laboratory

observations. Consideration of ecological validity should direct selection of the most appropriate tool to measure particular aspects of sleep (Sadeh, 2015).

Barnard Model

While Bronfenbrenner (1977, 2005) offered a rich theory to advance developmental research, his theory offered little guidance on the concepts related to the interactions, or proximal processes, that occur between children and their caregivers. The Barnard Model (Barnard et al., 1983; Oxford & Findlay, 2013) forms the foundation of an excellent measure of proximal processes, or parent-child interactions, between caregivers and children under 3 years of age (Tryphonopoulos, Letourneau, & DiTommaso, 2016). Given the emphasis on interactions between caregivers and infants, integrating the Barnard Model may help explicitly focus on the direct and indirect proximal processes that shape infant sleep.

The Barnard Model (Barnard et al., 1983; Oxford & Findlay, 2013) demonstrates how the caregiver, infant, and their environment influence caregiver-infant interactions. From this model, Barnard and colleagues (Barnard et al., 1983) developed the parent-child interaction teaching and feeding scales, used internationally in both research and practice to assess the quality of caregiver-infant interactions (Tryphonopoulos et al., 2016). In terms of infant sleep and development, using the Barnard Model expands the focus beyond bedtime parenting practices to examine the foundational and underlying specific proximal processes that guide everyday parent-child interactions. Aligning with Bronfenbrenner's (1977, 2005) concepts of reciprocity, functional social systems, and ecological validity, the Barnard Model (Barnard et al., 1983; Oxford & Findlay, 2013) characterizes parent-child interactions as reciprocal and contingent processes whereby the

social signals of one individual elicit a response from the other individual, framed and influenced by their environments. A foundation of the Barnard Model (Barnard et al., 1983; Oxford & Findlay, 2013) is the infant's ability to signal a wide variety of physical, social, and emotional needs to their caregivers using a repertoire of verbal and non-verbal cues. Caregivers adapt their behaviors to respond to these signals, and this elicits a subsequent response by the infant (Oxford & Findlay, 2013).

The Barnard Model (Barnard et al., 1983; Oxford & Findlay, 2013) depicts shared responsibility, with each member of the dyad contributing to successful interactions in unique ways. The caregiver is responsible for accurately interpreting and responding to infant cues, as well as alleviating sources of distress and providing growth-fostering situations. At the same time, infants contribute to reciprocal interactions by providing clear cues and responding to the caregiver's attempts to interact. When considering development of sleep habits, the clarity of the infant's cues and responses to caregiver attempts to facilitate sleep initiation could shape certain parental practices related to sleep.

Critical to Barnard's Model (Barnard et al., 1983; Oxford & Findlay, 2013) is the dyad's ability to engage in a pattern of contingent behavior, or the capability of the dyad to respond and adapt to one another whereby the response of the person receiving the signal is dependent on timing and quality of the signal being sent. If one or both members are unable to fulfill their role, the quality may be hindered. Such interference may be related to environmental conditions or characteristics of the infant or parent. For example, mothers experiencing severe sleep deprivation report hindered interactions with their infants (Deleon, 2012). Lower parental tolerance for infant crying may be associated with

faster response time and decreased opportunities for infants to learn self-regulatory behaviors, which may set the stage for interaction patterns that promote and perpetuate infant sleep disturbance (Sadeh et al., 2016). Parental mental health concerns, which are often associated with infant sleep disturbance (Sadeh et al., 2010), may reduce parental offerings of growth-fostering situations (Kingston, Tough, & Whitfield, 2012). Nuanced differences exist in the interaction patterns between father- and mother-infant interactions (Harrison, Magill-Evans, & Benzies, 1999). These differences, in conjunction with distinctions between maternal and paternal cognitions about infant sleep (Sadeh, Flint-Ofir, Tirosh, & Tikotzky, 2007), may play an important role in the development of infant sleep patterns. Meanwhile, infant temperament, such as reactivity, may influence the infant's ability to provide and respond to social cues (Barnard et al., 1983; Oxford & Findlay, 2013). The influence of an infant's temperament on parent-child interactions illustrates Bronfenbrenner's (1977, 2005) concept that humans influence their environments and subsequent development. For example, mothers with severe sleep deprivation caused by infant night wakings are more likely to report their infant as difficult (Deleon, 2012), and lower maternal sleep quality can predict higher maternal perception of negative affect, specifically sadness, in their infants (Tikotzky, Chambers, Gaylor, & Manber, 2010).

Proposed Theory

The proposed theory positions infant sleep patterns as a function of family contexts and a contributor to child and family development within a set of nested environments (Figure 2.1). Two concepts are highlighted: (a) the family belief system and (b) the synchrony within the family microsystem. Together, these concepts shape

infant sleep patterns. In turn, infant sleep patterns influence the development of the child and family. Over time, this development can influence, by either reinforcing or disturbing, the family belief system as well as the synchrony within the family microsystem, and the resulting infant sleep patterns. Key assumptions of the proposed theory include (a) complexity based on the existence of multiple realities, (b) inclusion of all family members, and (c) a strengths-based perspective.

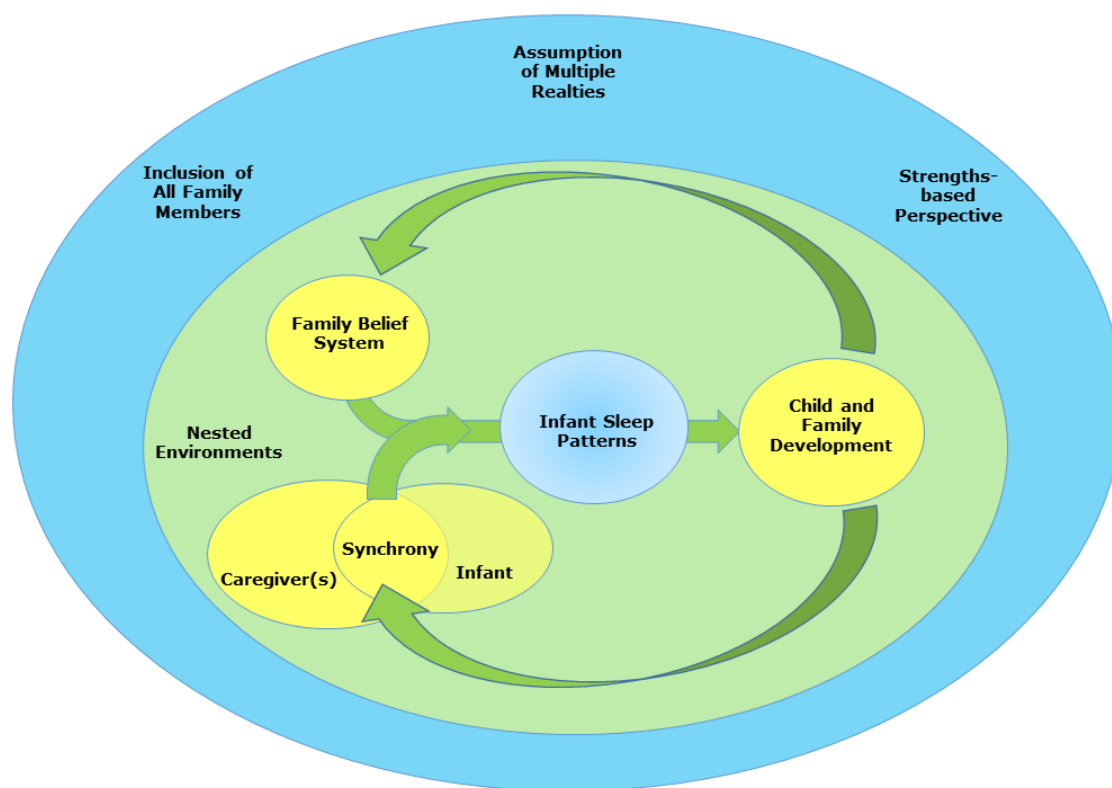


Figure 2.1. Proposed theoretical model.

Assumptions of the proposed theory for nursing practice. First, a genuine understanding of the complexity of infant sleep requires the nurse to assume the existence of multiple realities whereby nurses acknowledge families as situated within their own

contexts that affect each family members' experience (Chesla, 1995; Leahey & Harper-Jaques, 1996). As each family member experiences infant sleep patterns uniquely, nurses must accept the possibility of multiple concurrent realities and cannot apply a single 'truth' to the entire family experience (McKenna & Volpe, 2007). Nurses should consider how all family members' perceptions and experiences uniquely combine to influence the entire family unit's perceptions and experiences of infant sleep.

The second assumption relates to the meaning of family, and how the mother-infant dyad is tied to other significant relationships. One cannot assume that the mother is always the primary caregiver, although this is often the case. Moreover, the family itself grants membership (Wright & Leahey, 2013). Thus, nurses should account for other relationships, such as the father-infant relationship and mother-father relationship. Alternative family configurations may exist in the forms of single-parent families, same-sex couples, and those that include extended family. Consideration of other family relationships could enable nurses to have a more complete and meaningful understanding of the complex nature of infant sleep and its influence on child and family development.

The third assumption is that the family has capacity for optimal development in supportive environments (Wright & Leahey, 2013). This strengths-based perspective highlights, for both the family and the nurse, strengths that could be mobilized to enhance the family's ability to manage infant sleep. This assumption recognizes the family's unique knowledge and expertise regarding their own family and experience of infant sleep, shifting the nurse from expert to collaborator.

Family belief system. The interactions between the family microsystem and the encompassing macrosystem inform the structure and meaning of expectations and beliefs

about infant sleep based on informal and formal sociocultural systems. Social and cultural values held within the macrosystem inform the family's beliefs, assumptions, and parenting practices related to infant sleep (Jenni & Werner, 2011). Combined with individual beliefs, assumptions, and experiences related to infant sleep, each family constructs their belief system, which informs expectations surrounding infant sleep and the family's perception of what is considered as appropriate infant sleep patterns and practices, as well as acceptable parental responses. The family's belief system may or may not be supported by their social, cultural, and physical environments or the infant's developmental capacity. Depending on how the belief system aligns with these environments and capacities, the family may require culturally sensitive assistance from nurses in terms of aligning expectations or beliefs (Jenni & Werner, 2011; Sadeh et al., 2010).

Synchrony within the family microsystem. Synchrony is concerned with relational exchanges that occur between the parent(s) and infant within the microsystem. The Barnard Model (Barnard et al., 1983; Oxford & Findlay, 2013) informs how parent-child interactions achieve synchrony, which refers not only to behaviors and practices directly related to infant sleep but the foundational parent-child interaction patterns as well. The degree to which these relational exchanges, or proximal processes, achieve synchrony may influence infant sleep and subsequent development.

Both the infant and parent(s) have many complex and inter-related characteristics; thus, there is no ubiquitous and definitive strategy to achieve synchrony for every family. An infant's individual needs relating to sleep may be influenced by their genetics (Fisher, van Jaarsveld, Llewellyn, & Wardle, 2012), birth weight and preterm birth (Asaka &

Takada, 2010), and chronological age (Galland et al., 2012). Over half of mothers of preterm infants consider their infant's sleep to be problematic at 5 to 6 months of age (Ali, Hall, Warnock, Wong, & Ratner, 2014). Meanwhile, a caregiver's interactions with their infant and ability to optimally meet their child's unique needs may be influenced by separation anxiety (Scher, 2008), and the parent's own attachment status (Benoit, Zeanah, Boucher, & Minde, 1992), as well as parental age and education level (Oxford & Findlay, 2013).

The concept that synchrony of both sleep-related and foundational parent-child interactions, in addition to the individual parent and infant characteristics, shape infant sleep patterns is an essential premise of the proposed theory. Researchers evaluating interventions designed to optimize overall parent-child interactions have also noted significant improvements in parental ratings of sleep disturbances (Oxford, Fleming, Nelson, Kelly, & Spieker, 2013; Treyvaud et al., 2009). Thus, it may be beneficial to use broader conceptualizations of parent-infant interactions in a nursing theory pertaining to infant sleep, particularly those that capture synchrony of the family microsystem.

The synchrony construct presented in the proposed theory does not place sole responsibility for the interaction on the mother but honors the infant's own personhood as contributing to the interactive relationship. Therefore, synchrony is not innately linked to either the parent's or infant's particular behavior, but how well aligned their interactions are, which influences the ability of the pair to effectively engage together. If synchrony is suboptimal, it may lead to the development of infant sleep patterns that are perceived as disturbances. For example, sleep disturbances may develop in a family in which a parent

continually attempts new sleep-related routines with an infant who is less adaptable and more temperamentally inclined to needing very structured and consistent routines.

When considering synchrony, the proposed theory embeds Bronfenbrenner's (1977, 2005) premise that the presence or absence of other family members may affect the proximal processes that occur within each dyad. Thus, in families with dual parents, as well as those involving additional or alternate caregivers (i.e., a grandmother), it recognizes how other adults contribute to interactive relationships and synchrony within the microsystem. For instance, although both mothers and fathers of older infants and toddlers who experience sleep disturbances report higher stress and increased bedtime parental involvement, parental stress was reduced in families with higher paternal involvement (Millikovsky-Ayalon et al., 2015). Moreover, higher levels of paternal involvement in infant care may prevent infant sleep disturbance (Tikotzky, Sadeh, & Glickman-Gavrieli, 2011).

Infant sleep patterns. The convergence of the family beliefs with the synchrony of the family microsystems influences how the family shapes and experiences the infant's sleep patterns. For example, alignment between parental sleep attitudes with actual family sleep practices likely increases parental satisfaction of family sleep arrangements (Germo, Chang, Keller, & Goldberg, 2007). While infants and parents with wide ranges of characteristics and behaviors can achieve synchrony, if the two are unable to overlap in a synchronous way, with infant sleep patterns that are congruent with family beliefs, families may perceive infant sleep as problematic. When these systems are discordant, and infant sleep is perceived as problematic, this resulting dissonance could negatively influence the environmental context of child development. For example, infant night

waking has an indirect effect, via parental wakings and depression, on decreased co-parenting quality (McDaniel & Teti, 2012).

Child and family development. In the proposed theory, infant sleep patterns can positively or negatively influence child and family development. The proposed theory emphasizes implications of infant sleep, related to contexts and processes for both the infant and parent(s), as well as the family unit. Thus, infants can modify their environments through their interactions with caregivers and participate in their own development.

If infant sleep patterns are considered problematic, there is a disruption of conditions that support optimal development. When this occurs, infant sleep patterns elicit negative influences on development by decreasing parental mental and physical health, confidence and self-efficacy, as well as increasing feelings of parental stress, blame and guilt, and fatigue (Sadeh et al., 2010). Meanwhile, the development of both the infant and family reciprocally influence the family's beliefs, as well as the synchrony of the family microsystem. These influences may either inhibit or promote adaptive changes in the family beliefs and/or the synchrony, which may either reinforce or mitigate existing infant sleep patterns in a cyclical manner.

A recent study by Saxbe (Saxbe et al., 2016) highlights the utility of the proposed new theory. Saxbe et al. demonstrated how poor parental sleep, associated with infant sleep patterns, decreased the synchrony within the microsystem, and was also associated with depressive symptoms up to 12 months postpartum. Further, Saxbe et al. found poorer sleep in mothers was associated with increased rates of postpartum depression in fathers. These findings highlight the effect of infant sleep patterns, as manifested by

poorer parental sleep quality, on the development of the family, as evidenced by the development and maintenance of parental depressive symptoms, which then continues to decrease the synchrony within the microsystem. Over time, without intervention in one of the core concepts (in this case, likely infant sleep patterns and/or the microsystem synchrony), the cycle is reinforced and perpetuated.

Implications for Nursing

The proposed theory encourages nurses to assume a broad approach when considering infant sleep, where nurses consider factors directly related to infant sleep and those that facilitate sustainable environments and conditions to promote development and health. The work of supporting infant sleep in families can be extended to fostering environmental conditions that promote optimal development of infants, as well as the development of parents and of the overall family unit. As such, the proposed theory should provide nurses with a theory of infant sleep, contextualized within families' unique environments, and guide the design of meaningful nursing interventions to improve outcomes in child and family development.

Infant sleep interventions typically focus on addressing problematic sleep-specific behaviors and interactions, often while providing sleep information relevant to the infant's development and age (Meltzer & Mindell, 2014; Mindell & Owens, 2015). The proposed theory suggests that nurses should maximize the impact of these interventions by also addressing the foundational parent-child interactions that act as the building blocks of interaction patterns to develop parents' relational skills that are transferrable throughout the parenting experience. Nurses may otherwise risk imposing interventions that fix superficial or problem behaviors, but do not address the underlying challenges

(Sadeh et al., 2010). Accordingly, using the proposed theory should help direct nurses to consider both the overt and underlying challenges that may be associated with infant sleep.

By proposing a new theory, the authors hope to broaden the focus beyond daytime and nighttime sleep behaviors to achieve a holistic perspective of sleep, which includes the environments and familial socio-cultural contexts of young children. Doing so may help to reorient approaches to helping families set the conditions for optimal health and development while offering a perspective that complements health promotion, prevention, and treatment of sleep-specific concerns. This approach promotes acknowledgement of family strengths and resources, as well as the individualization of sleep-promoting strategies and interventions depending on the relationship each parent has with their infant, helping to maintain the ecological validity of the assessment and intervention. Thus, the proposed theory directs nurses to consider the appropriateness of strategies and interventions to ensure they are meaningful and feasible for the family by also considering parenting and family sociocultural beliefs and goals.

Conclusion

The proposed theory, informed by Bronfenbrenner's (1977, 2005) Bioecological Theory of Human Development and the Barnard Model (Barnard et al., 1983; Oxford & Findlay, 2013), offers nurses a unique and novel perspective with which to approach infant sleep, and ultimately, child and family development. In this proposed theory, synchrony within the family microsystem combines the family belief system to influence infant sleep patterns. In turn, infant sleep patterns influence child and family development, which subsequently serves to influence the family's synchrony and belief

systems. The theory situates this circular pattern within the family's nested environments. It also assumes that nurses who use this theory in research and practice will ground their work in the assumptions of inclusion of all family members, multiple realities, and a strengths-based perspective. Using this proposed theory should guide a more comprehensive understanding for nurses of how infant sleep relates to child and family development, as well as generate innovative and meaningful nursing interventions to support infant sleep and child and family development.

**Chapter 3: Using Play to Improve Infant Sleep: A Mixed Methods Protocol to
Evaluate the Effectiveness of the Play2Sleep Intervention**

Keys, E. M., Benzie, K. M., Kirk, V., & Duffett-Leger, L. (2018). Play2Sleep: A mixed methods protocol using play to improve infant sleep. *Frontiers in Psychiatry*, 9, 109.

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Introduction

Approximately one in four Canadian families experience infant sleep disturbances (Loutzenhiser et al., 2011). Infant sleep disturbances are associated with parental feelings of guilt and helplessness, as well as maternal depression and anxiety (Crncec, Cooper, & Matthey, 2010; Hiscock et al., 2007; Martin, Hiscock, Hardy, Davey, & Wake, 2007; Matthey & Speyer, 2008). Parents may bed-share with their infants in response to infant sleep disturbances despite awareness of safe sleep recommendations that discourage this practice (Ateah & Hamelin, 2008; McKenna & Volpe, 2007). Furthermore, infant sleep disturbances are associated with increased infant stress hormones (Scher et al., 2010) and may predict socio-emotional difficulties (Mindell et al., 2016). Assisting families in managing infant sleep disturbances may improve family health, as well as support child development. Time constraints and lack of provider confidence in being able to address sleep concerns may hinder primary health care providers' ability to address sleep concerns during primary care visits (Faruqui, Khubchandani, Price, Bolyard, & Reddy, 2011). The proliferation of privatized and unregulated sleep consultants (Mindell, Owens, Babcock, Crabtree, & Ingram, 2017) highlights a noteworthy gap in Canada's public health care system.

In a Cochrane review of postnatal parental education, parental education was shown to be effective in improving the amount of nighttime infant sleep duration by 29 minutes; however, similar improvements in infant crying were not observed (Bryanton, Beck, & Montelpare, 2013). Other individual trials provide further evidence that parental education on infant sleep can be an effective means for changing sleep-related parenting practices (Adachi et al., 2009) and improving infant nighttime sleep consolidation while

decreasing parental perception of night waking severity (Hall et al., 2015). Behavioral-based sleep interventions improve sleep in over 80% of children under age 5 years (Mindell et al., 2006). Yet, in a Canadian community-based survey, less than half of parents reported they were able to successfully manage their infant's sleep disturbances using behavioral-based sleep strategies (Loutzenhiser et al., 2014). Further, parents may experience reservations and practical challenges when applying behavioral-based approaches (Ramchandani, Wiggs, Webb, & Stores, 2000; Tse & Hall, 2008). Moreover, despite evidence that higher father engagement may mitigate maternal stress associated with infant sleep disturbances (Millikovsky-Ayalon et al., 2015) and reduce infant night wakings (Tikotzky et al., 2011), including fathers in infant sleep intervention research is limited.

Addressing only sleep-related parenting behaviors and interactions may be ineffective in improving broader parenting difficulties that may underlie infant sleep disturbances (Sadeh & Anders, 1993; Sadeh et al., 2010). When examining links between maternal sensitivity and infant sleep, researchers have found that maternal sensitivity was positively linked to subsequent, but not concurrent (Scher, 2001), sleep consolidation (Bordeleau, Bernier, & Carrier, 2012; Tétreault, Bouvette-Turcot, Bernier, & Bailey, 2017). Mothers observed to be more sensitive during an unstructured play session, according to the adult sensitivity scale of the Child-Adult Relationship Experimental Index, reported better perceived sleep quality in their 7 to 18 month old infants (Priddis & Wells, 2010). However, parent-child interactions are influenced by more than only maternal sensitivity and it may be important to recognize the dyadic nature of parent-child interactions. For instance, Scher (2001) found that infants who were highly

responsive in play interactions had more frequent night wakings than infants who were not as responsive. Some researchers have instead examined how infant sleep may be related to emotional availability, a dyadic concept that considers the emotional quality of parent-child interactions and includes sensitivity. Findings from these researchers demonstrate a positive association between greater emotional availability at bedtime and fewer night wakings (Teti, Kim, Mayer, & Countermine, 2010) and more rapid increases in the amount of night time sleep during the first 6 months of life (Philbrook & Teti, 2016b).

Treyvaud and colleagues (2009) found mothers who reported poorer sleep quality themselves were observed to have greater difficulty recognizing and responding to their infant's subtle and potent social cues. Over the duration of a 5-day residential parenting program, this sample of mothers was observed to have improvements in overall parent-child interactions, including contingent responses, and perceived that their child's behavior difficulties, 80% of which were related to sleep issues, had decreased in frequency and severity (Treyvaud et al., 2009). Another intervention with parents of maltreated toddlers aimed at improving the parent-child relationship by promoting responsive care using a series of video feedback sessions resulted in a reduction in sleep disturbances (Spieker, Oxford, Kelly, Nelson, & Fleming, 2012). However, researchers have not examined this relational approach in an otherwise healthy community-based population experiencing sleep disturbances. Thus, promoting positive parent-child interactions in a manner that enhances parental ability to identify infant sleep-related social cues represents a novel strategy that could be used to complement educational

approaches to more effectively support families challenged with infant sleep disturbances.

Parent-child interactions influence the architecture of children's growing brains, as well as developmental outcomes (Center on the Developing Child at Harvard University, 2016; Shonkoff & Fisher, 2013). High quality parent-child interactions occur with sensitive and effective parental behaviors that are contingent upon the child's clear and responsive verbal and non-verbal communication cues (Lutz, Anderson, Riesch, Pridham, & Becker, 2009; Oxford & Findlay, 2013). Parent coaching can improve the quality of parent-child interactions. This type of coaching is closely aligned with the skill set of registered nurses, such as expertise in relational communication, knowledge of healthy early childhood development, and proficiency in strengths-based approaches (Community Health Nurses of Canada, 2011). Providing personalized feedback on self-modeled, video-recorded, structured parent-infant interactions is a feasible and effective strategy for improving parental interactions with preterm and term infants (Bakermans-Kranenburg, Van Ijzendoorn, & Juffer, 2003; Benzies, Magill-Evans, Harrison, MacPhail, & Kimak, 2008; Benzies et al., 2013; Magill-Evans, Harrison, Benzies, Gierl, & Kimak, 2007).

The proposed nursing theory described by Keys and Benzies (2018) forms the theoretical underpinnings of this study. Informed by Bronfenbrenner's ecological theory (1977, 2005) and Barnard's Model of parent-child interactions (Barnard et al., 1983), Keys and Benzies (2018) guide nurses to consider parental knowledge and beliefs about infant sleep with the family's synchrony, not only relating to sleep, but also the family's ability to engage in effective parent-infant interactions. As such, nurses are encouraged to

enhance parental knowledge related to infant sleep, as well as the underlying foundational familial interactions that support parental ability to apply knowledge relating to infant sleep during daily and foundational parent-infant interactions.

Play2Sleep is an intervention that uses personalized feedback of structured parent-infant play sessions. This approach could help address broader parenting difficulties that may underlie infant sleep disturbances by enhancing parental ability to identify and respond appropriately to their infant's specific sleep-related and social cues. This study extends previous self-modeled, video-recorded interaction guidance interventions and aims to evaluate Play2Sleep to improve infant sleep. This protocol was prepared in accordance with the SPIRIT guidelines (Chan et al., 2013), as well as the TIDieR checklist and guide (Hoffmann et al., 2014) for reporting of interventions.

The overarching mixed methods research aim is to understand how parental perceptions of family experiences, processes, and contexts related to infant sleep explain the effectiveness of Play2Sleep. The objective of the quantitative phase is to compare the effect on infant sleep of one dose of Play2Sleep delivered during home visits with mothers and fathers of 5-month-old infants with sleep disturbances against standard infant sleep education only. The primary hypothesis is that Play2Sleep will decrease the number of night wakings at age 7 months. The objective of the qualitative phase is to describe parental perceptions of family experiences, processes, and contexts related to Play2Sleep and infant sleep.

Materials and Equipment

Study design. This study will employ a mixed method, explanatory sequential design to evaluate the Play2Sleep intervention, with priority given to the quantitative

phase (Figure 3.1). Phase 1 is a single center, prospective, randomized, controlled, parallel group, two arm, superiority trial with a 1:1 allocation ratio (ClinicalTrials.gov, identifier NCT02742155). Baseline data collection and intervention will occur when the infant is 5 months of age (± 2 weeks), with outcomes measured when the infant is 7 months of age (± 2 weeks). During Phase 2, interviews will be conducted with a subset of participating families (mothers and fathers together) about their perceptions and experiences related to their infant's sleep. The interviews will occur after the outcome home visit takes place, and analyzed using thematic analysis. Phase 3, the integration phase, will focus on explaining the quantitative results from Phase 1 using the qualitative findings from Phase 2.

Rationale for study design. Researchers are increasingly using qualitative research to facilitate the interpretation of randomized controlled trial (RCT) findings (O'Cathain, Thomas, Drabble, Rudolph, & Hewison, 2013). The quantitative phase will provide evidence relating to the measurable impact of Play2Sleep, while the qualitative phase will provide crucial information that will contextualize the outcomes of Play2Sleep and increase understanding of the processes that contribute to its effectiveness. The integration of qualitative and quantitative findings will be used to explain the measurable impact of Play2Sleep using perceptions and experiences described by parents.

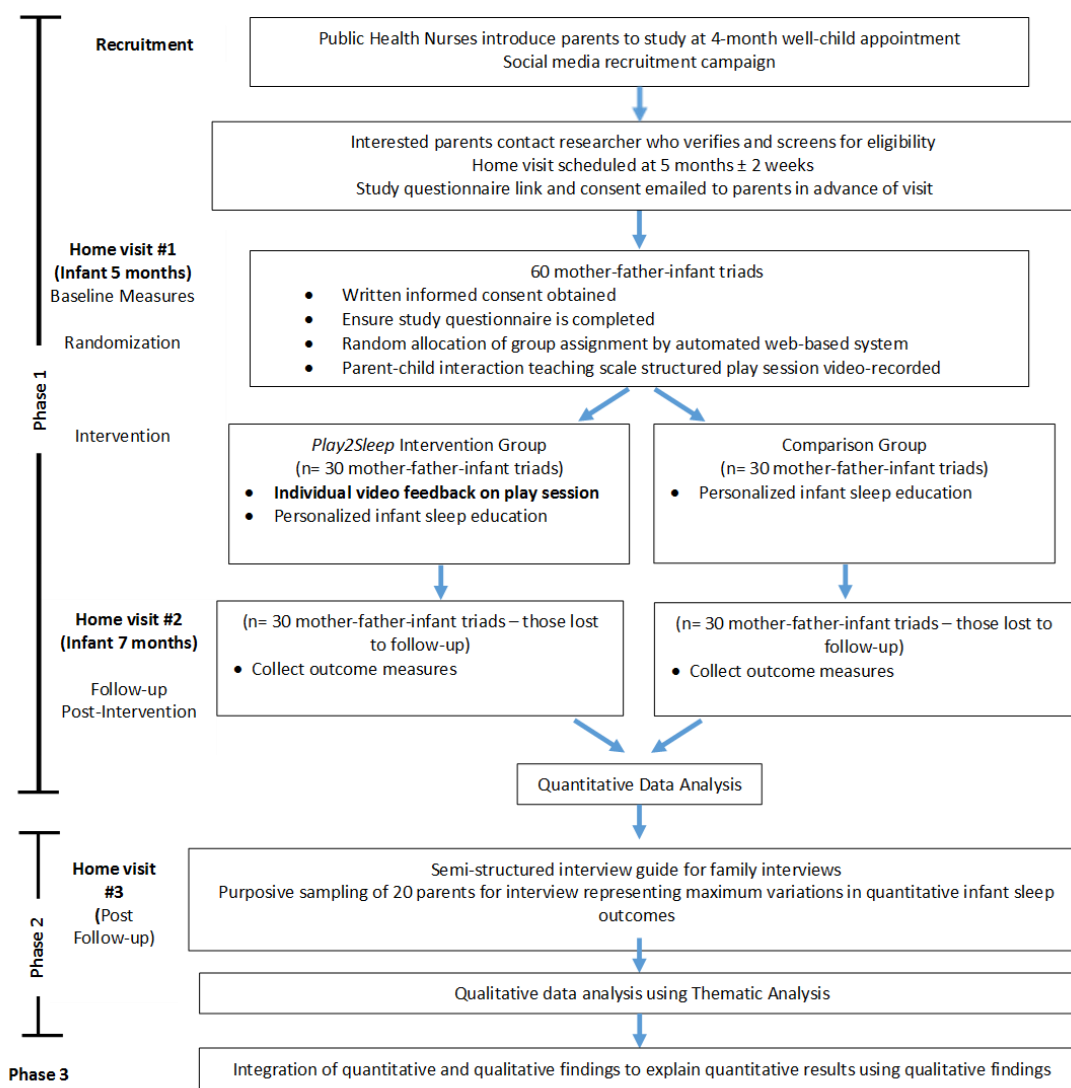


Figure 3.1. Study flow chart.

Participants. The study will take place in a large urban center in Western Canada (Calgary, Alberta). Public health nurses will introduce potential participants to the study during 4-month well-baby clinics at eight urban-zone local community health centers. In addition to recruitment posters and postcards placed at each of the community health centers, researchers will use a social media campaign to promote the study on Facebook

and Kijiji. At the community health centers, interested families will receive a card with a brief description of the study and public health nurses will request written permission from the parents to be contacted by the researcher. Upon contact with interested families, the researcher will follow a telephone script to (a) screen parents for eligibility, (b) obtain verbal consent from both parents to participate, (c) collect contact information, and (d) schedule the first home visit. Parents who are ineligible for the study will be offered standard public health information on infant sleep and provided with a list of community resources to which they can self-refer.

Participants (mothers and fathers) will be eligible if they meet the following inclusion criteria: (a) are co-habiting mothers and fathers of full-term, healthy, singleton, 4-month old infants; (b) are first-time parents; (c) are able to read, write, and speak English; (d) perceive that their infant has sleep disturbances; (e) have an infant who has greater than 3 night wakings per night and/or is awake greater than 60 minutes during the night, and/or has less than 9 hours total day and night time sleep. Infants meeting one or more of these three objected sleep criteria were considered to be a poor sleeper by Sadeh (2004) in the development of the original BISQ. Participants will be excluded if there is a known or suspected medical or physiological cause of sleep disturbance in either parent or their infant.

Sample size. The effect size for the sample size calculation for the quantitative phase was estimated from research that examined brief sleep interventions with the number of night wakings as the primary outcome. A study of a brief internet intervention for families of young children up to age 3 years that provided a customized sleep program, with and without a standardized bedtime routine, found relatively large effect

sizes (partial eta squared) of 0.442 and 0.441, respectively (Mindell et al., 2011a). In a narrower age group of infants 6 to 12 months, Hall and colleagues (2006) found an effect size (Cohen's d) of 0.64 for an intervention that included a 2-hour teaching session and telephone support for parents. An a priori analysis was conducted in G*Power for repeated measures ANOVA, between factors (Faul, Erdfelder, Lang, & Buchner, 2007). This calculation determined that a total sample size of 60 mother-father-infant triads (30 families in each group) would detect an effect size of 0.32 with a power of .80 at a .05 level of significance (Figure 3.2), which is below the effect size of the aforementioned studies (Hall et al., 2006; Mindell et al., 2011a). Recruitment will be ongoing until complete data are collected from 60 families. Based on previous studies (Benzies et al., 2013; Magill-Evans et al., 2007), attrition is estimated to be very low (less than 5%) after the initial home visit. Figure 3.3 shows the proposed Consolidated Standards of Reporting Trials (CONSORT) flow diagram.

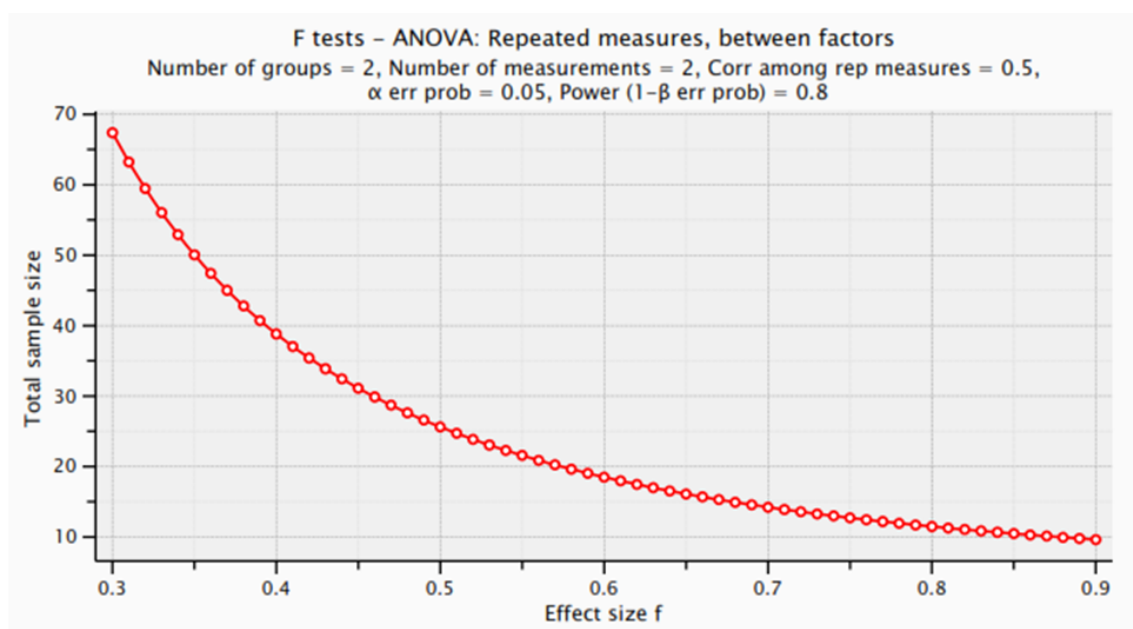


Figure 3.2. Effect size as a function of total sample size for power of .80.

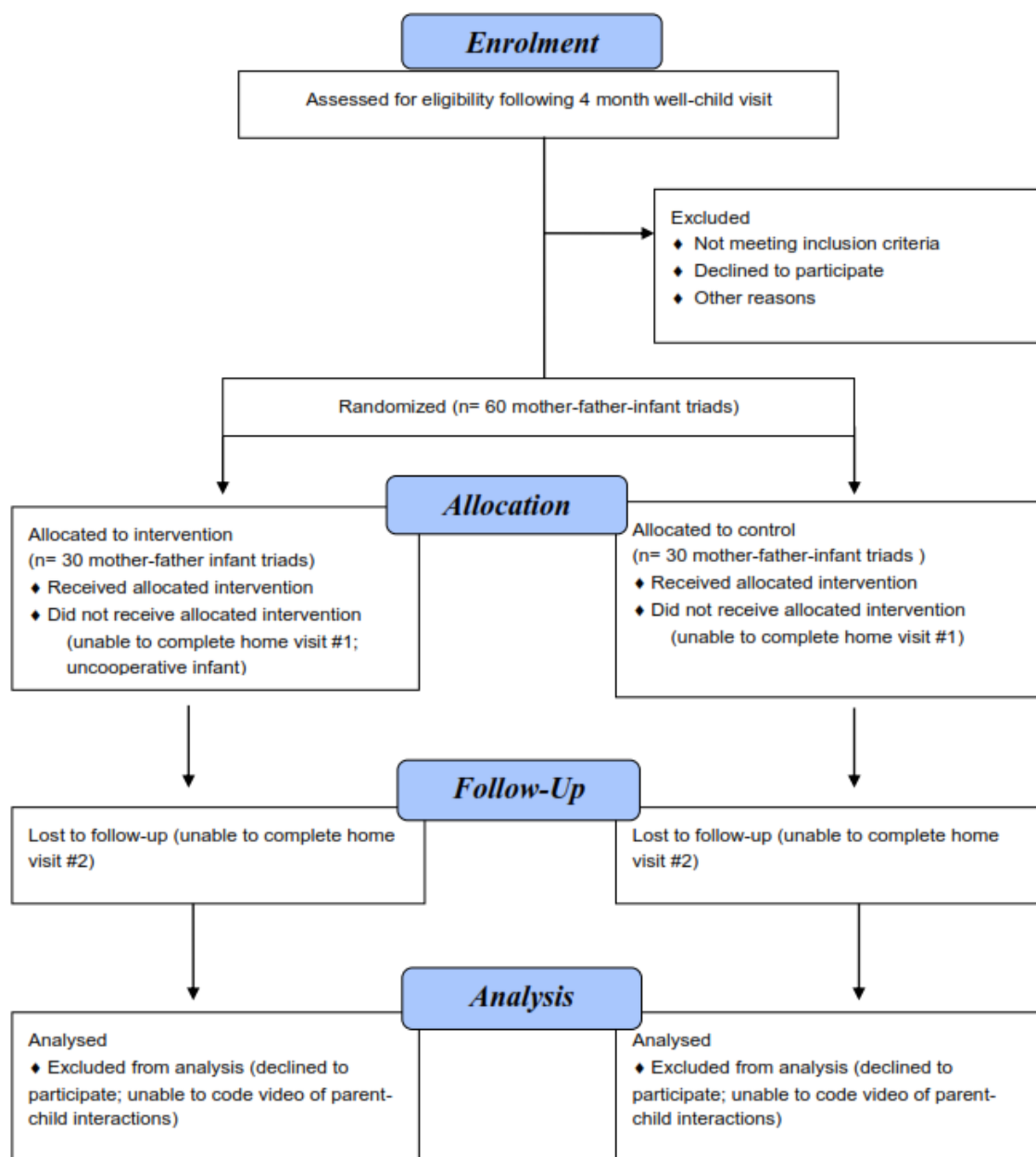


Figure 3.3. Proposed CONSORT flow diagram.

For the qualitative component in Phase 2, Braun and Clarke (n.d.) have recommended using sample sizes of 10 to 20 for a medium scope thematic analysis

project. Because this thematic analysis is part of a larger mixed methods study and could thus be considered a project of medium scope, 20 families (10 from the experimental group and 10 from the comparison group) will be included in Phase 2.

Trial arms.

Play2Sleep experimental group. The Play2Sleep intervention will be administered during a home visit. Mothers and fathers will be recorded separately while engaging in a structured play session with their infant that typically lasts 3-5 minutes, but no longer than 10 minutes, as per the Parent-Child Interaction Teaching Scale (PCITS) protocol (Oxford & Findlay, 2013). Immediately following the play session, a specially trained registered nurse (EK) will review the video recording with each parent separately, which will take about 15 minutes per parent. During this review, parents will receive 2 to 3 positive feedback comments on behaviors that promote overall interaction and child development, as well as 1 to 2 suggestions for areas of growth. To help parents address infant sleep concerns, this video feedback will also include the identification of real-life examples of the individual infant's actual social and sleep related cues, including both subtle and potent cues for engagement and disengagement, as described by NCAST Programs (Oxford & Findlay, 2013). According to the robust and well-defined NCAST classification system, infant cues can be broken down into engagement and disengagement cues (Oxford & Findlay, 2013). Engagement and disengagement cues are further broken down into subtle and potent cues. Both the subtle and potent disengagement cues are similar to cues that indicated drowsy and overtired infant states. We use the structured play session to elicit infant disengagement cues (both subtle and potent) to provide examples of the variety and range of cues that infants may use to

indicate to their parents that they are needing a break soon, with sleep being an important and penultimate “break” from interaction. Particular attention will be focused on helping parents identify clusters of subtle and/or potent disengagement cues (Table 3.1) that signal the infant requires a break from the interaction, as well as additional indicators of the drowsy state (Oxford & Findlay, 2013). A handout distinguishing subtle and potent disengagement cues will be provided to parents to reinforce the information presented. Provided the infant does not require care (feeding, diaper change, etc.) during the intervention, the entire play session and review will take approximately 20 to 30 minutes for each parent. Thus, the total play-related component of the Play2Sleep intervention, including the collection of the video-taped play interaction, takes approximately 50 minutes (5-10 minutes of play, plus 15 minutes of review, for each parent). During the video recording and review, the other parent will be asked to remain in another room out of visual and auditory contact with the interaction. At the end of the visit, the standard public health handouts on infant sleep will be reviewed with both parents together. These handouts include information on typical infant sleep patterns, including infant sleep cycles and sleep cues, as well as the importance of sleep associations and routines. Copies of these handouts are available online at: <http://foothillsnetwork.ca/get-informed/helpful-links/>. This discussion will take approximately 30 minutes, and it will be individualized to focus on the parents’ most pressing sleep-related concerns. The total home visit length for the Play2Sleep Experimental Group is approximately 1.5 hours.

Table 3.1. *Subtle Disengagement, Potent Disengagement, and Drowsy Cues*
(Oxford & Findlay, 2013)

Subtle	Potent	Drowsy
Gaze aversion, looking away	Back arching	Variable activity
Hand-behind-head or ears	Halt hand	Irregular respirations
Hand to mouth, eye, ear, or stomach	Pushing or pulling	Opens and closes eyes
Dull looking face/eye,	away,	Eyes glazed, heavy-
Head lowering	Crying, cry face	lidded look
Joined hands, self-clasp	Maximal lateral gaze	Delayed
Lip compression, grimace, or pout,	aversion	responsiveness
Sobering, tongue show, ugh face,	Overhand beating	
Cling posture, diffuse body movements		
Facial grimace,		
Frown or brow lowering		
Finger extension		
Yawn		
Rapid wrist rotation		
Wing palm		

Comparison group. The comparison group will also receive an intervention during a home visit. The comparison intervention consists only of the individualized review of the standard public health handouts on infant sleep with both parents, based on the parents' most pressing sleep-related concerns. This discussion will take approximately 30 minutes. Although each parent in the comparison group will be video-recorded engaging in a play session to capture baseline and outcome parent-child interactions, they will not receive any feedback or review of the video recording. Instead of completing reviews of the videotaped play session, the home visitor proceeds directly to the discussion with both parents of the standard public health handouts on infant sleep. Thus, the comparison group home visit lasts approximately 1 hour, which is about the same length of time for the intervention group.

Discontinuing or modifying allocated interventions. Given the brevity of the intervention, situations that require discontinuing or modifying the allocated intervention are expected to be rare. In cases of family illness or acute parental mental or physical health concerns, the home visit will be either rescheduled or discontinued altogether, according to family preference. Families who discontinue will be offered a listing of local community health services to which they can self-refer.

Adherence. Strategies to increase adherence to study intervention protocols include the use of the same home visitor (EK) for baseline home visits. As the intervention is concentrated in one home visit and relates to increasing parental ability to read and respond to their infant's sleep and social cues, no additional adherence strategies will be used. Families will be allowed to contact the home visitor if they required clarification about the information provided during the home visit.

Concomitant care. Families in both groups will not be restricted to using only the sleep strategies or suggestions received during the home visit. Rather, the baseline and outcome questionnaires will collect information about any additional strategies, resources, or services parents use.

Blinding. Given that the same home visitor will conduct both the experimental and comparison interventions, the home visitor cannot be blinded to group. Participants will be partially blinded by being informed that the research study is testing two different types of information about infant sleep during the home visit to see which one is superior. In addition, both groups will complete the PCITS protocol as an indicator of the quality of parent-child interactions, which requires parents to engage in a brief structured play interaction with their child. Blinding to group will occur during coding of parent-child

interaction videos and data analysis. Given the brief and low-risk nature of the intervention, there are no anticipated circumstances under which unblinding will be required.

Equipment. A PCITS kit (www.ncast.org), along with a digital video camera (Sony HDR-XR350 Handycam Camcorder) and adjustable tripod will be required for the home visits. In addition, a monitor (Sharp LC-13E1U television monitor) that connects to the video camera to play back the digitally-recorded play sessions will be used. For the family interviews, a digital voice recorder (Sony IC recorder ICD-SX68) will be used to audio record the interviews.

Measures. The primary infant sleep outcome will be the frequency of night wakings, as measured by the expanded version of the Brief Infant Sleep Questionnaire (BISQ; Sadeh, 2004; Sadeh et al., 2009). The BISQ is not a psychometric scale, but a screening questionnaire that can be used in clinical practice and research. The expanded version of the BISQ is a multi-dimensional 32-item screening tool (Sadeh et al., 2009) developed from the well-established original 13-item tool (Lewandowski, Toliver-Sokol, & Palermo, 2011; Sadeh, 2004). The original and expanded BISQ both include items covering the domains of sleep ecology, infant sleep patterns, and caregiver perception of infant sleep. However, using the expanded version of the BISQ addresses limitations of previous studies where unspecific and incomplete information on daytime sleep, longest consolidated period of sleep, and sleep ecology which may influence the families' subjective perception of the presence of sleep problems (Sadeh et al., 2009). Given that the BISQ is a screening questionnaire and not a scale, Sadeh (2004) did not provide a Cronbach's α for the BISQ. Secondary outcomes for this study will include (a) nocturnal

wakefulness, (b) sleep latency (the length of time it takes parents to put the infant to sleep in the evening, with responses captured as “less than 5 min”, “5–15 min”, “16–30 min”, “31–60 min” and “More than 1”), (c) the longest consolidated sleep episode, and (d) parental perception of problematic infant sleep; these secondary outcomes will also be measured using the expanded BISQ. The expanded BISQ will be administered as part of a complete study online questionnaire package that includes questionnaires measuring covariates, in the 5-7 days before each of the baseline and outcome home visits. Outcome and covariate measures are presented in Tables 3.2 and 3.3. Demographic information, including (a) parental age, education, ethnicity, and income; and (b) infant age, birth order, and feeding type will be collected. At baseline and outcome, parents will be asked to describe the techniques, strategies, and resources that they use to promote infant sleep, which will be explored further during the qualitative interviews.

Table 3.2. *Measures for Primary (Frequency of Night Wakings) and Secondary (Nocturnal Wakefulness, Sleep Latency, Longest Consolidated Sleep Episode, and Parental Perception of Problematic Infant Sleep) Outcomes*

Measure	Description
Expanded Brief Infant Sleep Questionnaire (BISQ; Sadeh, 2004; Sadeh et al., 2009);	32-item questionnaire of infant sleep patterns, sleep ecology, and caregiver perceptions; responses include numerical (time, frequency), categorical (sleep location, bedtime activities) and ordinal rankings (how much of a problem is your baby's sleep). No composite score is calculated. High 3-week test-retest reliability for sleep duration and wakefulness, night wakings, sleep-onset time, and settling time (.82 to .95; Sadeh, 2004). Used to assess sleep interventions for infants 6 to 36 months with a parent-identified sleep problem and detect significant short- and long-term improvements in the number of infant night wakings and sleep latency (Mindell et al., 2011a, 2011b; Mindell, Telofski, Wiegand, & Kurtz, 2009). Used in an internet sample ($N = 4,505$) of Canadian and United States parents of infants aged 0 to 36 months (Sadeh et al., 2009) and an international sample ($N = 29,287$) of parent of infants aged 0 to 36 months (Mindell, Sadeh, Wiegand, How, & Goh, 2010). Night wakings correlated with actigraphy, .42 and daily logs, .83 (Sadeh, 2004). Frequency of night wakings accounted for 13.27% of variance in parental perceptions of severity of sleep problems (Sadeh et al., 2009). Differentiated between clinical and control infants with two BISQ items, frequency of night wakings and nocturnal sleep duration, with assignment of cases to the correct group 85% of the time (Sadeh, 2004). Average completion time is 6.21 minutes (Sadeh et al., 2009).

Table 3.3. *Covariate Measures*

Measure	Description
PCITS (Oxford & Findlay, 2013)	73-item binary measure of parent-child interactions on 4 parent (sensitivity to cues, response to distress, social-emotional and cognitive growth fostering) and 2 child (clarity of cues and responsiveness to caregiver) subscales. Higher scores indicate higher quality interactions. Internal consistency for mothers, $\alpha = .53$ to $.87$ (Oxford & Findlay, 2013) and fathers, $\alpha = .64$ to $.82$ (Harrison et al., 1999). Test-retest reliability (1 and 12 months) of $.85$ for caregiver and $.55$ for infant subscales (Oxford & Findlay, 2013). Concurrent validity with Home Observation Measure of the Environment scale (Bradley & Caldwell, 1978). Predicts attachment, cognitive and language abilities (Morisset, Barnard, Greenberg, Booth, & Spieker, 1990; Oxford & Findlay, 2013). Play session typically lasts 3 to 5 minutes.
EPDS (Cox, Holden, & Sagovsky, 1987)	10-item measure of symptoms of depression, anxiety, and suicidal thoughts. Higher scores indicate more depressive symptoms. In mothers, correlated with Beck Depression Inventory 2 nd version, $.82$ (Boyd, Le, & Somberg, 2005). In fathers, EPDS was correlated with Center for Epidemiologic Studies Depression Scale, $.62$ (Matthey, Barnett, Kavanagh, & Howie, 2001). Internal reliability in mothers, $\alpha = .53$ to $.87$ (Boyd et al., 2005) and fathers, $\alpha = .87$ (Matthey et al., 2001); takes 3 to 5 minutes.
IBQ-R very short form (Gartstein & Rothbart, 2003; Putnam, Helbig, Gartstein, Rothbart, & Leerkes, 2014)	37 statements of parental perception of infant temperament on 3 subscales: negative emotionality, positive affectivity, and regulatory capacity. Rated on a 7-point scale; higher scores indicate more difficult temperament. Internal reliability was $.75$ to $.78$ (Putnam et al., 2014). Subscale test-retest reliabilities (2 and 12 months) from $.64$ to $.88$ (Putnam et al., 2014). Mother-father inter-rater correlations from $.28$ to $.61$ for infants aged 4 to 6 months (Putnam et al., 2014). Correlations with IBQ-R from $.71$ to $.86$; takes 12 minutes (Putnam et al., 2014).
MCISQ (Morrell, 1999)	20 items about parenting beliefs about infant sleep on 5 subscales: setting limits, anger, doubt, feeding, and safety; higher scores indicative of more negative concerns and doubts (Morrell, 1999). Cronbach's $\alpha = .82$; 1-month test-retest = $.81$ (Morrell, 1999). Mother-father correlations from $.65$ to $.72$ (Sadeh et al., 2007). Mothers' scores (doubt) and fathers' scores (anger) correlated with actigraphy (Sadeh et al., 2007). Overall score (mothers) and limit setting subscale (mothers and fathers) discriminated clinical and control groups (Sadeh et al., 2007). Takes 5 to 10 minutes.

DAS-4 (Sabourin, Valois, & Lussier, 2005; Spanier, 1976)	4-item measure of marital satisfaction; higher scores indicate stronger satisfaction. Internal consistency reliability ($\alpha = .84$); temporal stability demonstrated using structural equation modelling over a 2-year period (Sabourin et al., 2005). Established discriminant validity for couple distress and predictive validity for couple dissolution (Sabourin et al., 2005). Used to assess relationship satisfaction in fathers (Bernier, Jarry-Boileau, & Lacharite, 2014), as well as in married and unmarried parents (Rhoades, Stanley, Markman, & Ragan, 2012). Takes 3 to 5 minutes.
PSOC (Johnston & Mash, 1989)	16-item measure with satisfaction, efficacy (Johnston & Mash, 1989), and interest (Gilmore & Cuskelly, 2009; Rogers & Matthews, 2004) subscales; higher scores indicate higher parental competence. Internal reliabilities for satisfaction (.75) and self-efficacy (.76) subscales (Johnston & Mash, 1989). Test-retest (6 weeks) for the total score and subscales ranged from .46 to .86 (Johnston & Mash, 1989). Convergent with internalizing (-.17 to -.27) and externalizing (-.10 to -.31) behaviours on the Child Behavior Checklist (Johnston & Mash, 1989) and marital satisfaction, .27 to .32 (Ohan, Leung, & Johnston, 2000). Used to assess parental competence in mothers of children (0-4 years) with sleep problems (Giallo, Rose, & Vittorino, 2011). Takes 3 to 5 minutes.

Note. Estimated time to complete questionnaire package is 36 to 57 minutes. PCITS = Parent-Child Interaction Teaching Scale; EPDS = Edinburgh Postnatal Depression Scale; IBQ-R = Infant Behavior Questionnaire – Revised; MCISQ = Maternal Cognitions about Infant Sleep Questionnaire; DAS-4 = Brief version of the Dyadic Adjustment Scale; PSOC = Parental Sense of Competence.

Stepwise procedure.

Data collection and management. This community-based study will use both an online format and in-person home visits to collect baseline and outcome data (for a schedule of assessment, see Table 3.4) from both mothers and fathers separately. Families will be assigned a unique study identification number, which will be used to link mothers and fathers of the same family.

Online study questionnaires, hosted on Qualtrics, will be used to collect the majority of data on outcomes and covariates at baseline, when the infant is aged 5 months, and at outcome, when the infant is aged 7 months. Qualtrics is a recognized and secure electronic survey system that houses data on secure Canadian servers. Parents (mothers and fathers) in both groups will each complete baseline questionnaires in the 7 days prior to the initial home visit. A link to the baseline questionnaires will be emailed to parents 5 to 7 days before the home visit, and an email reminder encouraging parents to complete the questionnaires prior to the home visit will be sent if necessary.

The first home visit will occur when the infant is 5-months old (± 2 weeks), at a time that is convenient to the family. Benzies and colleagues (2008) have demonstrated 5-months of age is a feasible time-point to begin a video self-modelled intervention. Scheduling the home visit when the infant is 5-months of age will allow sufficient time between referral to the study at the 4-month well-child clinic visit and scheduling of the first home visit. Scheduling the home visits within a 2-week window of 5-months

Table 3.4. *Play2Sleep Study Schedule of Enrolment, Interventions, and Assessments.*

TIMEPOINT**	STUDY PERIOD					
	Enrolment	Baseline	Randomization	Initial Visit	Outcome Visit	Family Interview
	<i>-t₂</i>	<i>-t₁</i>	<i>0</i>	<i>T1</i>	<i>T2</i>	<i>T3</i>
ENROLMENT						
Eligibility screen	X					
Informed consent	X (verbal)			X (written)		
Allocation			X			
INTERVENTION						
<i>Play2Sleep Group</i>				X		
<i>Comparison Group</i>				X		
ASSESSMENTS						
<i>Expanded BISQ</i>		X			X	
<i>PCITS</i>				X	X	
<i>EPDS</i>		X			X	
<i>IBQ-R very short form</i>		X			X	
<i>MCISQ</i>		X			X	
<i>DAS-4</i>		X			X	
<i>PSOC</i>		X			X	
<i>Interview</i>						X

Note. BISQ = Brief Infant Sleep Questionnaire; PCITS = Parent-Child Interaction Teaching Scale; EPDS = Edinburgh Postnatal Depression Scale; IBQ-R = Infant Behavior Questionnaire – Revised; MCISQ = Maternal Cognitions about Infant Sleep Questionnaire; DAS-4 = Brief version of the Dyadic Adjustment Scale; PSOC = Parental Sense of Competence.

provides a realistic timeframe to schedule visits based on availability of both parents, as well as being able to re-schedule visits if there are unanticipated events (i.e., infant illness). This narrow window minimizes maturation bias due to the rapid developmental changes that occur in infants at this age.

An automated randomization service (Sealed Envelope Ltd) will generate the randomization sequence to allocate families to either the experimental or comparison group. Allocation concealment will be achieved because the randomization code will not be requested until the family enrolls in the study and parents complete the baseline questionnaire. After participants have completed the baseline questionnaire and immediately before the initial home visit, the home visitor will submit an online form requesting treatment allocation. A copy of the allocation will be emailed to the home visitor and stored in the study's online Sealed Envelope Ltd. account.

At the start of the first home visit, participants will affirm their verbal consent (provided during the eligibility screening phone call) by providing written consent. After establishing initial rapport with the parents, the home visitor will ask each parent (mother and father) to teach their infant a unique age-appropriate play task, which is video-recorded by the home visitor to be coded later using the PCITS coding scheme (Oxford & Findlay, 2013). As per the PCITS manual, the video-taped structured teaching and play sequence lasts no longer than 10 minutes, typically spanning a 3 to 5 minute timeframe (Oxford & Findlay, 2013). The order of the video-recordings will alternate between the mother and father to prevent ordering bias. Following the video-recorded structured play session, the home visitor will deliver either the Play2Sleep or comparison intervention.

At the conclusion of the home visit, the home visitor will offer to schedule the outcome home visit.

The outcome home visit will occur when the infant is age 7 months (± 2 weeks). Seven months was selected because parents need time to practice and solidify new interaction patterns to translate into measurable effects on infant sleep patterns. Parents (mothers and fathers) in both groups will each complete outcome questionnaires in the 7 days prior to the second (outcome) home visit. During the outcome home visit, parents in both the experimental and comparison groups will again engage their infant in a different play task that is video-recorded for later coding. All families will be offered a listing of local infant sleep-related resources and services. Once data collection is completed, data will be downloaded, backed-up, and deleted from the Qualtrics account.

Following the home visits, a reliable coder who has achieved the required reliability of 90% with the PCITS training videos and who is blind to group allocation will code the videos. Coding of video-recorded interactions occurs at a later time and typically takes 30 minutes. A random selection of 10% of the videos will be re-scored to assess intra-rater reliability. Another reliable PCITS coder will rescore 20% of the videos to assess inter-rater reliability.

The same home visitor will interview families who are selected to continue to Phase 2 during a third home visit. Families from each group will be purposively sampled for maximum variation based on the change in the number of infant night wakings from baseline to outcome. Mothers and fathers will be interviewed as a family unit, rather than conducting individual interviews (Donalek, 2009). Interviews will last up to 60 minutes and be digitally audio-recorded and transcribed verbatim. The semi-structured interview

guides (Table 3.5, Supplemental Material [Appendix C]) include prompts that focus on capturing underlying relational and family processes in addition to eliciting individual family members' perceptions and experiences (Donalek, 2009; Ganong & Coleman, 2014).

Quality assurance, monitoring, and safety. Only the study investigators will monitor the study. No interim analysis is planned because the intervention is not expected to cause harm. Each completed study questionnaire will be reviewed for completeness upon participant submission. Participants who score in the clinical range on the EPDS (≥ 13 for mothers, ≥ 9 for fathers) will be flagged and encouraged to follow-up with their primary health care practitioner. Parents will be referred to the appropriate health care provider(s) or agencies if they experience severe distress at any point during the study.

The study protocol may be stopped or changed if the following safety concerns arise from either participants' completed study questionnaires or the home visits (a) concern for a participant's potential to cause harm to self or others; (b) concerns of abuse or neglect of participants or their child; or (c) concern for the home visitor's physical safety.

There are no known physical risks to participants taking part in this study. Participants may feel uneasy being video-recorded while playing with their baby, completing questionnaires, or answering questions during the interview. No audit is planned for this study.

Anticipated Results

Phase 1 quantitative analysis. Quantitative data will be analyzed using IBM SPSS Statistics 24.0 software. Data will be examined for frequency and patterns of

missing data. If less than 20% of the data are missing, and if missing at random or completely at random, missing values will be imputed using multiple imputation (Polit, 2010). Descriptive statistics (means, standard deviations, frequencies, and percentages) will be used to describe the sample, and correlations between variables will be examined to identify potential covariates. Using the “intent to treat” principle, a RM-ANOVA will be used to detect differences between groups over time in mother and father reports of infant sleep patterns that are measured as continuous variables (night wakings, nocturnal wakefulness, and longest period of consolidated nighttime sleep). To control for Type I error that may result from multiple hypothesis testing, we will apply a Bonferroni correction during the analyses. Ordinal level infant sleep variables (sleep latency and parental perception of problematic sleep) will be analyzed using a Wilcoxon signed-rank test. If there are statistically significant differences between groups on the primary outcome, sub-analyses will identify which covariates have significant effects. Parent-child interactions scores for both mothers and fathers will be compared to normed scores available from the NCAST database.

Phase 2 qualitative (thematic) analysis. To align with Phase 1, the criterion variable for the thematic analysis will be the level of infant sleep disturbance, as indicated by the number of night wakings. To ensure rigor during the qualitative phase, Guba and Lincoln’s criteria of credibility, dependability, confirmability, transferability, and authenticity will be followed (Guba & Lincoln, 1994; Polit & Beck, 2017). In addition, Braun and Clarke (2006) provided a 15-point checklist that will be used as a benchmark throughout the process to enhance the credibility of the thematic analysis.

Braun and Clarke's (2006) six phases of thematic analysis, informed by Boyatzis' (Boyatzis, 1998) steps of inductive code development, will be used. These six phases include: (a) familiarization with the data as a whole, (b) generating initial codes, (c) searching for themes, (d) reviewing themes, (e) defining and naming themes, and (f) producing the report. Although these processes are presented linearly, the actual analysis activities will progress together in an interdependent and fluid manner (Braun & Clarke, 2006).

To develop the initial list of codes, a compare-and-contrast method in a subsample of transcripts will be used (Boyatzis, 1998). Five transcripts will be chosen as a subsample and reviewed line-by-line (EK) for key words or phrases within each subsample to develop codes based on similarities and differences across subsamples (Boyatzis, 1998). A more experienced coder (KB) will also code the subsample using the initial codes. Discrepancies in coding will provide discussion points regarding credibility, confirmability, and transferability. The remaining transcripts will then be coded, and data will be organized into meaningful patterns (Boyatzis, 1998; Braun & Clarke, 2006). NVivo 11 software will be used to assist in capturing the coded data extracts and managing the dataset.

Thematic maps will be used to articulate broad themes and thematic relationships, guided by the perspective that quantity does not necessarily dictate the creation of a theme, or its place in a hierarchy of themes (Braun & Clarke, 2006). Paton's (1990) criteria of internal homogeneity and external heterogeneity will be used to discuss developing themes among a doctoral supervisory committee (KB, VK, LD), as well as key clinical champions, to enhance dependability, transferability, and authenticity. As a

form of member checking, each family who participated in the interviews will be sent a letter with thematic summaries. This letter will offer families an opportunity to review the codes, themes, and initial interpretations of the data that they provided during their interview. The letter will invite families to comment on the codes, themes, and interpretations.

The researchers will write a detailed analysis that articulates the name and essence of each theme to compile a final report (Braun & Clarke, 2006), including a comprehensive analysis of how themes relate to one another. This qualitative component will provide rich insight into understanding parental experiences and perceptions that may influence the effectiveness of infant sleep interventions.

Phase 3 mixed methods integration. In Phase 3 the researchers will use the themes from the qualitative data to explain the quantitative results. During this phase, the researchers will explore how themes relate not only to the quantitative results, but also how they relate to the theoretical research framework (Keys & Benzies, 2018) from which the Play2Sleep intervention was developed. Understanding the explanatory mechanisms that contribute to the effectiveness of infant sleep interventions may help researchers and practitioners design and tailor future infant sleep interventions that are meaningful and effective for families. This approach will maximize the value of using a mixed methods approach to evaluate Play2Sleep.

Clinical Implications

If effective, the effect sizes of Play2Sleep could be used to calculate accurate sample sizes in future studies that tailor and target Play2Sleep for different groups (i.e., premature infants, single-parent families). If Play2Sleep improves infant sleep, existing

public health services may be able to integrate interventions that focus on parent-child interactions to improve infant sleep. Unlike behavioral-based extinction approaches (Douglas & Hill, 2013), families of infants younger than 6 months could use Play2Sleep, and Play2Sleep may have additional application as an infant sleep disturbance prevention strategy. Including fathers in this research and using family interviews to explain the quantitative results makes this project unique and should result in evidence that better represents the complex and relational experiences of dual-parent families. Because this study includes the gold standard measure of parent-child interactions, it will generate the most precise information available to date regarding which specific domains of parent-child interactions are most important for infant sleep difficulties, and could be used to establish validity of the PCITS in a new population. The data collected on the comparison group will provide critical reference values for the effectiveness of the current public health nursing care for families coping with infant sleep difficulties. If Play2Sleep does not produce positive effects on night wakings, the comprehensive data may still be used to explore alternate hypotheses and research questions regarding the relationships between family health indicators and infant sleep disturbances.

Limitations. Both convenience sampling and the subjective nature of parental report on infant sleep disturbances could be considered limitations. These limitations may lead to a recruitment bias as families experiencing milder difficulties may not perceive themselves to be eligible and those experiencing more severe sleep disturbances may not have the energy or motivation to participate. Inclusion of cohabiting mothers and fathers will limit the generalizability of results to single-parent and same-sex parent families.

Further, families enrolling in the study may be more motivated to achieve change in infant sleeping patterns, which may inflate improvements in infant sleep for both groups.

To minimize participatory burden, information on all possible covariates will not be collected. Specifically, no information on anxiety or perceived parental stress will be obtained. Similarly, although the expanded BISQ is a feasible and lower cost alternative to more objective sleep measures, such as actigraphy or polysomnography (Meltzer, Montgomery-Downs, Insana, & Walsh, 2012), this measure relies on subjective parental perceptions.

Another limitation of this study relates to the continuity and intimate involvement of the primary researcher in each phase, which may raise questions of bias. To increase transparency, the primary researcher will document activities that may promote or prevent bias. Other concerns for bias may relate to sampling and data collection techniques. For instance, although the naturalistic home environment typically enhances ecological validity for documenting parenting behaviors (Bronfenbrenner, 1975), it is possible that parents interact differently while being video-recorded interacting with their infant. Resource limitations necessitated the use of a single home visitor to conduct the initial home visits, when the experimental and comparison interventions are delivered. Using the same home visitor to deliver both interventions should contribute to intervention fidelity and help ensure that any differences between intervention and comparison groups are not due to differences in home visitors (i.e. ability to build rapport, clinical skill level). However, the use of a single home visitor precludes the ability to blind the home visitor to intervention allocation and it is possible that this may introduce bias in the study outcomes. For the qualitative interviews, it is important

families do not perceive the researcher to have a vested interest in a specific outcome, lest they avoid offering genuine perspectives that they perceive to conflict with the researcher's needs. Moreover, data collection techniques may not capture all the extraneous or additional strategies families use to improve their infant's sleep.

Lastly, in recent years there has been a rapid increase in interest in promoting sleep that is observed in the vast increases in public interest in sleep, sleep research, proliferation of privatized pediatric sleep consultants, as well as the development and availability of consumer products. It is difficult to account for how these changes may influence the study results. We hope that asking parents, in both the baseline and outcome study questionnaires, to describe the resources, strategies, and services that they have already used in attempting to improve their infant's sleep will help address this limitation and contextualize the results. If extraneous circumstances related to the increased commercialization of infant sleep were to significantly influence parental experiences of the intervention, we expect the family interviews to be useful in providing an in-depth understanding of these effects.

Ethics and Dissemination

Informed consent and institutional review boards. This protocol and study, including the informed consent forms, have received ethical approval from the University of Calgary Conjoint Health Research Ethics Board (REB15-2652), and will be renewed annually.

Individual informed consent will be obtained from each parent by ensuring they understand the study purpose, what participation in the study entails, as well as the potential risks and benefits of participating in the study. Consent forms will be written at

the 8th grade reading level. The consent form will be reviewed with each parent verbally over the phone prior to enrollment, along with an electronic copy provided to each parent via email. At the first home visit, the home visitor will obtain signed copies of the consent form from each parent after providing participants an additional opportunity to review information, ask additional questions, or obtain further clarification as needed.

At each home visit (baseline and outcome), families will receive a thank-you card containing a \$10 gift card in recognition of the time and effort that families have allocated to the study. Each family who participates in the qualitative interviews will receive an additional \$10 gift card.

Confidentiality. Confidentiality of the data will be maintained by storing study data on a timed out, password-protected computer, in a secure room on campus. Back-up data files will be stored in locked filing cabinets in a separate room on password protected hard drives. Only the research team will have access to the secure files. For the quantitative phase, data will be aggregated with no identifiers used when publishing results. To maintain confidentiality in the qualitative phase, pseudonyms will be assigned and used to replace any names used in the interview transcripts. Only the immediate study team members will have access to the study data.

Dissemination. The research team anticipates publishing one primary paper that reports on the effectiveness of the Play2Sleep study on night wakings, using the qualitative findings to explain the quantitative results. All contributing authors will meet the International Committee of Medical Journal Editors suggested criteria for authorship (International Committee of Medical Journal Editors, 2016). Findings from the study will be distributed and/or presented to local health care practitioners and agencies who

supported study recruitment through a final report and a telehealth “breakfast and learn”, as well as to participants themselves. An online video that highlights the key findings will also be created for both parents and clinicians, and disseminated as part of a broader online social media campaign. Following study completion, de-identified data will be submitted to Secondary Analysis to Generate Evidence (SAGE), a research and data facility operating under the authority of Policywise for Children & Families (<https://policywise.com/initiatives/sage/>).

Chapter 4: Effect of Play2Sleep for Mothers and Fathers of 5-month-old Infants

Keys, E. M., Benzies, K. M., Kirk, V., & Duffett-Leger, L. Effect of Play2Sleep for mothers and fathers of 5-month-old infants. Prepared for submission.

Target journal: *Pediatrics*.

Introduction

Infant sleep problems are associated with poorer outcomes including cognitive and behavioral developmental difficulties (Hall, Scher, Zaidman-Zait, Espezel, & Warnock, 2012; Hysing et al., 2014; Mindell et al., 2016; Sadeh et al., 2015; Sun et al., 2018). Parental behaviors, such as rocking or feeding to sleep, may promote the development of infant sleep disturbances. Likely a combination of parent, infant, and environmental factors converge to promote the use of more involved ‘hands on’ sleep-related parent practices and/or an infant’s responsiveness to these parenting practices (Keys & Benzies, 2018; Sadeh et al., 2010). Although effective (Meltzer & Mindell, 2014), concerns about implementing certain behavioral-based extinction-interventions (such as graduated extinction) in infants less than age 6 months have been articulated (Douglas & Hill, 2013).

In the broader context of parenting practices and behaviors (beyond sleep-specific strategies), parent-child social interactions may support the development of infant sleep patterns (Keys & Benzies, 2018). Thus, the aim of this study was to evaluate the effectiveness of an intervention (Play2Sleep) designed to improve parent-child interactions (Keys, Benzies, Kirk, & Duffett-Leger, 2018) in a community sample of mothers and fathers who considered their 5-month-old infant’s sleep to be problematic. The quantitative research question was: Does one dose of Play2Sleep delivered during home visits with mothers and fathers of 5-month-old infants with infant sleep disturbances reduce the number of night wakings at age 7 months? The qualitative research question was: What are parental perceptions of family experiences, processes, and contexts related to Play2Sleep and infant sleep disturbances? The mixed methods

research question was: How do parental perceptions of family experiences, processes, and contexts related to infant sleep explain the effectiveness of Play2Sleep?

Methods

Study design and participants. In a large Canadian urban center, we used an explanatory sequential mixed method design with emphasis on a randomized controlled trial and included follow-up family interviews. From December 2016 to July 2018, we recruited families through social media and advertisement at all eight community health centers, which offered universal well-child clinic appointments and immunizations by public health nurses to families of children age 2 months and older. Interested families contacted the study team directly or provided their contact information to their community health center and were later contacted by the first author (EK). The University of Calgary Conjoint Health Research Ethics Board (REB15-2652) approved this study, which was registered with ClinicalTrials.gov (NCT02742155).

We included co-habiting mothers and fathers if: (a) they perceived their first-born, full-term, healthy singleton, 4-month old infant was experiencing sleeping difficulties; (b) parents agreed to a home visit where they would be video-recorded playing with their baby; and (c) their infant's sleep pattern met one of three specified criteria (more than 3 wakings/night, greater than 60 minutes awake during the night, and/or less than 9 hours of sleep in 24 hours). Due to the nature of the intervention and study measures, we included only parents who could read, write, and speak English. We excluded families if either parent or the infant had a known or suspected medical or physiological cause of sleep problems. To detect an effect size comparable to those of other brief infant sleep interventions (.44 to .64; Hall et al., 2006; Mindell et al., 2011a), a sample of 60 families

(30 in each group) was needed to detect an effect size of .32 with a power of .80 at a .05 level of significance. We contacted 208 families and enrolled 63 (recruitment rate of 30.3%). Of the 63 families enrolled, one family withdrew citing scheduling difficulties for the outcome home visit, and data for two families were lost due to difficulties with the online data collection platform. See Figure 4.1 for the CONSORT flow diagram.

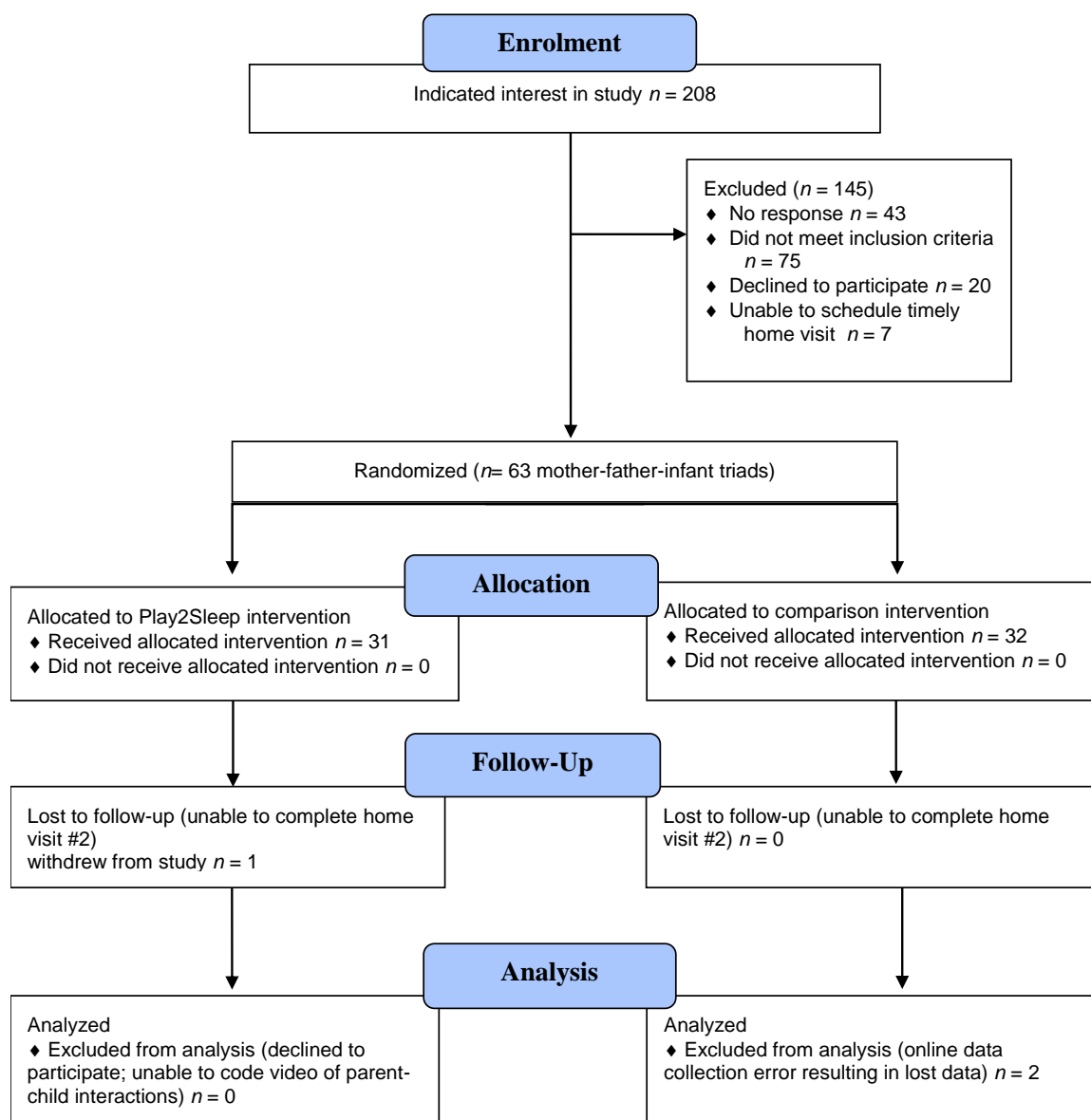


Figure 4.1. CONSORT flow diagram.

Procedures. In the week before the initial 5-month (+/- 2 weeks) home visit, families were emailed a link to the study questionnaire. Immediately prior to the initial home visit, the first author (EK) used an automated randomization service (Sealed Envelope Ltd.) to allocate families to the intervention or comparison group. Families, but not EK, were blinded to group allocation. EK conducted initial home visits for both groups. After obtaining written consent (Appendix A), mothers and fathers were each video-recorded separately engaging with their infant in a 3 to 5 minute novel play activity that they chose from a list, as per the parent-child interaction teaching scale (PCITS) protocol (Oxford & Findlay, 2013). Mothers and fathers then received the Play2Sleep intervention or the comparison intervention (see Table 4.1 for a detailed description).

At 7 months (+/- 2 weeks) postpartum, parents were again emailed a link to the study questionnaire prior to their outcome home visit. Only one family was unable to schedule their follow-up visit within the designated timeframe and completed their follow-up visit when their infant was aged 8 months. As before, each parent was video-recorded engaging in a structured play session with their infant.

Upon completion of the 7-month outcome home visit, we selected families (10 from each group) for interviews based on maximum variation in the change in number of infant night wakings. Using a semi-structured interview guide (Appendix B), EK explored parental experiences and perceptions of infant sleep and participating in the study. Interviews lasted approximately 60 minutes, were audio recorded, and transcribed verbatim. Families received a \$10 gift card after each home visit.

Table 4.1. *Description of Play2Sleep and Comparison Interventions*

Intervention	Description
Play2Sleep	<p>Upon completing the structured play session, each parent individually reviewed the video-recording with the home visitor, a specially trained registered nurse (EK), who provided feedback on 2-3 positive behaviors that the parent was doing to encourage positive parent-child interactions and 1-2 suggestions for areas of growth. The home visitor also helped parents identify specific examples of different types of engagement and disengagement cues, as described by Parent-Child Relationship Programs (Oxford & Findlay, 2013), that their infant demonstrated during the play session. Engagement and disengagement cues can be classified as either subtle (less obvious) or potent (more obvious), with some of the disengagement cues clustering to include those that are often identified as early (subtle) or later (potent) infant sleep cues. During the video-feedback session, the home visitor provided individualized information on how infants may cluster disengagement cues to indicate the need for a momentary or small break (i.e., pause, change in activity) or a larger break (i.e., sleep). Mothers and fathers received these feedback sessions separately, which lasted between 10-20 minutes per session. Based on parental concerns, the home visitor then provided an individualized review of public health handouts on infant sleep (http://foothillsnetwork.ca/get-informed/helpful-links/) with both mothers and fathers together (approximately 30-40 minutes).</p>
Comparison	<p>Although mothers and fathers both participated in the structured play sessions with their infant, the home visitor did not review the video-recording. Instead, parents were immediately brought back together to receive the same individualized review of public health infant sleep handouts as the Play2Sleep group. These handouts contained information on typical infant sleep patterns, as well as sleep cues, sleep associations, and routines.</p>

Outcomes. The primary outcome was the number of parent-reported night-wakings, measured by the Brief Infant Sleep Questionnaire (BISQ; Sadeh, 2004; Sadeh et al., 2009), with the remaining sleep quality items used as secondary outcomes. We measured parent-child interactions using the PCITS to assess for the effect of the intervention in improving parent-child interactions. Based on the theoretical framework

(Keys & Benzies, 2018) we included potential covariates: (a) symptoms of depression, (b) cognitions about infant sleep, (c) perceptions of infant temperament, marital satisfaction, parental sense of competence, (d) demographics, and (e) investigator designed single items about infant feeding, use of parenting and/or sleep resources and strategies, and perceptions of effectiveness. See Table 4.2 for measures.

Statistical analysis. We replaced missing values ($< 1.5\%$) on scales with the group mean. Except for positive skewness, data met assumptions for statistical tests. We compared group differences at baseline using chi-square and independent samples *t*-tests and assessed for correlations between variables. We selected covariates based on significant correlation with the dependent variable at $p < .01$ level (2-tailed). In accordance with ‘intention to treat’ and controlling for covariates, we used a repeated measures analysis of covariance (RM-ANCOVA) to test if group had an effect over time on the number of infant night-wakings. We also used RM-ANCOVA to test if Play2Sleep improved secondary infant sleep variables (daytime, nighttime, and total 24-hour sleep duration, nighttime wakefulness, longest self-regulated sleep period, number of naps). We applied a Bonferroni correction in SPSS to account for multiple tests. We conducted Wilcoxon signed rank test to determine the impact of the intervention on parental perception of problematic infant sleep and sleep latency. We compared PCITS scores to normed (mothers) and reference (fathers) values using independent samples *t*-tests.

Table 4.2. *Description of Study Measures*

Infant sleep patterns	Expanded-BISQ (Sadeh et al., 2009). A 32-item multi-dimensional questionnaire capturing infant sleep patterns, sleep ecology, and caregiver perceptions; response categories include numerical (time, frequency count), categorical (sleep location, bedtime activities) and ordinal rankings (how much of a problem is your baby's sleep?). Used in large international internet surveys of parents with children aged 0 – 36 months (Mindell et al., 2010; Sadeh et al., 2009) and to assess intervention effects on the number of infant night wakings and sleep latency for infants aged 6 to 36 months (Mindell et al., 2011b; Mindell et al., 2009). (Mindell et al., 2011b; Mindell et al., 2009). No internal consistency reliability available as no composite scoring system. High 3-week test-retest reliability for sleep duration and wakefulness, night wakings, sleep-onset time, and settling time (0.82-0.95; Sadeh, 2004). Satisfactory concurrent validity with significant correlations to actigraphy and daily logs (Sadeh, 2004; Tikotzky & Volkovich, 2019). Discriminant validity between clinical and control infants with two BISQ items, number of night wakings and nocturnal sleep duration (Sadeh, 2004). Average completion time is 6.21 minutes (Sadeh et al., 2009).
Parent-child interactions	PCITS (Oxford & Findlay, 2013). Measures multi-dimensional quality of parent-child interactions using a coding scheme of 73 binary (yes/no) items divided among 6 subscales with a theoretical total score from 0 to 73. Higher scores indicate higher quality parent-child interaction. There are four parent subscales (parent's sensitivity to cues, response to child's distress, social-emotional growth fostering and cognitive growth fostering), two child subscales (clarity of cues and responsiveness to caregiver). Parent and child contingency can also be measured. Normed scores with standard deviations are available, with established cut-off scores for fathers (Harrison et al., 1999) and mothers (Oxford & Findlay, 2013). Cronbach's α for total score was 0.87 (Oxford & Findlay, 2013). Minimum 90% inter-rater reliability required to use in research. Test-retest reliability from when the infant is aged 1 to 12 months is higher for caregiver domains (0.85) than for infant domains (0.55), likely due to infant developmental changes (Oxford & Findlay, 2013). Concurrent validity with moderate correlations with the Home Observation Measure of the Environment inventory (Bradley & Caldwell, 1978) and the Bayley Mental and Psychomotor Development Index (Oxford & Findlay, 2013). Predictive validity for cognitive and language abilities, as well as attachment, is established (Morisset et al., 1990; Oxford & Findlay, 2013). Used to evaluate a 5-day parenting program for mothers mainly experiencing sleeping and settling difficulties in their infants ($M = 13.6$ months; Treyvaud, Rogers, Matthews, & Allen, 2010). The videotaped play session usually lasts 3-5 minutes (no more than 10) and takes approximately 30 minutes to code. For the present study, videos were randomly assigned for coding to one of two reliable coders (> 90% reliability with PCITS developers, Parent-child Relationship Programs), who were blinded as to the family's group assignment. Twenty percent of the videos were randomly selected for coding by both coders to determine interrater reliability (Pearson correlations from .72 to .94). Intra-rater reliability was assessed by having coders recode 10% of their assigned videos (Pearson correlations from .72 to .99).
Parental mental health (symptoms of depression)	EPDS (Cox et al., 1987). Consists of 10 items that examine symptoms of depression, anxiety, and suicidal thoughts. Respondents indicate level of agreement with each item, which are scored from 0 to 3 for a total theoretical range from 0 to 30; higher scores indicate more depressive symptoms, with referral cut-off scores of ≥ 13 for mothers (Cox et al., 1987) or > 9 for fathers (Matthey et al., 2001). Extensively used in research and clinical settings (Boyd et al., 2005). Internal consistency for mothers ranges from .53 to .87 (Boyd et al., 2005) and is .87 for fathers. For mothers, correlates with Beck Depression Inventory (.59 to .78), Beck Depression Inventory (2 nd version; .82), General Health Questionnaire (.42 to .61), and Zung Self-Rating Depression Scale (.57 to .71) (Boyd et al., 2005). In fathers, correlates with CES-D, .62 (Matthey et al., 2001). Takes 3-5 minutes to complete.

Parental thoughts about infant sleep	MCISQ (Morrell, 1999). Multi-dimensional measure of parenting beliefs about infant sleep; include 5 subscales (setting limits, anger, doubt, feeding, and safety) rated on a 6-point Likert-type scale (strongly agree to strongly disagree) scored from 0 to 5 (theoretical range from 0 to 100). Higher scores indicate more negative concerns and doubts (Morrell, 1999). Cronbach's alpha is .82 with high one-month test-retest reliability of .81 (Morrell, 1999). Mothers' scores (doubts) and fathers' scores (anger) correlate with actigraphic infant sleep measures (Sadeh et al., 2007). Total score discriminates between clinical and control groups in mothers, but not in fathers (Sadeh et al., 2007). Limit setting subscale discriminates between clinical and control groups for mothers and fathers (Sadeh et al., 2007). Takes 5-10 minutes to complete.
Infant temperament	IBQ-R VSF (Gartstein & Rothbart, 2003; Putnam et al., 2014). Multi-dimensional measure parental perception of infant temperament based on 3 broad subscales (negative emotionality, positive affectivity/surgency, and orienting/regulatory capacity) using 37 statements rated on a 7-point Likert scale (1=never to 7=always) for a theoretical total ranging from 37 to 259; higher scores indicate perception of more difficult temperaments. Internal reliability was very high, .75 to .78, in an economically and ethnically diverse sample (Putnam et al., 2014); estimated test-retest reliabilities for each subscales from 2 to 12 months ranged from .64 to .88 (Putnam et al., 2014). Correlation with the standard IBQ-R ranges from 0.71 to 0.86. The very short form has not been used in similar populations, however the IBQ-R has been used to examine if maternal depression and sleep disturbance are related to maternal perceptions of infant temperament in infants aged 6 months (Tikotzky et al., 2010) and determine if infant temperament moderated maternal emotional availability at bedtime in infants aged 3 to 6 months (Jian & Teti, 2016). Can be completed in under 12 minutes.
Relationship satisfaction	DAS-4 (Sabourin et al., 2005; Spanier, 1976). A uni-dimensional measure of marital satisfaction using 4 items rated on a 6- or 7-point Likert scale for a theoretical range of 0-25; higher scores indicate stronger satisfaction. Good internal consistency reliability ($\alpha = .84$) with temporal stability demonstrated over a 2-year period (Sabourin et al., 2005). Established discriminant (couple distress) and predictive validity (couple dissolution; Sabourin et al., 2005). Used to assess relationship satisfaction in fathers of young children (Bernier, Jarry-Boileau, et al., 2014), as well as in married and unmarried parents (Rhoades et al., 2012). Takes approximately 3-5 minutes to complete.
Parental competence	PSOC (Johnston & Mash, 1989). A multi-dimensional 16 item tool of beliefs about parenting role and ability, with 2 subscales - satisfaction and efficacy (Rogers & Matthews, 2004). Items rated using a 6-point Likert scale, totaled for a theoretical range of 0-96 with higher scores indicative of higher parental competence. Acceptable internal consistency for satisfaction and self-efficacy subscales, 0.75 and 0.76, respectively (Johnston & Mash, 1989). Test-retest reliability (6 weeks) for total score and subscales ranged from 0.46 to 0.86 (Johnston & Mash, 1989). Convergent validity with higher scores of internalizing and externalizing child behaviours (Child Behavior Checklist; Achenbach & Edelbrock, 1983), marital satisfaction using the DAS, and easy-going parenting style and co-parenting agreement as measured by the Child-Rearing Practices Report (Johnston & Mash, 1989; Ohan et al., 2000). Used to assess perceived parental competence in mothers of children with sleep problems aged 0 to 4 years (Giallo et al., 2011). Takes approximately 3-5 minutes to complete.

Note. BISQ = Brief Infant Sleep Questionnaire; PCITS = Parent-Child Interaction Teaching Scale; EPDS = Edinburgh Postnatal Depression Scale; MCISQ = Maternal Cognitions about Infant Sleep Questionnaire; IBQ-R VSF = Infant Behavior Questionnaire – Revised, very short form; DAS-4 = Brief version of the Dyadic Adjustment Scale; PSOC = Parental Sense of Competence Scale

Qualitative analysis. EK used inductive thematic analysis (Boyatzis, 1998; Braun & Clarke, 2012) to develop themes, which were reviewed for credibility, confirmability, and transferability by a second, more experienced coder (KB). A compare-and-contrast method was used to compare themes and supporting codes between groups (Play2Sleep or comparison), as well as families with the least and most improvements. To increase transferability and authenticity, preliminary code clusters, broad themes, relationships between themes, and codes were discussed with the research team, as well as local clinical champions.

Results

Quantitative findings. See Table 4.3 for sample characteristics by group and baseline group differences. Mothers in the comparison group were significantly more likely to have a post-graduate degree and speak mostly English at home. See Table 4.4 for means and standard deviations of scale scores for mothers and fathers, by group. At baseline, mothers in Play2Sleep scored significantly higher on the MCISQ Anger subscale, $t(1, 58) = 2.65, p = .01$, and significantly lower on relationship satisfaction (DAS-4), $t(1, 49.79) = -1.96, p = .005$. We found no other group differences at baseline for mothers or fathers (Table 4.4). Sleep variables for mothers and fathers at baseline and outcome by group are reported in Table 4.5 and Table 4.6.

Table 4.3. *Participant Demographic Characteristics with Group Differences at Baseline*

	Mothers (N = 60)				Fathers (N = 60)			
	Play2Sleep (n = 30)	Comparison (n = 30)	χ^2	p-value	Play2Sleep (n = 30)	Comparison (n = 30)	χ^2	p-value
	n (%)	n (%)			n (%)	n (%)		
Parental Age (years)			5.55*	0.18			1.38*	0.98
21-24	0 (0)	1 (3.33)			0 (0)	0 (0)		
25-29	7 (23.33)	2 (6.67)			3 (10.00)	4 (13.33)		
30-34	16 (53.33)	21 (70.00)			16 (53.33)	14 (46.67)		
35-39	7 (23.33)	5 (16.67)			8 (26.67)	8 (26.67)		
40-44	0 (0)	1 (3.33)			3 (10.00)	3 (10.00)		
> 50	0 (0)	0 (0)			0 (0)	1 (3.33)		
Employment			3.41*	0.70			2.02*	1.00
Employed Full-time (> 30 hrs/week)	1 (3.33)	2 (0.07)			26 (86.67)	25 (83.33)		
Employed Part-time (< 30 hours/week)	0 (0)	2 (6.67)			1 (3.33)	2 (6.67)		
Student	0 (0)	0 (0)			1 (3.33)	2 (6.67)		
Parental leave	26 (86.67)	25 (83.33)			0 (0)	0 (0)		
Homemaker/At-home parent	2 (6.67)	1 (3.33)			0 (0)	0 (0)		
Unemployed /in-between jobs	0 (0)	0 (0)			1 (3.33)	0 (0)		
Other	1 (3.33)	0 (0)			1 (3.33)	1 (3.33)		
Education			9.07*	0.02			5.49*	0.18
High school diploma	0 (0)	1 (3.33)			1 (3.33)	1 (3.33)		
Certificate or diploma after high school	7 (23.33)	2 (6.67)			4 (13.33)	10 (33.33)		
College or University degree	19 (63.33)	14 (46.67)			17 (56.67)	10 (33.33)		
Post-graduate degree	4 (13.33)	13 (43.33)			8 (26.67)	8 (26.67)		
Prefer not to answer	0 (0)	0 (0)			0 (0)	1 (3.33)		
Ethnicity			8.07*	0.27			6.51*	0.49
White (Caucasian)	17 (56.67)	22 (73.33)			24 (80.00)	22 (73.33)		
Aboriginal (e.g. First Nations, Inuit, or Metis)	1 (3.33)	0 (0)			0 (0)	1 (3.33)		
Chinese	2 (6.67)	1 (3.33)			2 (6.67)	2 (6.67)		
South Asian (e.g. East Indian, Pakistani, Sri Lankan)	2 (6.67)	4 (13.33)			1 (3.33)	3 (10.00)		
Latin American	3 (10.00)	0 (0)			2 (6.67)	0 (0)		

Southeast Asian (e.g. Vietnamese, Cambodian, Malaysian)	0 (0)	1 (0.03)			0 (0)	1 (3.33)		
West Asian (e.g. Iranian, Afghan)	2 (6.67)	0 (0)			1 (3.33)	0 (0)		
Other (please specify):	3 (10.00)	2 (6.67)			0 (0)	1 (3.33)		
Language most spoken at home			--	0.02*			--	0.24
English	24 (80.00)	30 (100.00)			27 (90.00)	30 (100.00)		
Other	6 (20.00)	0 (0)			3 (10.00)	0 (0)		
Household income			2.79*	1.00			5.78*	0.21
\$20,000-\$39,000	1 (3.33)	0 (0)			0 (0)	1 (3.33)		
\$40,000-\$59,000	1 (3.33)	1 (0.03)			0 (0)	1 (3.33)		
\$60,000-\$79,000	1 (3.33)	1 (0.03)			4 (13.33)	0 (0)		
More than \$80,000	26 (86.67)	25 (83.33)			24 (80.00)	26 (86.67)		
Don't know	0 (0)	1 (3.33)			0 (0)	0 (0)		
Prefer not to answer	1 (3.33)	2 (6.67)			2 (6.67)	2 (6.67)		
Child Sex (need % by column)								
Female	12 (40.00)	11 (36.67)	0.07	0.79	-	-		
Male	18 (60.00)	19 (63.33)			-	-		

Note. (*) indicates that cell counts were less than 5 and Fisher's test was used if 2 x 2. For crosstabs greater than 2 x 2, Fisher-Freeman-Halton Test is reported.

Table 4.4. *Maternal and Paternal Scale Scores by Group at Baseline (5 months) and Outcome (7 months)*

	Mothers (N = 60)				Fathers (N = 60)			
	Play2Sleep		Comparison		Play2Sleep		Comparison	
	Baseline <i>M (SD)</i>	Outcome <i>M (SD)</i>	Baseline <i>M (SD)</i>	Outcome <i>M (SD)</i>	Baseline <i>M (SD)</i>	Outcome <i>M (SD)</i>	Baseline <i>M (SD)</i>	Outcome <i>M (SD)</i>
EPDS	8.93 (5.10)	5.57 (3.17)	8.00 (4.26)	7.60 (5.14)	5.60 (3.44)	5.74 (3.33)	5.67 (4.1)	5.60 (4.09)
MCISQ (total)	45.00 (14.66)	34.97 (16.08)	43.00 (15.59)	34.70 (12.45)	34.80 (13.64)	28.13 (12.8)	34.87 (12.39)	27.80 (10.64)
MCISQ Limits	15.60 (4.02)	12.77 (5.71)	16.50 (5.89)	13.77 (5.62)	12.47 (5.23)	11.07 (5.29)	13.47 (4.75)	10.23 (4.50)
MCISQ Anger	8.00 (3.95)	6.87 (4.57)	5.40 (3.65)	4.73 (2.83)	7.70 (3.77)	6.40 (3.74)	6.30 (3.22)	5.13 (2.86)
MCISQ Doubt	9.33 (5.18)	6.47 (4.56)	8.73 (4.84)	5.93 (3.82)	6.63 (4.58)	4.53 (3.77)	6.53 (4.17)	4.40 (3.01)
MCISQ Feeding	8.40 (3.13)	6.47 (3.34)	8.53 (3.61)	7.77 (3.51)	6.10 (3.28)	4.73 (3.23)	6.70 (3.45)	6.03 (3.40)
MCISQ Safety	3.67 (2.54)	2.40 (1.89)	3.83 (2.79)	2.50 (2.66)	1.90 (1.83)	1.40 (1.61)	1.87 (1.91)	2.00 (2.05)
IBQ-R-VSF								
Surgency	4.21 (0.90)	4.86 (0.69)	4.33 (0.75)	4.86 (0.65)	4.33 (0.77)	4.78 (0.81)	4.35 (0.60)	4.90 (0.59)
Negative emotionality	4.09 (0.61)	4.14 (0.57)	3.98 (0.82)	3.96 (0.84)	3.88 (0.43)	3.95 (0.89)	3.95 (0.92)	3.85 (0.98)
Orienting/regulatory capacity	5.10 (0.56)	5.07 (0.67)	5.00 (0.58)	5.11 (0.63)	4.98 (0.49)	4.91 (0.71)	4.96 (0.73)	4.97 (0.72)
DAS Total	9.17 (1.51)	9.30 (1.88)	10.67 (2.32)	9.70 (2.41)	9.80 (2.12)	10.23 (2.84)	9.43 (2.57)	9.83 (2.41)
PSOC Total	70.20 (10.72)	73.37 (12.45)	68.83 (8.94)	73.20 (10.38)	69.70 (10.56)	72.57 (12.74)	71.63 (11.56)	75.03 (12.41)
PSOC Satisfaction	33.30 (5.98)	35.73 (6.07)	31.93 (4.87)	35.40 (5.86)	32.03 (4.99)	33.90 (5.11)	33.27 (5.15)	34.77 (6.04)
PSOC Self Efficacy	36.90 (6.12)	37.63 (7.99)	36.90 (5.71)	37.80 (6.00)	37.67 (7.22)	38.67 (8.86)	38.37 (7.89)	40.27 (7.72)
Parent-child interaction								
Total	53.63 (5.76)	51.67 (5.52)	52.03 (7.66)	51.97 (6.66)	51.60 (7.90)	52.30 (6.22)	53.70 (7.20)	50.40 (6.02)
Parent Total	37.73 (4.43)	36.97 (4.00)	36.43 (5.28)	37.23 (4.81)	35.77 (5.69)	36.37 (5.51)	37.70 (5.10)	35.80 (4.33)
Infant Total	15.90 (2.99)	14.70 (3.19)	15.60 (3.19)	14.73 (3.41)	15.83 (3.19)	15.93 (2.35)	16.00 (3.32)	14.60 (3.08)
Contingency Parent	13.50 (2.64)	12.87 (3.41)	12.67 (3.32)	13.87 (2.91)	13.13 (3.54)	12.83 (3.51)	13.70 (3.65)	12.90 (3.13)
Contingency Infant	7.47 (2.00)	6.57 (1.92)	7.20 (1.77)	6.50 (2.08)	7.33 (2.01)	7.03 (1.59)	7.47 (2.11)	6.30 (1.84)

Note. EPDS = Edinburgh Postnatal Depression Scale; PCISQ = Parental Cognitions about Infant Sleep Questionnaire; IBQ-R vsf = Infant Behavior Questionnaire – Revised, very short form; DAS-4 = Brief version of the Dyadic Adjustment Scale; PSOC = Parental Sense of Competence Scale.

Table 4.5. *Maternal and Paternal-Reported Infant Sleep Characteristics at Baseline (5 months) and Outcome (7 months) by Group*

	Mothers (<i>N</i> = 60)				Fathers (<i>N</i> = 60)			
	Play2Sleep <i>n</i> = 30		Comparison <i>n</i> = 30		Play2Sleep <i>n</i> = 30		Comparison <i>n</i> = 30	
	Baseline <i>M</i> (<i>SD</i>)	Outcome <i>M</i> (<i>SD</i>)	Baseline <i>M</i> (<i>SD</i>)	Outcome <i>M</i> (<i>SD</i>)	Baseline <i>M</i> (<i>SD</i>)	Outcome <i>M</i> (<i>SD</i>)	Baseline <i>M</i> (<i>SD</i>)	Outcome <i>M</i> (<i>SD</i>)
Number of night wakings	4.20 (2.11)	2.80 (1.69)	3.50 (1.53)	2.57 (1.47)	3.33 (1.63)	2.69 (1.66)	3.10 (1.24)	2.53 (1.43)
Nocturnal wakefulness (minutes)	82.67 (37.85)	41.40 (36.39)	70.33 (55.10)	67.17 (87.02)	78.62 (50.65)	50.00 (32.77)	62.00 (30.05)	43.62 (34.28)
Longest self-regulated sleep period (minutes)	235.86 (87.27)	309.66 (147.78)	253.17 (106.82)	324.57 (183.70)	262.93 (111.98)	303.10 (144.91)	259.50 (83.85)	294.66 (153.66)
Nighttime sleep duration (minutes)	588.00 (64.17)	636.93 (80.94)	575.37 (83.00)	625.50 (80.07)	538.97 (118.30)	591.72 (111.67)	553.50 (94.73)	606.21 (66.56)
Daytime sleep duration (minutes)	164.50 (67.25)	145.00 (45.14)	161.50 (80.03)	156.50 (44.16)	147.68 (65.92)	151.03 (82.81)	148.83 (76.01)	167.50 (61.04)
Number of naps	3.03 (0.56)	2.62 (0.49)	3.02 (1.74)	2.65 (0.59)	3.07 (0.75)	2.57 (0.50)	2.80 (0.92)	2.78 (0.72)
Mean nap duration (minutes)	55.32 (24.12)	57.31 (20.62)	61.50 (29.19)	60.43 (17.73)	50.05 (21.49)	55.30 (20.66)	54.22 (22.98)	61.60 (20.92)
Total 24-hour sleep time (minutes)	752.50 (95.85)	781.93 (95.39)	736.87 (97.23)	782.00 (103.23)	693.04 (139.34)	742.76 (158.09)	702.33 (137.50)	773.28 (77.55)
Length of bedtime routine (minutes)	49.17 (25.70)	37.67 (15.13)	65.50 (48.00)	49.83 (39.88)	45.34 (24.67)	43.33 (15.94)	54.67 (28.86)	38.50 (31.93)

Note. Bold indicates statistically significant group differences over time.

Table 4.6. *Maternal and Paternal-Reported Infant Sleep Characteristics at Baseline (5 months) and Outcome (7 months) by Group*

	Mothers (N = 60)				Fathers (N = 60)			
	Play2Sleep n = 30		Comparison n = 30		Play2Sleep n = 30		Comparison n = 30	
	Baseline n (%)	Outcome n (%)	Baseline n (%)	Outcome n (%)	Baseline n (%)	Outcome n (%)	Baseline n (%)	Outcome n (%)
Typically, how difficult is bedtime for your child, for example, fussing, crying, protesting?								
Very Easy	0	0	2 (7)	2 (7)	0	0	0	1 (3)
Somewhat Easy	9 (30)	17 (57)	5 (17)	10 (33)	4 (13)	6 (20)	8 (27)	5 (17)
Neither Easy nor Difficult	3 (10)	4 (13)	8 (27)	5 (17)	6 (20)	14 (47)	2 (7)	13 (43)
Somewhat Difficult	13 (43)	8 (27)	7 (23)	10 (33)	16 (53)	7 (23)	12 (40)	9 (30)
Very Difficult	5 (17)	1 (3)	8 (27)	3 (10)	4 (13)	3 (10)	8 (27)	2 (7)
How long does it typically take your child to fall asleep at night?								
Less than 5 minutes	1 (3)	4 (13)	2 (7)	1 (3)	0	2 (7)	2 (7)	0
5-15 minutes	11 (37)	16 (53)	9 (30)	18 (60)	7 (23)	16 (53)	7 (23)	16 (53)
16-30 minutes	9 (30)	6 (20)	6 (20)	5 (17)	15 (50)	9 (30)	10 (33)	11 (37)
31-60 minutes	6 (20)	2 (7)	8 (27)	5 (17)	7 (23)	3 (10)	8 (27)	2 (7)
More than 1 hour	3 (10)	2 (7)	5 (17)	1 (3)	1 (3)	0	3 (10)	1 (3)
Rate how well your child usually sleeps at night								
Very Well	0	3 (10)	0	2 (&)	1 (3)	3 (10)	0	0
Well	2 (7)	7 (23)	0	4 (13)	1 (3)	5 (17)	3 (10)	6 (20)
Fairly Well	10 (33)	12 (40)	19 (63)	16 (53)	16 (53)	12 (40)	19 (63)	17 (57)
Fairly Poorly	12 (40)	4 (13)	5 (17)	4 (13)	7 (23)	9 (30)	7 (23)	3 (10)
Poorly	5 (17)	2 (7)	6 (20)	3 (10)	3 (10)	0	1 (3)	4 (13)
Very Poorly	1 (3)	2 (7)	0	1 (3)	2 (7)	1 (3)	0	0
Do you consider your child's sleep as a problem?								
A very serious problem	14 (47)	6 (20)	7 (23)	6 (20)	8 (27)	4 (13)	6 (20)	4 (13)
A small problem	16 (53)	18 (60)	23 (77)	20 (67)	22 (73)	17 (57)	20 (67)	20 (67)
Not a problem	0	6 (20)	0	4 (13)	0	9 (30)	4 (13)	6 (20)

After adjusting for covariates, we found no significant differences between groups over time in the number of night-wakings reported by mothers, $F(1,53) = 1.59, p = .21$, partial $\eta^2 = .03$ (Figure 4.2) or fathers, $F(1,55) = 0.36, p = .85$, partial $\eta^2 = .001$ (Figure 4.3).

After adjusting for covariates (child sleep location, bed-sharing after waking, and attendance at a general parenting class), mothers in Play2Sleep reported significantly more reductions in nocturnal wakefulness (minutes) over time than those in the comparison group, $F(1, 55) = 5.33, p = .025$, partial $\eta^2 = .09$. Compared to fathers in the comparison group, fathers in Play2Sleep reported a significant decrease over time in the number of infant naps, $F(1, 58) = 4.90, p = .03$, partial $\eta^2 = .08$ (no covariates). We found no other significant group differences for any of the remaining continuous infant sleep variables.

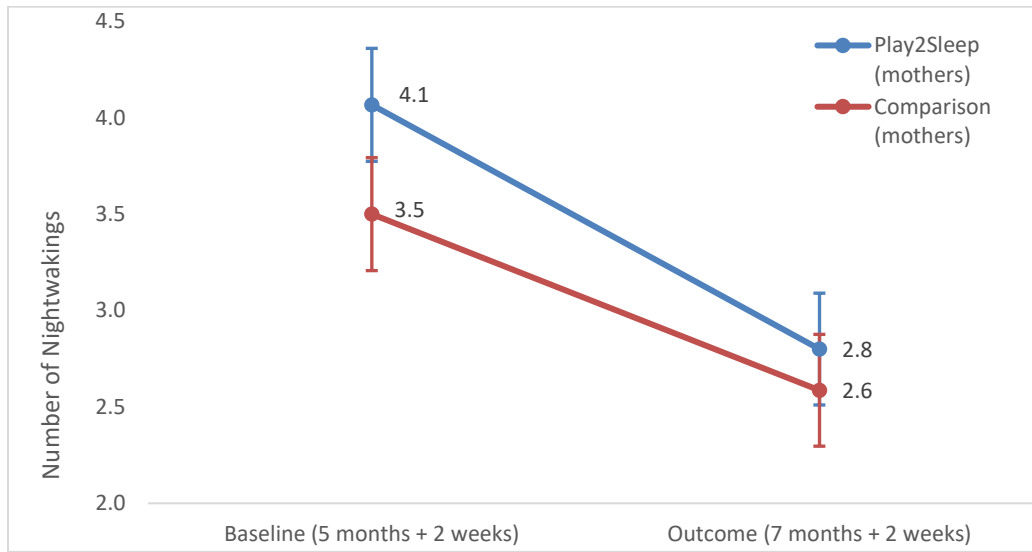


Figure 4.2. Maternal-reported number of night wakings by group at baseline and outcome (covariates = child sleep location, child falling asleep by self in own crib/bed, ethnicity, English spoken at home, and MCISQ total score).

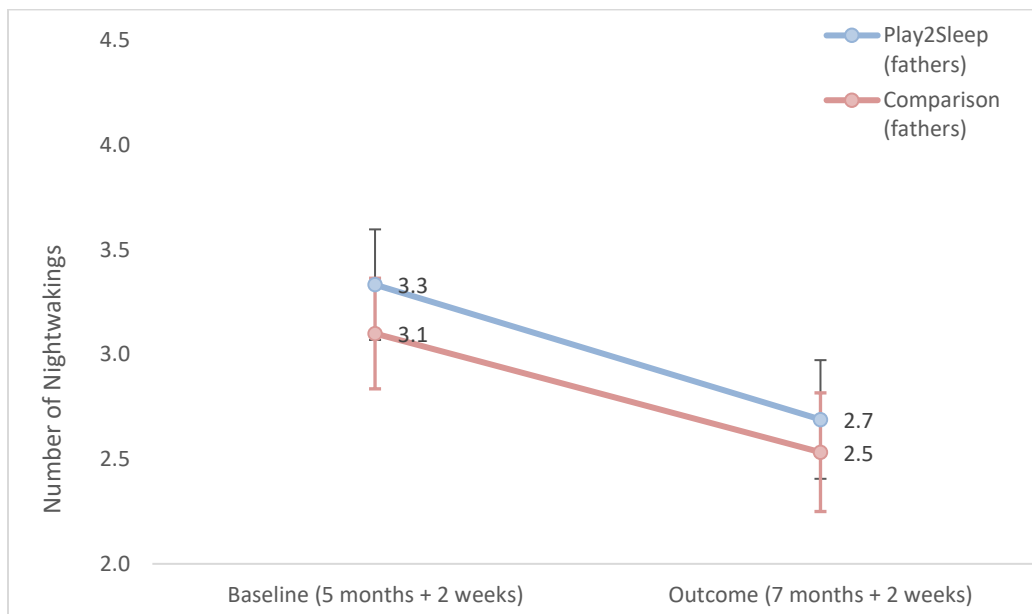


Figure 4.3. Paternal-reported number of night wakings by group at baseline and outcome (covariates = father MCISQ Limits, infant sleep surface, child falling asleep by self in own crib/bed).

For ordinal-level sleep variables (Table 4.6) , we found significant improvements over time in parental rating of problematic infant sleep for both mothers and fathers in the Play2Sleep (based on negative ranks, $Z = -2.82$, $p = .005$; based on positive ranks, $Z = -3.19$, $p = .001$), while no such improvements over time were observed in the comparison group.

Compared to normed reference PCITS scores (Oxford & Findlay, 2013), mothers in the present study had significantly lower baseline scores on the total score and parent domain score, as well as lower scores in all parent domain subscales (Supplementary Table, Appendix C). Compared to published reference values (Harrison et al., 1999), fathers in the present study had significantly lower scores on the total score, parent domain, and infant domain total scores, as well as the social emotional growth fostering, both infant subscales (clarity of cues and responsiveness to caregiver), and contingency subscales for both the father and infant (Supplementary Table, Appendix C).

Qualitative themes. To explain the quantitative findings and understand group differences, our explanatory efforts are focused on describing three themes from the qualitative findings that relate most directly to understanding the effectiveness of Play2Sleep (a) *information overwhelm*, (b) *learning infant cues*, and (c) *working together* with a sub-theme of *father involvement* (Table 4.7).

Information overwhelm. Nearly all families commented on the availability and amount of information on infant sleep. Conflicting information hindered parental ability to improve infant sleep, while information provided by sources perceived as credible facilitated infant sleep improvements. Despite the overwhelming amount of information parents received external to the study, Play2Sleep parents with the most improvements in

night wakings described the video-feedback process as an effective strategy to gain new knowledge about their infant's cues. Play2Sleep parents with least improvements had minimal recollections of the infant cue information and would more often recollect broader parenting suggestions related to daytime pacing of play activities instead.

Learning infant cues. While parents from both groups commented on the process of learning to respond to their infant's cues, Play2Sleep parents with the greatest improvements described how they were immediately able to implement their learning about infant cues. Parents stated that this helped them respond to infant states more effectively, leading to more success in timing and anticipating their infant's sleep needs (especially with naps). Although Play2Sleep parents with least improvements in night wakings commented that the individualized information on their parent-child interaction was helpful, these parents did not retain as much information about the cues and/or mainly applied this information to daytime activities and play interactions. These parents did not, as strongly, report on the knowledge translating into a feeling of knowing their infant better and often used the time of day, in combination with their infant's cues, to determine when their infant needed to sleep. Lastly, these parents commented on the lack of stability and a change in cues during "sleep regressions".

Working together. Parents with the most improvements in infant sleep from both groups described the importance of *working together* in being able to improve their infant's sleep. A key component of *working together* was the sub-theme *father involvement* to develop confidence in father's ability. For Play2Sleep families with the most improvements, mothers and fathers were especially proud of the father's abilities to understand their infant's cues. This ability helped to facilitate *father involvement*,

especially in sleep-related parenting, such as being able to successfully put the infant down to sleep. These successes increased and reinforced confidence in the father's abilities. Alternately, parents with least improvements in infant sleep had more difficulties in *working together*, sometimes due to limited *father involvement*, which was often hindered by work or school commitments and/or decreased confidence in fathers' abilities.

Table 4.7. *Inductively Developed Themes to Explain Effectiveness of Play2Sleep*

Information Overwhelm
<p>Parents commonly described experiences and frustrations with an overwhelming number of potential information sources (external to the study) on infant sleep (books, blogs, providers, friends/family). Parents described how the breadth of accessible infant sleep information, particularly that found on the internet, was overwhelming, often contradictory, and often subjective (being based in personal opinions, philosophies, or social expectations), rather than objective evidence. Parents reported finding credible information sources (such as the home visitor or trusted friends who were experienced parents) was helpful in improving their infant's sleep. Some parents described how they were eventually able to filter out unhelpful information (often with the assistance of credible information sources), but several parents described continued uncertainty over what information to consider as trustworthy.</p>
<p>Mother: [W]e've just recognized that there's a lot of information out there. A lot of expectations, the social expectations that are imposed on us especially from others. You know, you kind of have to just disregard a lot of it." (Play2Sleep most improved)</p>
<p>Father: [T]here is a lot of contradicting information on the web too. The problem is you gotta take it with a very large grain of salt. For everything you read you'll find something else that contradicts it. It's hard to figure out which ones are valid. " (Play2Sleep least improved)</p>
<p>Mother: [B]ecause there's just so much overwhelming and conflicting information that it was really hard to figure out....We knew that we didn't want him to nurse to sleep but then didn't really know how to fix it. I found it really overwhelming with the sleep stuff because there's so many books and not one of them says like the same thing as the other one.... But it's hard if they haven't met your baby and you can't ask specific questions like we could with [home visitor]. (Comparison most improved)</p>
Learning about infant cues
<p>Play2Sleep parents with the most improvements described how they were instantly better able to pay attention to more subtle early cues and this translated to improved ability in helping their infant with state regulation (not just sleep) and more success in timing and anticipating sleep need (particularly with naps). These parents gained new appreciation about their infant's capacity to communicate and reflected they may have previously mis-interpreted any infant disengagement cues as a feeding cue. Parents were proud of their enhanced ability to better understand and interpret their infant's cues and described how this skill helped them get to know their baby better. In contrast, Play2Sleep parents with least improvements did not remember (to the same intensity) talking about the cues. These parents did not generalize information beyond daytime (awake) period and appeared more likely to retain information related to pacing activities or play-specific interactions and did not report this translating into a feeling of knowing their baby better. In addition to infant cues, these parents used the time of day to determine sleep-related activities. Parents in the comparison groups with most improvements described increasing abilities to interpret their infant's cues (cries) more accurately but attributed this to knowledge gained with experience and as a function of their infant getting older, while parents in this group with the least improvements described using the time of day to judge when to put baby to bed.</p>
<p>Mother: I had a really hard time figuring out what those [early cues] were before watching the video. So, I've found that's really helped me cuz I'm really visual, be really aware of what those cues are. I think that's why we've been successful the majority of the time putting him down for a nap and him just going straight down because of that....understanding cues ahead of time is really, really important and something we immediately started applying....I think there is this misinformation when you are having a child that, like, you're gonna get to know your child so well that you know, every cry they make or every</p>

motion they make you're gonna know what it means. I feel like that's a bit of a fallacy. Like there's so much that's thrown at you. You try your best but there's only so much you can figure out by yourself." (Play2Sleep most improved)

Mother: I think I remember the, I think we covered pulling the ears at one point in one of the visits. Cuz I vaguely remember that from somewhere. I can't remember if it was the book, or one of the visits....

Father: I read it and was trying to do stuff but you [to mother] were just so exhausted at that point the reception was just not there (Play2Sleep least improved)

Mother: For so long we were waiting for her to cue us in when she was hungry, when she was sleepy, um, but now it's the time of day. If it's this time of day, we feed her. So, I know what I need to be doing, making food or getting her bath ready or anything like that. So, it's made our lives a little bit easier. She's reacted ok to that. The sleep thing is during the day she's amazing but as soon as you try and get her to that long sleep she turns into a monster. (Comparison least improved)

Working Together

Parents in families with the most improvements in infant night wakings described a process 'getting on the same page' or becoming more of a team in their efforts to improve their infant's sleep. In contrast, parents in families with the least improvements in infant night wakings did not describe a process of being able to work together during the time period between baseline and outcome home visits. Parents with more improvements appeared more likely to agree with each other's parenting practices and philosophies, while parents in families with least improvements would more often interrupt each other to disagree or describe how their parenting approaches and philosophies were different.

Mother: I would get up with her and [father] would sleep in the night. I think there was one time or two times that I woke you [to father] up because I was like really frustrated but mostly it was just me and her. So, it was really helpful once you were on, not that you weren't on board before but once we decided we were doing this together, to have that support. To have both of us doing it at the same time....When he was home, I could go for sleeps. We've always had a good relationship, never, like we were resentful or anything. But I would say yeah in the last few weeks it does feel like we're more of a team. (Play2Sleep most improvement)

Mother: [T]hat was really taking a toll I found, at least I found on our relationship because I was getting super frustrated because it was always me that had to put him down obviously cuz [father] would try to shush him or whatever but it just didn't work....

Father: Different philosophies to putting the baby down. (Play2Sleep least improved)

Father: She's not getting any sleep and it's affecting her day, and then she's screaming at night and it kind of led to, you know, some arguments about what I felt is right and what she felt is right....

Mother: Yes, of course you wanna be on the same page but if you have completely different viewpoints how do you get, while still managing the day to day, how do you get to the same page, or how do you come to an agreement that this is how you're going to move forward? (Comparison least improved)

Father involvement. Parents with the greatest improvements in infant sleep discussed the experience and value of fathers becoming more involved in sleep-related parenting practices and decisions. This involvement facilitated and reinforced the ability of parents to be *working together*. These parents described how fathers started taking a more active role in bedtime routines, either by taking turns doing the routine or taking over bedtime routines entirely,

and that their infant responded differently to fathers' efforts to put them down to sleep, due to differing expectations, mainly relating to the lack of milk. Both mothers and fathers in families with greatest improvements in infant sleep described feeling more confident in fathers' abilities. For Play2Sleep parents, *Learning infant cues* was helpful in building father's infant care skills and facilitated confidence in father's abilities. In contrast, fathers in families with least improvements in infant sleep describe being less involved in their infant's sleep- and bedtime routines, often due to work schedules, strong infant feeding-to-sleep associations, and/or deferral to the mother as the primary caregiver. Fathers in these families sometimes had erratic or irregular success in helping their infant fall asleep. In families from the least improvement, there was less emphasis and reflections of how fathers' abilities had improved and little descriptions of how either mothers or fathers had increased confidence in the father's ability to put the infant to sleep.

Father: If I get to do the routine, we get more time together and it means he's more used to me putting him to sleep so [mother] doesn't have to do it every night.... when I put him to bed when we were on holidays, he seemed to sleep a little better and I kind of was like "Oh I'm actually not terrible at this at all". I can actually do it quite well....I really felt I hit my stride when we were when I was doing it every other night and stuff. We're trying to do that now, I do it a couple of times a week if possible, here. It's really part of my routine as well, putting him to bed. It's, I'm annoyed at myself for not doing it earlier cuz "Oh this is great, I got some quality time with my son"....It's nice that he lets me put him to sleep so I'm happy with that....

Mother: [A]nd then helping put him to bed. Um, that was nice because it shared, it lifted some of the burden off me and then I could you know, get a drink or eat myself. So, I think that was nice when you were able to start doing that. I think that was my proud moment of being proud of [father] for being, you know, taking the initiative as well to do it. It wasn't like me asking, he would just be like "C'mon then let's go up to bed"

Father: I know his tells. That's something that I'm actually very happy, kind of proud about, I, I feel like I know him a bit better now and I know what cues to look for. (Play2Sleep most improved)

Father: By the time I was getting home baby was almost already going to bed. Like there were nights when I was getting home at like 6 o'clock so then baby, I get home just in time to wrap up baby and put her to bed. Then I'd be post-call, so I'd be sleeping all day....when I was here it was just for like a very brief moment when she was still awake. (Play2Sleep least improved)

Mother: You got her down twice, on your own without me.

Father: I've done more than twice actually.

Mother: Well not at that time, I'm proud of that because it's always me. I always have to get her down, it has to be me, and he did it twice I remember.

Father: I did it more than twice.

Mother: Those two times stood out for me because it was over an hour long. The first time was like an hour and then the next time was 45 minutes. So, the fact that he was able to get her down.... I think he tried this morning without me and she was sort of getting sleepy? No? She was quiet though.

Father: I got her to be quiet. (Play2Sleep least improved)

Mother: I think I always rushed in and said, "No it's my job, it's my job, give her to me". That wasn't fair to either of us so now I try to take a little bit more time to kind of say like, "No grandma's here, [father] is here, whoever is here they can deal with it until such a point that I feel like I can't deal with it anymore. So, we're trying to redefine the roles and the responsibilities in the relationship and try to get it as 50/50 as we can. Sleep ultimately you can't do it to a certain degree because of the approach that we're taking and because of the hours he works. But everything else we try. (Comparison least improved)

Discussion

To our knowledge, this is the first attempt to experimentally manipulate parent-child interactions to evaluate the effect of these interactions on infant sleep patterns. This mixed methods study demonstrated Play2Sleep was effective in reducing maternal-reported duration of infant nocturnal wakefulness and the number of paternal-reported infant naps. There were significant improvements in the subjective rating of problematic infant sleep in Play2Sleep mothers and fathers that were not observed in the comparison group. Parents in the Play2Sleep group emphasized the value of individualized video feedback as a strategy to increase their ability and confidence to read their infant's sleep and social cues more accurately. Including fathers was novel and the qualitative analysis contributed to understanding the *how* and *why* of intervention effects.

The finding that Play2Sleep had a significant effect on reducing nocturnal wakefulness is promising, considering nocturnal wakefulness duration during infancy is associated with cognitive growth trajectories (Pisch, Wieseemann, & Karmiloff-Smith, 2019). As Play2Sleep may have been most helpful in assisting mothers to accurately reframe their understanding of what infant behavioral cues were indicative of a waking state, these findings require further exploration with objective sleep measures. Still, accurate parental assessment of wakefulness and infant distress during the early postpartum period may help prevent infant sleep disturbances (Teti & Crosby, 2012; Voltaire & Teti, 2018). While there were no group differences with other maternal-reported infant sleep variables (night wakings, sleep duration and latency), identification of decreased wakefulness may be an intermediary step towards increased maternal

capacity to accurately identify behavioral state cues that result in fewer infant sleep disturbances.

Too much, too little, too late. While parents in the Play2Sleep group reported being able to better read and respond to their individual infant's cues, there were no measurable improvements in the quality of the parent-child interactions. The theme *information overwhelm* suggests that, combined with the breadth of information presented on infant sleep and parent-child interaction in the first home visit, parents may have already felt overwhelmed by *too much* information and were preoccupied with achieving infant sleep improvements.

Although similar community-based interventions have been effective in improving paternal interactions with term infants (Magill-Evans et al., 2007), parents in this study did not achieve measurable improvements in the quality of their parent-child interactions. Parents of infants with sleep difficulties may be so fatigued they retained *too little* of parent-child interaction information. Thus, information may be more effectively delivered in a series of sessions, as has been used to improve parent-child interaction in more high risk and vulnerable populations (Huebner, 2002; Letourneau et al., 2001; Oxford et al., 2013).

Our findings demonstrated that families who are experiencing infant sleep difficulties may already be at risk of lower overall quality parent-child interactions at 5 months postpartum, which could extend up to age 3 years (Millikovsky-Ayalon et al., 2015). Thus, the timing of the Play2Sleep intervention may have been delivered *too late* for families to capitalize on the effects on sleep of improving parent-child interactions. Given that infant sleep duration may moderate how infants differentially respond to

sensitive maternal caregiving (Bernier, Belanger, Tarabulsky, Simard, & Carrier, 2014; Bernier, Jarry-Boileau, et al., 2014), patterns of interaction may have been so well-established that the single dose of Play2Sleep at age 5 months was insufficient to overcome these interaction patterns. Delivering interventions to improve parent-child interactions earlier may also enhance parental emotional availability at bedtime, which has been linked to infant cortisol levels and infant sleep duration (Jian & Teti, 2016; Philbrook et al., 2014; Philbrook & Teti, 2016a, 2016b; Teti et al., 2010). These interventions could be delivered as early as the newborn period. For instance, mothers in the NICU who received intensive infant cue training reported improved mother-infant interactions and reduced nocturnal crying duration (Kusanagi, Hirose, Mikuni, & Okamitsu, 2011). Accordingly, future research should explore prevention approaches that incorporate elements of Play2Sleep into prenatal education and/or in the early perinatal period.

Working together to improve infant sleep. Families with more infant sleep improvements tended to describe experiences of working together, and that the father was able to take a more active role in sleep-related parenting practices (i.e., taking over the bedtime routine). *Learning infant cues* in Play2Sleep families may have helped to foster *father involvement*, helping parents to work together. This supports other literature describing how broader father involvement in daytime caregiving predicts improved sleep for both mothers and infants (Tikotzky et al., 2011; Tikotzky et al., 2015) and is consistent with our findings that Play2Sleep infants may have had improved nap consolidation, as indicated by the more rapid decrease in paternal-reported infant naps.

For fathers in this study to become more actively involved in sleep related practices, it appeared that both parents needed to have some degree of confidence in the father's ability to soothe and settle his infant. Such a finding is consistent with literature that describes how maternal beliefs about father's roles (McBride et al., 2005), and maternal encouragement (Schoppe-Sullivan, Brown, Cannon, Mangelsdorf, & Sokolowski, 2008) may moderate the level of paternal involvement. Our study highlights the importance of building positive paternal caregiving experiences, as fathers' success in putting their infant to sleep reinforced their confidence and involvement, while unsuccessful attempts diminished confidence and overall involvement.

Poor infant sleep can indirectly, via parental sleep deprivation and depression, negatively influence co-parenting quality (McDaniel & Teti, 2012), as can cumulative parenting stress (McDaniel, Teti, & Feinberg, 2018). As co-parenting and confidence in fathers diminish, families may develop a pattern whereby mothers engage in gatekeeping and fathers become less involved (Fagan & Barnett, 2003; Schoppe-Sullivan, Altenburger, Lee, Bower, & Kamp Dush, 2015). Future infant sleep interventions should integrate purposeful strategies to enhance co-parenting as a means of promoting fathers' abilities and confidence related to general and sleep-related parenting behaviors.

Limitations. A key limitation of the study was the relatively small sample size whereby random allocation resulted in baseline group differences. A second limitation is potential expectation bias resulting from the home visitor (EK) not being blinded to group allocation during intervention delivery or follow-up interviews. We did not assess if participants could distinguish between the two groups and cannot exclude potential expectation or contamination bias. The use of parental report tends to underestimate

nocturnal wakefulness when compared to objective sleep measures (Tikotzky & Volkovich, 2019), limiting these findings to subjective parental perception of infant sleep. Lastly, this study was limited to first-born term infants of co-habiting heterosexual couples with relatively high income and education levels; these constraints reduce generalizability of the results.

Conclusions

The Play2Sleep intervention shows promise to reduce infant sleep disturbances and parents valued learning how to accurately identify and respond to their infant's sleep and social disengagement cues. Parent-child interactions in families experiencing infant sleep disturbances may be at risk of being lower quality, affirming the need for further examination of how to support parent-child interactions in these families. Adaptations in the dose, delivery, and timing of Play2Sleep may increase the effectiveness in improving additional infant sleep characteristics.

Chapter 5: Qualitative Themes for Understanding Broader Parental Experiences of Infant Sleep Difficulties

As key group differences in themes between the Play2Sleep and comparison groups have been discussed in Chapter 4, this chapter describes six themes (Table 5.1) that relate to differences between all families with the most and least improvements in infant sleep. As such, this current chapter reports the broader experiences that parents described as they navigated their family's difficulties with infant sleep. When applicable, some themes include descriptions of sub-themes. Generally, themes could be classified as a facilitator or barrier to a family's ability to implement changes to their infant's sleep.

Although parents were asked about their experiences within the timeframe of their participation in the study, many families situated their experiences in a broader time period. This resulted in rich descriptions of experiences and perceptions that families had before, during, and after the timeframe between baseline and outcome home visits. Due to the enduring nature of these experiences, some of the descriptions begin before and extend beyond the study period (i.e., between the baseline and outcome home visits). The magnitude of the extension beyond the study period depended on the timeframe between the outcome home visit and when the interview was conducted. In some cases, this meant the infant's sleep patterns had changed significantly (improved or worsened) since their outcome home visit. Rather than be considered a limitation, this continuity and breadth of time frame helped provide a more comprehensive understanding of parental experiences related to infant sleep. Although it is possible that families may not accurately recall their experiences, the theoretical model with which this research is framed assumes that families have multiple truths and are experts in their own lived experiences. As such, an

assumption of these qualitative interviews is that parents will remember and speak to what is important to them, even after time and reflection.

Families were invited to interviews based on most and least improvements in their infant's night wakings. To help readers situate the following parental perceptions and experiences, details on parent-reported infant sleep characteristics for each group of families interviewed are provided in the appendix (Appendix C; Tables 5.2 and 5.3). For instance, interviewed mothers in Play2Sleep and comparison families with the *most* improvements reported a mean decrease of 3.4 and 2.0 night wakings, respectively. In contrast mothers in Play2Sleep and comparison families with the *least* improvements reported a mean decrease of 0.2 and 0.6, respectively.

Table 5.1. *List of Themes and Subthemes*

Theme	Subthemes
Developing routines	
Changed attitudes and beliefs	
Fears, concerns, and anxieties	
Support	<i>Tangible (practical) supports</i> <i>Social and emotional support</i>
Sleep associations	<i>Extinction-based strategies</i> <i>Bed-sharing</i>
Context of infant sleep difficulties	<i>Individual</i> <i>Relational family system</i>

Theme 1: Developing Routines

Regardless of the magnitude of improvement in infant sleep, families described experiences of adapting sleep routines as their infant grew and developed. Parents described how intense lack of sleep impaired their ability to react to infant sleep challenges and develop helpful infant sleep routines, "I think going through it, it's very,

very tough and I think in the moment you can't really see a way out" (mother, most improved - Play2Sleep). Parents often prioritized actions that would result in immediate or short-term sleep improvement, despite knowing that these may build unsustainable sleep routines.

Mother: Yeah, I think it's just a Catch 22 cuz you wanna get better sleep, but you're so sleep deprived that you can't see like the, the long-term results. Like you wanna see it right away but it really does take like a lot of patience. (least improved - Play2Sleep)

Families with the greatest improvement talked about how they figured out routines that worked best for their family, with fit helping to ensure consistency. While families with most and least improvement described knowing the benefits of consistent routines, families with most improvement also described how they purposefully selected specific activities to include in the bedtime routine and commented that their infant enjoyed and knew their bedtime routine. "[F]iguring out the routine that worked best for us and the baby and sticking to it, yeah, definitely. Cuz I think that's the way that, that made it more successful sticking to the routine." (father, most improved - Play2Sleep). Another mother stated,

Mother: We knew that we wanted to read to him every night because it's really important that he learns about reading and books. So, we knew that was gonna be in there.... [W]e wanted him to be comfortable with water, so we knew bath time was gonna be a factor.... I played around with it a bit, tried it, you know, tried it one way for a week. Ok, let's move this bath time first and then this and then that. (most improved - comparison)

Families with least improvement needed more concrete and pragmatic examples of how to build sleep routines and adapt what they considered to be vague information to their own infant and family situation.

Mother: You can't ask some unknown. You can't say to the book, "Tell me what I need to do." [laughs]

Father: You can only kind of get it down to a degree for everybody right. Every baby is different, it's not that its bad information, it wasn't.... it's different than our baby. (least improved - Play2Sleep)

Routines included developing a specific and consistent bedtime routine, as well as plans for how to respond to nighttime awakenings. Families with most improvement emphasized their success resulted from instituting plans and routines with consistency. "[I]t really stood out to me, the consistency. Like whatever you do just choose it and keep on it and good things will come from it." (mother, most improved - Play2Sleep).

Mother: [O]ur experience was very up and down for the first, probably, 3 weeks. Some nights were amazing, other nights were terrible. But we did just really stick with it, we tried really hard to stay consistent and I think it's paid off for sure. (most improved - comparison)

Parents described detailed contingency plans and rules for bedtime and responding to their infant in different scenarios and how this helped them remain consistent in their approach.

Father: [W]e started out with like the, the being in the room thing.... It actually made him cry more. So, when we kind of shifted over to doing it, what we did, when we first went to bed, we did 20 minutes to go check on him. There would be me, you know I'd kind of sing a song and stuff like that to soothe him. For the most part that worked and we kind of just kept it as a rule that every 20 minutes we checked on him, give or take, and if he woke up in the middle of the night we'd wait 10 minutes to see if, he'd put himself back to sleep. Only after that 10 minutes we'd go and check on him. (most improved - Play2Sleep)

In contrast, families with least improvement reported less consistency in implementing their routines and did not have the same emphasis on contingency planning. "I was changing things too often and she didn't have a chance to adapt So, I think I was

doing things every 3-4 days changing them and she didn't have time to adapt to try it out" (mother, least improved - comparison). Parents with least improvement described how interruptions (travelling, family visitors, holidays) interfered with their ability to develop and maintain consistent routines for improving their infant's sleep. Fatigue, resulting from sleep deprivation and information overwhelm, were often barriers to consistency, while working together facilitated consistency.

Father: I think part of it might have been that [mother] and I weren't um, like I was consistent and [mother] was consistent but we weren't consistent on the same things together. So, the strategies I was doing was maybe not what [mother] was doing and vice versa. Every once in a while, we'd figure that out and we'd, we'd be like, it would be 2 in the morning and we'd be sitting there, "What are you doing when she does this? And, "What am I doing when she does this?" And we were like, "No wonder this isn't working like we're doing opposite things." (least improved - Play2Sleep)

Theme 2: Changed Attitudes and Beliefs

Parents described a range of attitudes and beliefs that influenced their experiences with infant sleep difficulties. Parents reflected on how previous beliefs impacted their expectations regarding daily life activities,

Father: [Y]ou just kind of expect that oh yeah, the baby, a baby would have a two- or three-hour nap in the afternoon so I could just attend to other stuff and just do stuff. We've never had that with him because we're always, because he doesn't sleep and if he does sleep it's always like you're just like trying to make sure he's sleeping so you're not even really, like we can't run the vacuum cleaner, we can't bang around because you don't wanna wake him up right? (least improved - comparison)

Parents described changes in attitudes and beliefs about their infant's abilities to self-soothe, infant development, and infant's innate characteristics, as well as a growing recognition of infants as uniquely developing beings with previously unrecognized

capacity. “[T]hat realization was so freeing. It’s not my job to put him to sleep, it’s my job to support him to fall asleep.” (mother, most improved - comparison). Changes in attitudes and beliefs sometimes followed improvements in infants sleep – parents describe how they underestimated their infant’s self-soothing capabilities or that they changed their attitude related to infant crying. “I think the biggest adjustment parenting-wise was getting comfortable with the fact that she might cry, she might fight it a little bit.” (father, most improved - comparison).

In other instances, changes in attitudes and beliefs preceded improvements in infant sleep. Parents described how particular experiences were turning points in changing their belief or attitudes, such as when an infant starting to sleep longer at night,

Mother: “[O]ne night she slept all through the night on her own, like no intervention. We were like, “Ok, she’s ready,” and then we started doing the sleep training right?”

Father: “That’s right, she gave us the signal” (most improved - Play2Sleep).

Occasionally, these changes were spurred by more intense or dramatic situations, such as this experience described by a bed-sharing mother: “And then, when that happened, it really motivated me to go ahead and do it. She fell off the bed.” (mother, least improved - Play2Sleep). Other parents reported how reaching their breaking point in terms of exhaustion and fatigue in managing infant’s sleep difficulties marked a change in how they managed their infant’s sleep. “Every time he’d put him down wide awake, crying and so it was just like everyone was beyond frustrated we just all kind of shut down. [Laughs] So we knew we needed to do something a little bit different” (mother, most improved - comparison).

Families with least improvement tended to describe a process of realizing and appreciating their infant as unique and that not all information applied to their infant. “[W]e had read a couple of books and programs about it. I suppose there were some things you could say that were maybe helpful. But as a whole [infant] didn’t fit into any of their little boxes.” (mother, least improved - Play2Sleep). These parents sometimes changed their beliefs about their infant’s characteristics, as well as attitude towards nighttime sleep disruptions.

Mother: He’s a very, very active boy and I think that’s also part of his personality and we didn’t accept that factor in the beginning and we said, “He has to take 2 hours naps how do we do that? Like ok, we can rock him, we can nurse him, but he also needs activity”. He also needs to go around, he needs to play with other kids....it seems like he’s been moving that much, he’s also getting these longer naps.... what I do love and I, I, love about us as a family is we can share a bed and whenever I wake up, I feel his small body right next to me. It’s like I don’t mind waking up 5, 6, 7 times per night.... I’ve learned to enjoy waking up.” (least improved - Play2Sleep)

Theme 3: Fears, Concerns, and Anxieties

Parents described a range of fears, concerns, and anxieties that influenced their experiences of managing their infant’s sleep difficulties. These ranged from concerns about how lack of sleep could impact infant brain development to fears about infant sleep safety and Sudden Infant Death Syndrome (SIDS). These concerns were sometimes driving factors for parents to change their strategies to managing infant sleep. “We all know how sleep deprivation affects adults; you wonder if it’s gonna affect his physical development, mental development. Is he gonna be prone to certain ailments?” (father, least improved - comparison).

More often, parental fears, concerns, and anxieties acted as barriers to improved infant sleep situations. For example, parents described how concerns about feeding, weight gain, and breastfeeding difficulties led to unplanned sleep situations, “[N]one of us were getting any sleep and she was very, very fussy. She was so overtired, so that’s why we started co-sleeping along with the nursing to try and get more calories into her at night time.” (mother, most improved - comparison), and “[T]he big problem that we have was he didn’t latch. So, once he was in there, we didn’t want to move him. That’s why we let him just eat.” (father, least improvements - Play2Sleep). Similarly, many parents had concerns about infant crying, “[father] has a really hard time with him crying, so [to father] I hope you don’t mind me saying that, but he [father] has a hard time with him crying” (mother, most improved - comparison).

Families with most improvement used strategies to manage or overcome their fears, concerns, and anxieties. These strategies included parents using each other as social supports or finding alternate ways of coping with their concerns. “I actually left the house for the first four nights, like I found other places to be, because it was really hard for me to let him cry” (mother, most improved - Play2Sleep). In contrast, families with least improvement talked about how they had continued fears, concerns, and anxieties, which they were unable to overcome. Often, these parents described how they could not stand to hear their infant cry or that it made them too anxious. One mother with continued sleep difficulties was still concerned about her infant’s weight gain, despite a normal growth trajectory, “I still need to nurse her just before bedtime, partially because I feel like she’s not getting enough milk during the day. It’s kind of a catch up.” (mother, least improved - Play2Sleep).

Parents who experienced prior feeding or crying difficulties received support from health care practitioners that helped them cope at the time. However, parents reflected that a lack of additional anticipatory guidance about infant sleep acted as a barrier to improved infant sleep after these difficulties were resolved. These parents reflected that additional preparation in terms of knowing when and how to start building more independent infant sleep habits once feeding and crying difficulties were resolved would have been helpful.

Mother: [I]f we understood or knew the importance of setting those routines right from the beginning, one, would we have been in a place to even hear that information give all the other things that we were trying to manage at the time? Or um, would we have managed the colic differently, because [father] and I often feel like that was a contributing factor, how we managed the colic, contributed to the poor sleep habits or introducing those crutches....Where every provider is keen to say, “Yes you’re right, this sucks it’s really intense” the validation is great, but it was always do whatever you can to, to cope. And so that’s what we were doing without realizing the implication that we feel it’s now had on that. (least improved - comparison)

Theme 4: Support

Parents described a range of experiences related to supports for infant sleep. Support for infant sleep could be from formal (i.e., health services or health care providers) or informal (i.e., friends or family) sources, present or absent, and helpful or unhelpful. Many parents in the study were unaware of any potential sources of formal support, such as sleep-specific perinatal education classes, or felt that their concerns were minimized by both formal and informal supports. “I think so many parents, like are suffering because they’re not sleeping. People are like, “Oh that’s just what babies do, babies don’t sleep, like you’re just not gonna sleep.” (mother, least improved - Play2Sleep).

Sub-theme: Tangible (practical) supports. Tangible supports that parents used included (a) specific sleep books, (b) additional health care provider consultations, and (c) written sleep training plans or programs borrowed from friends who had previously paid for a sleep consult or commercialized sleep program. These tangible supports were often most helpful when they included detailed, step-by-step instructions that were framed to fit with parental beliefs and parenting philosophies, and when these supports were endorsed by a credible person providing positive social support. Parents were often struck by the lack of formal supports embedded within the health system for managing infant sleep difficulties, in contrast to support for infant feeding. “I feel like there’s not a lot of support for like sleep out there. You go to all these classes and there’s like this support for breast feeding and this for breast feeding,” (mother, most improved - Play2Sleep).

Sub-theme: Social and emotional support. Social support could be positive or negative and provided by either informal social relationships or formal healthcare provider relationships. Some families described a lack of, or very minimal, social support networks, with family being geographically distant. Families with most improvement described having trusted sources of support. This included a sense of trust in the home visitor as a credible expert, as well as the information provided during the home visit being non-biased and offered in a non-judgmental manner. “Just having [home visitor’s] expertise at our disposal.... just having that feeling, “She’s a nurse and she’s in our home we can ask her whatever we want”. It was really comforting at that time.” (mother, most improved - Play2Sleep).

Parents also associated positive social support experiences with others who had recent lived experiences with infants. “I tried to only talk to friends who have kids who are [infant’s] age or have had children within a year.” (mother, most improved - comparison). In addition to lived experience or credentials, positive social support came from individuals with whom parents had trusting relationships with (either formal or informal). “[W]e have friends that have kids around the same age that have gone through it we knew what to expect and were kinda coached from two friends” (mother, most improved - Play2Sleep). Similarly, families tended to describe being reassured and having a sense that they were on the right track as beneficial, “[T]he reassurance that what we ... were already doing and being reassured that we are on the right track. Um, was good, was very helpful.” (mother, most improved - comparison).

Social support that involved a sense of judgement contributed to negative parental experiences. Judgement was experienced within both formal and informal social support systems.

Mother: There was a part of me in the beginning that almost felt guilty saying that we were doing the cry it out method because there are some people who are quite negative about the cry it out method. So, I almost felt like I didn’t wanna share that with everybody because I felt they might judge me for doing that.” (most improved - Play2Sleep)

Parents commented on how initial disclosures to health care practitioners about bed-sharing in response to their infant’s sleeping difficulties, led to feelings of shame and judgement, which led to non-disclosure in future health care encounters.

Mother: [T]o be honest there was a little bit of like guilt or shame with it, so I wasn’t always honest....I remember at one of her vaccine appointments they asked how she was sleeping, and I didn’t wanna get into it. “Oh yeah she’s in her crib”. Just that I didn’t want the, not a lecture necessarily but the whole, you know

that a crib is safer, and we don't recommend co-sleeping. Of course, I knew that but at the time I didn't feel like I had another option." (most improved - comparison)

Theme 5: Sleep Associations

Overall, parents understood the concept of sleep associations and how certain associations could be helpful or unhelpful in improving infant sleep difficulties. Parents with most improvement described much more success in removing parent-related sleep associations (i.e., holding, rocking, or feeding to sleep) and building more sustainable infant-related sleep associations and independent self-soothing behaviors, such as the use of a soothers or security item (i.e., a soother toy). "I think the biggest thing is probably separating feeding from sleeping and just that routine. Just really consistent" (mother, most improved - comparison). Some parents removed sleep associations in one direct step (i.e., stopped rocking), whereas others described using a multi-step and gradual approach (i.e., building additional sleep associations before removing undesirable ones; moving from rocking to holding to patting in the crib).

Mother: [A]nother one of the tips was maybe decrease the shushing as well, decrease the rocking slowly, decrease the shushing, ah, it was decrease everything really because we were just spending too long getting him out cold for him to wake up again. And as [home visitor] mentioned not getting him out cold would be the next step. Don't get him out right cold, get him down drowsy but awake instead. Then the next step after that would be just putting him down awake. So, I guess a lot of the tips we got were stepping stones. Because we needed stepping stones, we knew it wasn't gonna be a quick click your finger fix" (most improved - Play2Sleep).

Families with least improvement described having less success in being able to modify their infant's sleep associations (at least during the study period), with parents sometimes giving up because they saw no sign of success until the baby was older.

“[T]he information that you gave us was great, um, it was just how to execute it.... you need to break the habit, but that’s the hardest thing to do” (mother, least improved - comparison). One family with least improvement described that although they did not observe any changes in their infant’s sleep patterns, they were able to change their infant’s sleep location (from bed-sharing and being held by parents to the infant’s own crib), which the parents viewed as an important success.

Sub-theme: Extinction-based strategies.

Families with most improvement more often described the explicit use of an extinction-based strategy in changing infant sleep associations. These strategies were often referred to by parents as ‘sleep training’ and ranged from a structured check and reassure strategy to gradual fading of parental presence. Parents with least improvement more often commented that they had attempted some form of an extinction-based strategy, but were unsuccessful, due to their infant crying for longer than their tolerable threshold.

Mother: I can’t stand her crying for a long time. That Ferber method, we’ve tried so many times, but we give up after 1 or 2 nights because it says to leave her and keep coming back every 8, 10, 15 minutes, and I can’t do it cuz I just can’t stand her crying when I’m not in the room.” (least improved - Play2Sleep).

Families with most improvement described being able to successfully replace breastfeeding-to-sleep associations, with mothers often describing a sense of relief that they could relinquish the sole responsibility of putting the baby to sleep. “[A] big win for me was that we don’t have to nurse him to sleep anymore....I’m just so happy that I don’t have to nurse him to sleep [now].” (mother, most improved - Play2Sleep).

Sub-theme: Bed-sharing. Many families in the study described bed-sharing at some point, as a coping strategy for intense fatigue related to infant sleep disturbances. Bed-sharing was often used in response to strong breastfeeding-to-sleep associations. Parents recognized bed-sharing was not an ideal safe sleep environment but struggled to find practical advice and assistance related to harm reduction strategies and/or how to stop bed-sharing. Parents often stopped disclosing to health care practitioners that they were bed-sharing due to perceived judgement and a lack of support related to identifying tangible strategies to stop bed-sharing while still experiencing infant sleep disturbances. Few families with most improvement described continued bed-sharing. In contrast, families with least improvement reported extended bed-sharing experiences, often being used as a strategy to cope with their infant's strong feeding-to-sleep associations in the midst of experiencing extreme fatigue. Mothers with least improvement reported insufficient energy to invest in modifying their infant's sleep associations due to extreme and continued fatigue.

Mother: [A] couple of times when we said that we were co-sleeping, I didn't get support.... I got more of the, 'don't co-sleep, put her in crib'. And when I would say, "How 'how do I do that?', it's "Put her down drowsy". I was like, "But that isn't working for me". But they didn't have any advice on that.... more support and understanding.... more like, "Hey if you're going to co-sleep, if it is a last resort kind of thing, do these steps to make it as safe as possible.

Father: Yeah, we definitely didn't need encouragement that we were doing the right thing by co-sleeping, we understood that that wasn't...our ideal, but just knowing that....it was ok to do it if we did the right things. Then that would have made us feel a lot better about it." (most improved - comparison)

Theme 6: Context of Infant Sleep Disturbances

All parents described how infant sleep disturbances influenced themselves, other family members, and/or their relational family system. This impact was described as either

direct experiences or illustrated by changes that occurred once sleep had started to improve. These contexts manifested across two broad sub-themes: individual and relational family system.

Sub-theme: Individual. Parents described how sleep problems impacted their infant's mood and behaviors. Once sleep had improved, parents described that their infants were happier. "[N]ow he's like, and he's so happy. Like that's actually really rewarding too is just seeing how happy he is." (mother, most improved - comparison). Some parents equated success with sleep to success as parent, "[I]t was so direct, like if she slept then I really felt better about myself as parent, I liked him [to father] more you know" (mother, most improved - Play2Sleep).

One mother explained how her experience of sleep loss related to infant sleep disturbances was compounded by sleep difficulties during pregnancy. "[Y]ou need the sleep. I mean it's been a year, plus the third trimester of not sleeping properly" (mother, least improved - Play2Sleep). Both mothers and fathers described feelings of isolation, guilt, self-doubt, frustration, and overwhelm. "[Y]ou always feel very alone when you're going through it, especially if your other friends that have kids, their kids are great sleepers, and you wonder what you're doing wrong." (mother, least improved - comparison), and "I was.... doubting about myself, about everything. About everything so yeah it contributed a lot. At some point I just think it's all my fault, but I don't want to think like that." (parent, least improved - Play2Sleep). Parents also described how their own feelings of fatigue and tiredness, negatively impacted their mood, cognitive abilities, and caregiving activities.

Mother: The nurses would always ask, “Do you have postpartum depression?”

You’re kind of going, “I don’t know, I haven’t slept for more than 3 hours”.

Father: “I feel like garbage does that count?”

Mother: “I’m crying all the time but is that hormones or cuz I’m so tired?” (least improved - comparison)

While experiencing infant sleep disturbances, parents were often unable to practice self-care activities such as napping, exercise, or social activities outside their home. Once sleep had improved, parents described feeling more relaxed and increased happiness for both themselves and their infant.

Mother: I think like I’m a lot happier [laughs] now, wouldn’t you agree?

Father: I didn’t even know you were unhappy. [Laughs]

Mother: I was stressed. (least improved - Play2Sleep)

Parents also became less frustrated and had increased patience regarding infant sleep, with more time and energy to engage in exercise and social engagements.

Father: I can tell when she’s started getting rested again cuz the jokes come back....

Mother: I can engage more, and I have more patience with him for sure during the day. If I’m more rested and I don’t feel as exasperated if he’s not going to sleep. I’ll just think, “Ok, it’s not working, I’ll just try again”. The exasperation isn’t there. (most improved – comparison)

Sub-theme: Relational family system. In terms of family relationships, parents described reduced levels of enthusiasm and motivation to interact with their infant and spouse, as well as reduced levels of patience during interactions. Mothers also described how infant care was often overwhelming and restricted their own freedom.

Mother: I was so sleep deprived that I don’t get to do much activities with her. Like during the day, I’d rather pass out again if she’s asleep I’m asleep, if she’s awake it’s either I’m feeding her or changing her diaper or just eating. Like me, going to the bathroom is taking care of myself. Cuz I don’t have much freedom. The thing is it’s not just the lack of sleep it’s also her being, like the co-sleeping

right? She wouldn't rest without me beside her. So that kind of took away a lot of my freedom even to just have a second and go to the bathroom. (mother, least improved - Play2Sleep)

One mother described dreading the night and nighttime interactions with her infant. "I used to dread the night cuz you don't know how it's gonna go." (mother, most improved - comparison), while another found she could not enjoy spending the day with her infant because she was preoccupied with thoughts about when she would be able to nap.

Mother: I was very reluctant to enjoy my day with [infant] because I'd hardly had any sleep and I wasn't feeling like I was functioning 100%. Then when [infant] was being demanding during the day as well, because well, he wasn't sleeping well, let's face it, um, we were both as cranky as each other really and it was just a survival game during the day. I'd be trying to play with him but all I could think of was a nap and I wasn't, you know, giving it my all as a mother, I guess. (mother, most improved - Play2Sleep)

Conversely, once sleep had improved parents described how they became more engaged, relaxed, present, and enthusiastic in their interactions with their infant.

Parents also described how infant sleep disturbances strained their spousal relationships, created household tension, and limited their ability to spend time and enjoy each other as a couple. Fatigue impaired communication and lead to increased conflict and arguments. "[O]ur relationship is better now. Not that it was bad before, but it was definitely some tension, right? You really had to watch what you said a lot of times because before [infant] came along that stuff never even happened" (father, most improved - comparison). In families where sleep had improved, parents reflected on the importance of then being able to spend more quality time as a couple. "So, we kind of

look forward to having, now we eat dinner together and put her down and then we get a couple of hours just us which is key.” (mother, most improved - Play2Sleep).

Mothers were often the primary nighttime responders, especially when breastfeeding.

Mother: I would get up with her and [father] would sleep in the night. I think there was one time or two times that I woke you [to father] up because I was like really frustrated, but mostly it was just me and her” (most improved - Play2Sleep)

Often, as a way of ensuring that at least one parent was well-rested, mothers attempted to buffer fathers from sleep-related disruptions related to infant sleep disturbances.

However, mothers sometimes alluded to this leading to unexpected feelings of resentment.

Mother: [T]hat was really taking a toll I found, at least I found on our relationship because I was getting super frustrated because it was always me that had to put him [infant] down obviously cuz [father] would try to shush him or whatever but it just didn't work.... Like resentful even though there's no reason to be” (least improved - Play2Sleep).

Summary

In summary, families provided detailed descriptions of their experiences and perceptions related to infant sleep disturbances. These experiences and descriptions were synthesized into six themes, centered on specific concepts (such as *developing routines* and *sleep associations*), the evolution of *changed attitudes and beliefs*, as well as associated feelings and emotions (*fears, concerns, and anxieties*) and the impact that *support* and infant sleep disturbances had on families' lived experiences (*context of infant sleep disturbances*). These qualitative themes provided a comprehensive description of parental experiences and perceptions associated with infant sleep disturbances to answer

the qualitative research question. To maximize the potential role that these themes may play in furthering current understandings the effectiveness of infant sleep interventions, an integrative discussion of all quantitative and qualitative findings is presented in the next chapter.

Chapter 6: Mixed Methods Integration and Discussion

Integration is a key component of mixed methods studies (Johnson, Onwuegbuzie, & Turner, 2007). In a sequential explanatory research design, the qualitative findings are used to explain the quantitative results (Ivankova, Creswell, & Stick, 2006). Chapter 4 detailed how Play2Sleep, a brief, personalized video-feedback session of parent-child interactions, was effective in improving the duration of maternal-reported infant nocturnal wakefulness and paternal-reported number of infant naps. In addition, parental perception of the severity of infant sleep disturbances significantly improved in Play2Sleep families but not in families who received the comparison intervention. In comparing the qualitative data by intervention assignment (Play2Sleep or comparison), three key themes (*information overwhelm, learning infant cues, and working together*) were developed to explain how and why Play2Sleep was effective in some, but not all families. Meanwhile, the qualitative analysis presented in Chapter 5 described shared contexts, perceptions, and experiences that facilitated or hindered family's capacity to improve infant sleep, regardless of intervention type. From this analysis, six themes related to the broader experiences of infant sleep disturbances were described in Chapter 5: (a) *developing routines*; (b) *changed attitudes and beliefs*; (c) *fears, concerns, and anxieties*; (d) *support*; (e) *sleep associations*; and (f) *context of infant sleep disturbances*.

The purpose of the current chapter is to situate both the quantitative results and qualitative findings presented in Chapter 4 within the broader qualitative themes described in Chapter 5. Integrating these findings into a single comprehensive discussion will provide a broader frame for how families experienced infant sleep interventions and

achieved improvements in infant sleep disturbances. This integration will then be discussed with respect to implications for the proposed theory on sleep and development described in Chapter 2.

Using Qualitative Themes to Explain Improvements in Infant Sleep Disturbances

Figure 6.1 provides a visual representation of how the explanatory themes of Chapter 4 relate to the themes of Chapter 5. The presence or absence of certain themes facilitated or hindered family capacity to improve infant sleep disturbances. The *context of infant sleep disturbances*, both on an individual level and family relational level, influenced how families experienced all other themes and served as a foundational context. Often the *context of infant sleep disturbances* (i.e., parental fatigue, household tension) served as a barrier that families needed to overcome to improve infant sleep disturbances. *Support* also broadly influenced how families experienced and perceived the process of improving infant sleep. Positive support buffered the negative impacts of infant sleep disturbances and helped parents develop their capacity to address infant sleep disturbances, while negative or absent support acted as a barrier. For example, spousal support (in the form of *working together*) facilitated improvements, while judgements from family and/or providers acted as a barrier and reinforced *fears, concerns, and anxieties*.

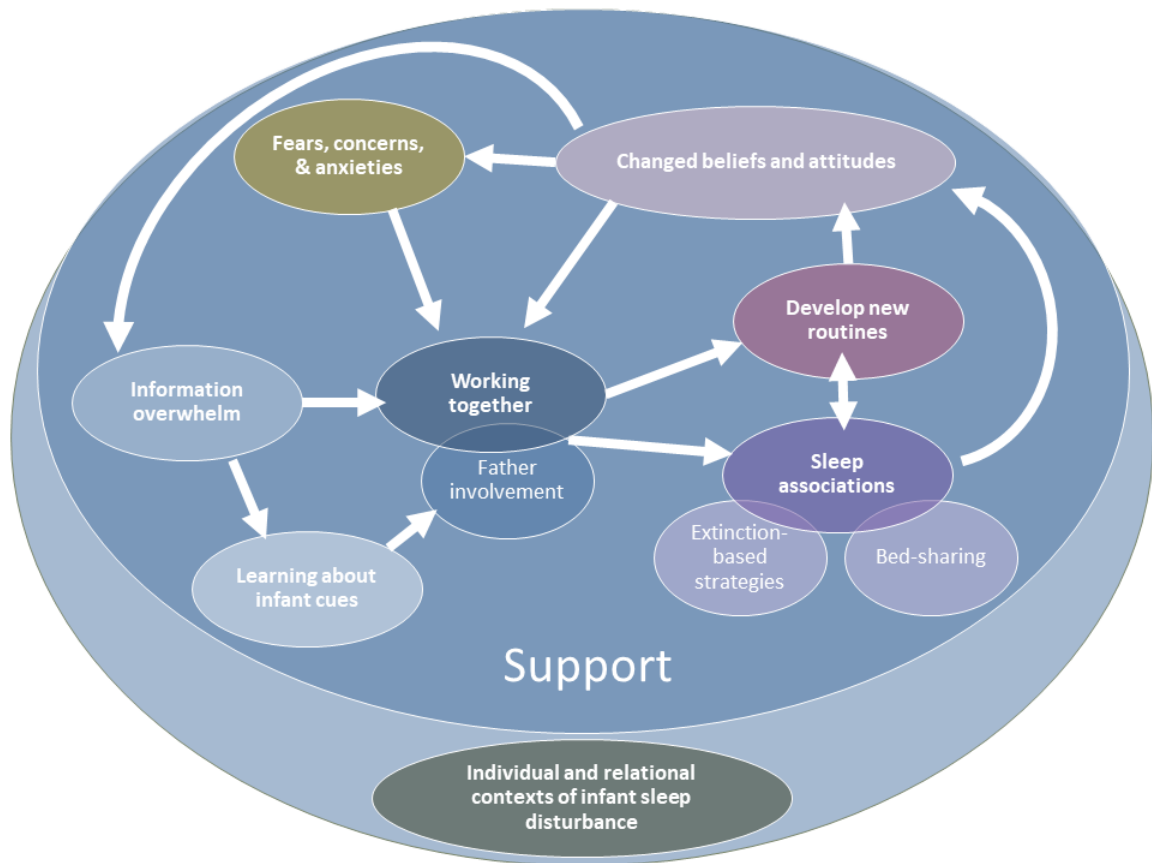


Figure 6.1. Relationships between qualitative themes.

Information overwhelm and *fears, concerns, and anxieties* hindered parental ability to *work together*. In the context of the Play2Sleep intervention, *information overwhelm* reduced parental capacity for uptake and retention of the information on *learning infant cues*. For Play2Sleep families, *learning infant cues* could directly and indirectly influence parental ability to *work together*. A direct influence was enacted by engaging both mothers and fathers in the process and providing parents with a common ground from which to *work together*. *Learning about infant cues* during the Play2Sleep intervention could also exert an indirect positive influence on *working together* by facilitating increased *father involvement*. However, if *information overwhelm* was not

resolved for families and/or the Play2Seep information on *learning infant cues* failed to develop *father involvement*, families often continued to struggle to work together to effectively *develop routines* and modify *sleep associations*.

In the broader context, often a *change in attitudes and beliefs* was pivotal in instigating (or re-instigating) a family's attempts to *work together* to *develop routines* and change *sleep associations*. Generally, families who experienced the greatest improvements in infant sleep described a process whereby they had a *change in attitude or beliefs*, helping them to effectively manage *information overwhelm* and *work together* to develop and enact a plan for replacing undesirable and unsustainable *sleep associations* to assist in *developing routines*. These families often engaged effective *support* (a person or resource) from a credible source(s). *Working together* facilitated a family's ability and determination to consistently work toward developing new routines that replaced undesirable and unsustainable *sleep associations*. Parents described a range of *sleep associations*; however, breastfeeding-to-sleep was one of the most difficult *sleep associations* for parents to overcome.

Overall, parents described attempting variations of *extinction-based strategies* to change undesirable *sleep associations*. The use of *extinction-based strategies* often, but not always, resulted in improvements in infant sleep, while *bed-sharing* more often hindered changing undesirable *sleep associations*. In terms of successful implementation of *extinction-based strategies*, parents were most successful when they had made a purposeful and planned decision to *work together*. These parents also provided emotional and practical *support* to each other while implementing *extinction-based strategies* to eliminate undesirable *sleep association*. For many families, replacing the breastfeeding-

to-sleep association appeared to be a turning point in their experience. Parents who experienced successes (large or incremental) in terms of adopting new routines and sleep associations often also experienced a *change in attitudes and beliefs*, which often helped to reinforce and sustain parents in *working together* to continue their newly established routines and sleep associations.

Integration with Proposed Theory on Infant Sleep and Development

The following section offers a comprehensive discussion of how the study findings relate to the proposed nursing theory on infant sleep and development. This discussion will map the above explanation of how families achieve improvements in infant sleep disturbances and relevant literature onto the proposed nursing theory described in Chapter 2 (Figure 2.1, repeated below).

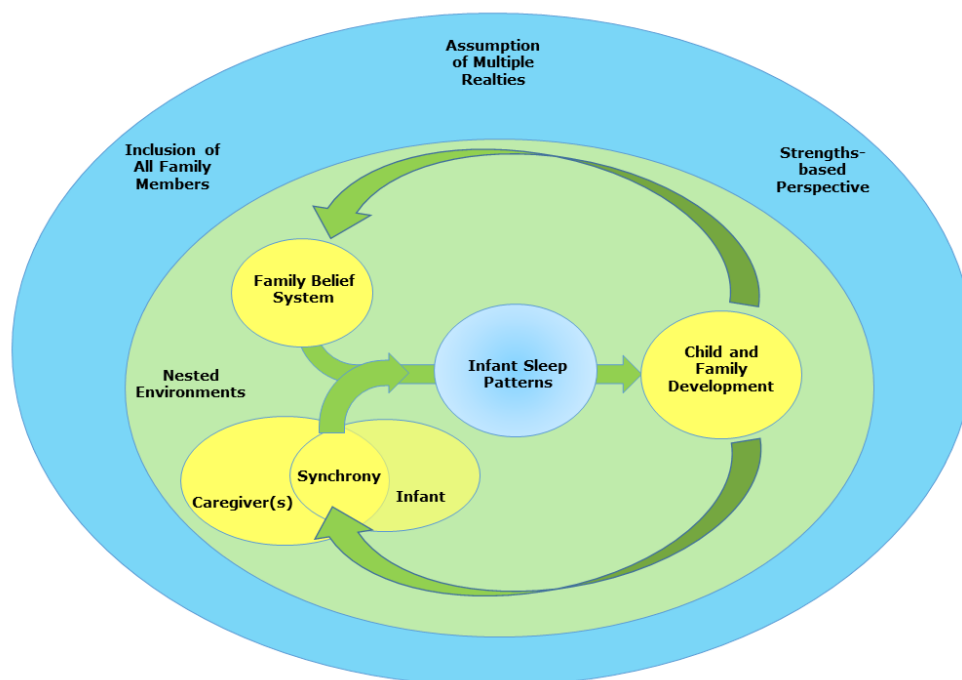


Figure 2.1 Proposed theoretical model.

Synchrony within the caregiver-infant microsystem. The aim of this evaluation of the Play2Sleep intervention was to specifically examine the effect on infant sleep of improving the synchrony element within the caregiver-infant microsystem of the proposed theory (Chapter 2). Synchrony is concerned with how the parent(s) and infant work together in terms of individual characteristics related to sleep patterns and behaviors, as well as the overall components of the broader parent-child social interactions. Play2Sleep aimed to improve this synchrony primarily by coaching parents to accurately identify their infant's sleep-related and social cues and respond appropriately.

The finding that parent-child interactions were significantly lower than normed and published general population scores affirms it is worthwhile to continue exploration of how to improve parent-child interactions in families who are experiencing infant sleep disturbances. In this study, families were already experiencing difficulties at age 5 months, as evidenced by the parent-child interaction scores and the qualitative theme of *context of infant sleep disturbances*. Given that higher maternal sleep quality can help mothers cope and 'bounce back' from more negative social interactions (Lillis et al., 2018), incorporating strategies to first improve parental sleep quality may assist parents in translating knowledge about how to improve parent-child interactions.

While both mothers and fathers were observed to have significantly lower parent scores on the PCITS with their 5-month-old infants than available reference values, the subscales that contributed to lower interaction scores were inconsistent across mothers and fathers. This inconsistency suggests differential susceptibilities of parent-child interactions to infant sleep disturbances in mothers and fathers. The lack of a quantifiable

measurable effect on night waking reductions for Play2Sleep is contrasted by the qualitative data in which nearly all Play2Sleep families reported benefits of learning about infant cues to visually identify and interpret the meaning of their infant's social and sleep related cues. Although it is possible that the PCITS items are too distantly related to sleep-related cues, it is more likely that the dose of the intervention was too low, for the severity of sleep disturbances experienced in this sample. In a small Australian pretest-posttest study of a 5-day in-person residential program that incorporated similar concepts and the same measure of parent-child interactions, mothers achieved significant improvements in their overall interaction quality, as well as improved contingency in interactions and reductions in perceived presence and severity of difficult infant behaviors, maternal depression, anxiety, and stress (Treyvaud et al., 2009). Given the intensity and multi-faceted nature of that program, it is not known if the maternal-infant interactions improved as a result of the program components or concurrent improvements in mental health and stress. This suggests there may be value in adapting Play2Sleep to explore how best to achieve measurable improvements in parent-child interactions, likely by increasing Play2Sleep dose.

Another possible adaptation to increase Play2Sleep's effectiveness in improving parent-child interactions is to explore strategies for increasing social support. Without intervention, the quality of maternal interactions (emotional availability) remain relatively consistent from ages 6 months postpartum to 4 years of age, but can be predicted by higher levels of social support, even when maternal education is controlled for (Célia, Stack, & Serbin, 2018). This suggests a role for including support in parent-

child intervention models as a potential modifier or mediator for enhancing Play2Sleep effects.

The qualitative theme of *father involvement* alludes to the importance of developing high quality interaction between infants and their fathers in families experiencing sleep difficulties. However, in a longitudinal study of infant night waking and parental attachment, secure maternal attachment, but not paternal attachment, was linked to steeper declines in night waking between ages 7 and 14 months (Zentall, Braungart-Rieker, Ekas, & Lickenbrock, 2012). Still, fathers of toddlers with sleep disturbances were more likely than fathers of toddlers without sleep disturbances to have lower observable sensitivity during daytime feeding interactions (Millikovsky-Ayalon et al., 2015). Higher father involvement can buffer parental stress related to toddler sleep disturbance (Millikovsky-Ayalon et al., 2015), and in the first 6 months of life, is associated with reduced infant night waking (Tikotzky et al., 2011). In addition, father involvement at 3 months postpartum in general daytime caregiving, but not nighttime caregiving, was significantly associated with fewer infant night wakings at both ages 3 and 6 months, while father involvement in nighttime caregiving at age 6 months was associated with fewer night wakings and long wake episodes (Tikotzky et al., 2015). As such, developing high quality father-infant interactions that contribute to healthy attachment relationships and facilitate father involvement may not have a direct impact on infant night wakings. Rather, increasing the effectiveness of father-infant interactions may indirectly improve infant sleep by facilitating increased paternal involvement in caregiving that offers maternal respite and support to reduce stress and fatigue. In turn, this increased involvement could lead to enhanced parental ability to work together to

develop consistent routines and change undesirable sleep associations. Using *learning infant cues* to facilitate *working together* via increasing *father involvement* reiterates the importance of understanding caregiver-infant microsystems within nested environments, such as the mother-father mesosystem, described in more detail below.

Parental mesosystems as nested environments. The qualitative theme of *working together* suggests that an element of synchrony between caregivers, in a parent-parent mesosystem, is also important. In other words, there is need to consider synchrony within the caregiving dyads (mother-infant and father-infant) *and* between caregiving partners. This consideration is also supported by the theoretical assumption of inclusion of all family members. In this study, assessing marital satisfaction (DAS-4) served as a measure of the quality and synchrony of the parent-parent mesosystem. Although infant sleep disturbances have been significantly related to poorer marriage satisfaction at 2 years postpartum (Wake et al., 2006), this variable was not related to the effectiveness of Play2Sleep, nor correlated with infant sleep variables. It may be that the effects of infant sleep disturbances on marriage satisfaction accrue over a longer timeframe than that which was captured by the current study's time frame, suggesting the role that infant sleep disturbances play in broader role of the family's development.

Given the prevalence of the qualitative theme of *working together*, a different measure may have been more helpful in quantifying the synchrony within the parent-parent mesosystem. Co-parenting quality may have served as a more relevant indicator of the parent-parent mesosystem and fits with other research demonstrating that overall, supportive co-parenting is associated with reduction in parenting [maternal] stress (De Roose et al., 2018). *Working together* to develop routines that become consistent may be

indicative of increasing synchrony in co-parenting within the parent-parent mesosystem, which in turn supports the development of healthy infant sleep patterns. Alternatively, and/or complementarily, increased synchrony in co-parenting within parental mesosystems *a priori* may enhance family capacity to improve infant sleep habits. These present findings support the idea that as mothers and fathers beliefs about how to respond to night waking become more similar, co-parenting quality also increases (Reader, Teti, & Cleveland, 2017).

Household or family chaos is another concept that may better capture the synchrony within parent-parent mesosystems and across different meso-systems in which the family interacts. Household or family chaos is characterized by a lack of routine, unstructured activities, unpredictability, environmental distractions (Evans & Wachs, 2010). Increasing household chaos is associated with more fragmented infant sleep across the first year (Whitesell, Crosby, Anders, & Teti, 2018). In preschool children, increasing family chaos is associated with concurrent overall sleep problems, bedtime resistance, and sleep anxiety (Boles et al., 2017). Household or family chaos may preclude parental capacity to work together and develop consistent routines and approaches to replace undesirable infant sleep associations. Understanding that some families may be embedded in chaotic households, and how to help families overcome these circumstances to implement daily and bedtime routines may be helpful in capitalizing on the positive and swift effect of instituting bedtime routines (Mindell, Leichman, Lee, Williamson, & Walters, 2017).

The impact of a father's work or school environment, as a mesosystem, in terms of reducing father's physical availability, may also need to be taken into consideration for

understanding how to develop improvements in father-infant synchrony. Scheduling home visits at the family's convenience (mainly during evenings and weekends) was one strategy used to overcome the commonly identified barrier of work commitments (Tully, Collins, et al., 2017; Tully, Piotrowska, et al., 2017) to accommodate father involvement. This necessitated home visitor (professional) availability during times outside of typical office hours.

While engaging fathers in the intervention is a starting point, embedding strategies into such programs to help families continue to develop fathers as direct caregivers may also be needed. Such strategies might include focusing on developing paternal self-efficacy to promote involvement (De Montigny, Lacharité, & Devault, 2012). These strategies would need to be contextualized within the family's nested environments to develop realistic expectations and practical plans that help families overcome the day-to-day barriers to father involvement.

Embedding support within nested environments. The qualitative theme of *support* is enmeshed throughout the nested environments within which the parent-child microsystem is embedded. Support can be provided within the meso- and macro- systems of these nested environments. In this study, support was facilitated when fathers became more involved as a result of learning about infant cues and parents began working together. Support was also provided by ensuring the home visitor established a therapeutic relationship and provided information and validation in a non-judgmental manner. In and of itself, the home visits could have provided support by acknowledging the importance of the family's sleep concern, perhaps leading to increased confidence and motivation to implement sleep improvement strategies.

Although the majority of mothers typically considered their partner as a main source of support, many mothers appeared to also receive social support through social media channels, consistent with other reports (Baker & Yang, 2018; Price et al., 2018). Connections via social media may be an emerging source of significant emotional and social support for women. A lack of emotional support is associated with higher levels of psychological distress in women with unsettled infants, a categorization that includes crying and sleeping difficulties (Wynter, Wilson, Thean, Bei, & Fisher, 2018). However, obtaining primary sources of social support via social media may not offer the same opportunities for mothers to receive more tangible and practical forms of support, such as respite from infant care or assistance with daily tasks. Having a trusted individual to provide tangible support, in the form of respite, has been identified as a possible mechanism to relieve maternal postpartum distress (Law, Jackson, Guelfi, Nguyen, & Dimmock, 2018). On the other hand, social media can also provide private platforms (i.e., Facebook groups) for mothers to leverage and facilitate in-person connections (Price et al., 2018). This is one possible area to develop in regard to preventing or treating infant sleep disturbances, especially given the notable absence of extended family supports for families in this study. The absence of extended family support is in stark contrast to the depth and breadth of support provided by grandmothers in other counties (e.g., Japan; Matsui & Sato, 2018).

Despite sleep being a known primary concern of new mothers (Verbiest, Tully, Simpson, & Stuebe, 2018), families in this study often commented on the apparent lack of formal support for infant sleep within the public health care system. This is consistent with previously reported gaps in pediatric care for behavioral sleep concerns across

Canada (Corkum et al., 2018). Although limited local supports on infant sleep do exist (e.g., Alberta Health Services “Sleep Like a Baby: Parent education class” and “Sleep Workshop for Tired Parents”), parents in this study were typically unaware of these classes. This lack of awareness is concerning given that these families are the target population for these classes and had often searched extensively for resources prior to enrolling in the study.

Many parents in this study bed-shared to cope with infant sleep disturbances. When these parents did report having accessed their primary health care providers (i.e., physicians and/or public health nurses) for assistance with infant sleep disturbances, provider judgements related to bed-sharing and/or a lack of practical advice became barriers to further engagement with health care providers. When providers only reiterated safe sleep recommendations, rather than offer practical solutions for parents to address the underlying infant sleep disturbance, parents felt unheard, frustrated, and became disengaged. These contacts damaged the therapeutic relationship to such an extent that parents freely admitted to lying or actively avoiding conversations about infant sleep during subsequent interactions with health care providers, even when it was with a different provider. This fits with the estimate that nearly 70% of parents who bed-share do not disclose this to their health care provider (Kendall-Tackett, Cong, & Hale, 2010). In contrast to other reasons for bed-sharing such as facilitating breastfeeding, promoting maternal-infant bonding, or disagreement about the actual risk (Ward, 2015), parents in this study who bed-shared in response to infant sleep disturbances were often willing, but seemingly unable, to adhere to safe sleep recommendations.

Between 45% to 72% of families report engaging in some form of bed-sharing during the first year (Ateah & Hamelin, 2008; Dennis et al., 2018; Doering, Lim, Salm Ward, & Davies, 2019; Kendall–Tackett et al., 2010); nearly 50% of parents report bed-sharing as being unplanned (Doering et al., 2019). Thus, the above disengagement represents a lost opportunity to increase adherence to safe sleep guidelines by working with parents who recognize the value of, and would like to adhere to, safe sleep guidelines but are overwhelmed with pressing infant sleep disturbances. These findings converge with research by Aston and colleagues (2018), who described that the way information and support (i.e., caring concerned tone vs. harsh and judgmental) is delivered can facilitate or hinder maternal receptiveness of information and support. Such findings further illustrate the need to tailor public health messages on bed-sharing and safe infant sleep to specific populations and underlying challenges they may encounter (Ward, 2015).

Family belief systems. For this research, beliefs were understood to inform parental thoughts and attitudes about infant sleep. The cyclical nature of these belief systems was highlighted by the *changed attitudes and beliefs* theme, which situates changes in beliefs as both a starting and end point of changes in infant sleep. Families sifted through information on infant sleep until they found information or proposed strategies that resonated with their beliefs and attitudes. This is comparable to the information gathering strategy described by other first-time mothers in Nova Scotia on similar and related parenting topics (Aston et al., 2018). Moreover, mothers may rely on information being consistent among multiple sources before they believe it (Aston et al.,

2018). This confirms the importance of delivering consistent messaging about infant sleep across health services.

The findings that sleep variables were correlated with parental beliefs about infant sleep (MCISQ) converges with other research that parental thoughts about infant sleep are related to infant sleep disturbances both prenatally (Tikotzky & Sadeh, 2009) and in the postpartum (Hall, Moynihan, Bhagat, & Wooldridge, 2017; Sadeh et al., 2007). As described in the qualitative theme of *context of infant sleep disturbances*, parents often experienced feelings of self-doubt and guilt. While the MCISQ includes a subscale on doubt, which was significantly related to infant sleep, scores on the Parental Sense of Competence scale, measuring parental satisfaction and confidence, were not as strongly or consistently correlated with infant sleep patterns. Research exploring maternal distress during the postpartum period describes how maternal lack of sleep leads to feelings of overwhelm and being unable to cope, as well as engaging in catastrophizing thought patterns (Law et al., 2018). These types of feelings and thought patterns may contribute to and reinforce *parental fears, concerns, and anxieties*. Further examination of other parenting beliefs related to these emotions and how they relate to family capacity to improve infant sleep could be useful. Considering the prevalence of qualitative themes relating to these concepts, (i.e., *fears, concerns, and anxieties; context of sleep problems, and support*), it may be worthwhile to delve more deeply into how integrating a strengths-based perspective could support these related constructs. Integrating the theoretical assumption of a strengths-based perspective into intervention design may offer parents a much-needed sense of positive social support, particularly in the form of

providing reassurance, using a non-judgmental manner, and helping parents cope with feelings of guilt and self-doubt.

The qualitative theme of *fears, concerns, and anxieties* also supports research that associates parental concerns and tolerance for infant crying with infant sleep patterns (Kahn et al., 2018), specifically as this theme includes parental descriptions of having difficulty with hearing their infant cry. Families with most improvement in infant sleep generally described changes in their thoughts about infant crying. In order to best understand how to support parents in adopting more reflective views regarding their infant's crying, it is also important to consider that parental beliefs related to crying are deeply embedded in, and influenced by, broader socio-cultural beliefs, which form part of the family's macrosystem. For instance, the practice of ignoring young children's crying at bedtime is largely influenced by Western beliefs that prioritize independent sleep (Maute & Perren, 2018). Thus, when trying to better understand and/or adjust parental beliefs about infant sleep, including their fears, concerns, and anxieties, it is important to also understand the prevailing beliefs within the family's macrosystem.

Additional research is needed to disentangle if, when, and how fears and anxieties related to history of feeding and settling concerns (i.e., colic) influence parental responses and sleep-related practices (i.e., extensive rocking or feeding to sleep) given that infant sleep, feeding, and settling concerns can often be entwined with each other, particularly in young infants. If infant sleep interventions are to be pragmatic and implemented in real-life settings, they need to, at minimum, consider and account for these fears, concerns, and anxieties may influence parental adherence and implementation of sleep-specific strategies. One way to do this may be to help parents reflect upon and examine

their beliefs about infant feeding, settling, sleeping, and crying, in a more purposeful way. Even when feeding and settling concerns have been resolved, parents may have underlying fears and anxieties that will affect how they adopt and adapt suggestions related to improving infant sleep.

One important element in *changed beliefs and attitudes* was an evolving attitude of perceived parental role in helping their infant sleep, and reflection of what was within the parental sphere of influence. Parents often reported developing a new sense of what they could control (i.e., their own behaviors) and what they could not (i.e., their infant's response). Further examination of parental beliefs regarding which components of infant sleep remained in their sphere of influence, compared to those that continued to be perceived as having external loci of control, could help to understand of how best support parents in managing these feelings of self-doubt and guilt. For instance, while the application of self-efficacy theory has been extensively examined for parental caregiving behaviors, such as feeding (Brockway, Benzies, & Hayden, 2017), how parental self-efficacy beliefs relate to the development of infant sleep patterns has not yet been explored. Thus, it may be worthwhile to explore how directly assessing and supporting self-efficacy related to parental beliefs about their ability to modify infant sleep could enhance family capacity to develop infant sleep routines and associations.

Infant sleep patterns. The finding that certain infant sleep associations, such as feeding to sleep, are highly influential in the development and maintenance of infant sleeping disturbances is consistent with other research (Sadeh et al., 2010). The use of parents employing behavioral-based extinction strategies to modify infant sleep patterns, as described by study participants, is also well-documented (i.e., Honaker et al., 2018;

Loutzenhiser et al., 2014). Similarly, it is unsurprising that many parents reported *bed-sharing*, and that those families who continued to bed-share had less improvement in infant sleep and were less likely to report *working together* and *father involvement*. These findings are consistent with reports that increased negative co-parenting practices and decreased positive co-parenting practices at 1 month were significantly associated with consistent *bed-sharing* from 1 to 6 months postpartum (Teti, Crosby, McDaniel, Shimizu, & Whitesell, 2015).

The theoretical assumption of multiple realities relating to experiences of infant sleep disturbances is demonstrated in both the qualitative and quantitative findings. In terms of the quantitative results, the fact that group differences were not consistent between maternal and paternal reported infant sleep items highlights how even mothers and fathers from the same family unit may experience and perceive infant sleep disturbances differently. This phenomenon is supported by a description of significant differences in newborn parental night time experiences (Insana, Garfield, & Montgomery-Downs, 2014) – mothers, more often than fathers, reported infant-related night wakings and increased nocturnal wakefulness, often related to infant caregiving. To extend the understanding of which infant sleep characteristics are most susceptible to differing parental perceptions, future research could use this dataset to explore if higher mother-father interrater reliability in reporting infant sleep characteristics influences the effectiveness of the Play2Sleep and/or improvements in infant sleep.

It is also important to consider how different individuals (clinicians, researchers, and family members) define improvements in infant sleep. For some families, improvements in infant sleep did not always correlate directly with the researcher-chosen

indicator of night waking. Indeed, some families were more concerned with achieving improvements in daytime naps, decreasing the time to fall asleep (sleep latency), or changing sleep locations. Some families with least improvement in infant night wakings were very satisfied with all or at least parts of the interventions and considered their infants to have had quite notable improvements in sleep. These ‘negative’ cases reinforced the importance that parental perception of infant sleep disturbance is subjective, and clinicians and researchers should not project problems onto families based on only one aspect of sleep behaviors. This reinforces the benefit of integrating subjective parental perceptions of problematic sleep behaviors and may also suggest the utility in using a multi-dimensional/composite rating of infant sleep patterns. For example, researchers are currently developing a normalized scoring system for the Brief Infant Sleep Questionnaire (Gould, Mindell, Leichman, & Walters, 2018), which could be applied in future studies.

Child and family development. Despite general improvements in infant sleep patterns, the parent-child interaction scores did not improve, remaining lower for both mothers and fathers up to age 7 months, regardless of group assignment. This suggests that the quality of parent-child interactions did not repair during the timeframe of the study, despite overall parental perceptions of improvements in infant sleep patterns. Given the known effects that these foundational interactions have on development over time, this finding is notable with respect to strategizing how to support optimal child development. It is worth keeping in mind that, although these scores were significantly lower than what would be expected, they did not reach the referral range. Still, this sample was comprised of families from relatively advantaged socioeconomic

backgrounds. It is reasonable to speculate these differences may be exaggerated in more socially vulnerable families or those with multiple risk factors for lower quality parent-child interactions.

Both the individual and relational subthemes of *context of infant sleep disturbances* could influence the development of parents during their transition to parenthood. In other research, parents describe similar impacts of infant sleep disturbances. For example, in Japanese mothers, longer sleep duration is associated with higher self-reported quality of life (Nishida, Tanaka, & Sakakibara, 2018). For both mothers and fathers, parental sleep satisfaction and duration does not fully recover until 6 years after the birth of the first child (Richter, Kramer, Tang, Montgomery-Downs, & Lemola, 2019). Such an extended timeframe with perceived problematic sleep could compound the negative effects on parental development.

Mothers reporting lower parenting satisfaction were more likely to identify sleep deprivation as a challenge to achieving their maternal role and responsibilities (Corkin et al., 2018). As represented in parental descriptions of enhanced fatigue and decreased motivation, parents struggled in their daily interactions with their infant and often did not have energy to support their child's overall development or to develop themselves as parents. As evidenced by the theme of *information overwhelm*, parents experiencing infant sleep disturbances may have a limited threshold regarding the amount of information they can digest. In mothers, brain changes during pregnancy and the postpartum period may influence memory, cognitive abilities, and executive functioning (Duarte-Guterman, Leuner, & Galea, 2019). As such, in combination with the known effects of sleep deprivation (Krause et al., 2017; Lowe, Safati, & Hall, 2017), parental

capacity to receive the wide breadth of information may have been diminished. To help parents of infants experiencing sleep disturbances develop themselves as optimal parents, and in turn optimize their child's development, they must concurrently be supported in overcoming the challenges associated with infant sleep disturbances, namely fatigue and sleep deprivation.

As evidenced in the themes of *father involvement* and *context of infant sleep disturbances*, parental ability to modify their infant's sleep patterns was tied to parental perceptions of themselves being successful as they developed their role as a parent. As observed in this study, experiencing success with putting their infant to sleep reinforced father's confidence and positively supported their capacity to undertake a meaningful role in the care of their infant. For fathers who experienced this success, the associated feelings of self-efficacy may have supported their transition to parenthood, acting as a positive element of family development.

Similarities existed for mothers, which is important given that maternal feelings of doubt and low self-efficacy are associated with the presence of infant sleep disturbances at 4 weeks postpartum (Cook, Mensah, Bayer, & Hiscock, 2018). Self-efficacy as early as 3 weeks postpartum is associated with lower maternal stress from 3 weeks to 6 months postpartum (Law et al., 2019), and mothers have described how building confidence is key to reduce maternal postpartum distress (Law et al., 2018). Given the potential role that self-efficacy plays in the transition to parenthood, scaffolding experiences that build upon smaller successes may help to positively support parental perceptions of self-efficacy and positive development as a family. For instance, infant sleep interventions could incorporate elements to support parents to achieve and

recognize developments in their infant's sleep, which may positively reinforce their roles as caregivers.

Conclusion

The aim of this chapter was to achieve a comprehensive mixed methods integration that is situated within current literature. The first step of this integration required a synthesis of how the explanatory qualitative themes are embedded within themes that described broader parental experiences. This synthesis was then subsequently integrated with the quantitative findings and existing literature. There is still much room for the development of understanding how parents adopt, adapt, and implement infant sleep interventions, as well as how the use of strategies influence, and is influenced by parent and child characteristics, family belief systems, family microsystems, and parent-parent mesosystems. This discussion informs the implications derived from this research, as discussed in the following and final chapter.

Chapter 7: Implications and Conclusions

Infant sleep disturbances are common and may negatively influence child development and family well-being. Infant sleep interventions that address both sleep-specific and broader parenting practices could help address broader parenting difficulties that may underlie infant sleep disturbances. Using a sequential explanatory mixed methods design, this research demonstrated that Play2Sleep holds promise as a strategy to improve infant sleep and support family wellbeing in families of 5-month-old infants who self-identify they are experiencing infant sleep disturbances. Including both mothers and fathers, as well as a qualitative phase, resulted in a comprehensive and pragmatic evaluation that contributed to increased understanding of barriers and facilitators of Play2Sleep effectiveness, along with a broader understanding of how families adopt, adapt, and implement strategies/interventions to improve the sleep of their infants.

This research adds to the existing literature on infant sleep interventions by specifically addressing three main gaps. Firstly, study findings advance understanding of parent-child interactions beyond specific-sleep related parent-child interactions. Secondly, this research is one of the first infant sleep intervention studies to include fathers, highlighting them as an integral part of infant sleep and family development. Thirdly, the mixed method design provides a rich understanding of *how* families undertake, adhere, and experience infant sleep interventions. This understanding is crucial as researchers and clinicians strive to develop pragmatic interventions for families that can be implemented in real-world settings.

This research marks the first study in my emerging program of research that will attempt to broaden knowledge related to how nurses can work with parents to optimize

child development by supporting the development of healthy sleep patterns in children and their families. Parenting agencies and centers in Alberta and Australia have expressed interest in using elements of Play2Sleep to inform home visiting and parent education programs. Before such implementation is undertaken, however, further research will be needed to optimize Play2Sleep in terms of dose, timing, delivery modality, and essential content. As such, findings from this study should inform four key areas of future research: (a) prevention; (b) precision-care models; (c) workforce development; and (d) parent and provider engagement.

Improving Prevention Approaches for Infant Sleep Disturbances

One of the most novel findings in this research is that the quality parent-child interactions in mothers and fathers of infants with sleep disturbances were significantly lower than those of mother's normed (Oxford & Findlay, 2013) and father's reference (Harrison et al., 1999) values. Early parent-child interactions form foundational brain architecture that support future development and childhood outcomes (Center on the Developing Child at Harvard University, 2016). As such, further exploration of parent-child interactions in families experiencing sleep problems is needed to understand how best to prevent risks to this crucial foundation of child development in families experiencing infant sleep disturbances. Findings from this study suggest the importance of exploring interventions to prevent the development of infant sleep disturbances. Parents experience overwhelming amounts of information related to infant sleep. This overwhelming amount of information likely reduces parental capacity to uptake information related to infant cues and apply this knowledge to optimize broader parent-child social interactions. Interventions that incorporate a preventative approach, perhaps

as part of prenatal education or before parents reach critical thresholds of fatigue and frustration, may assist with parental knowledge uptake and subsequent behavior change.

Parent education on infant sleep during the postnatal period is one possible strategy that may be effective in improving infant sleep, however, results have been mixed (Bryanton et al., 2013; Hiscock et al., 2014; Nikolopoulou & St James-Roberts, 2003; Stremler et al., 2013; Stremler et al., 2006). Additional synthesis of existing infant sleep disturbance prevention research would be beneficial to uncover the essential ‘active ingredients’ of such interventions. Integrating these findings into the broader knowledge base about engaging parents and developing effective parenting programs (Baumann et al., 2015; Breitenstein, Gross, & Christophersen, 2014; Bryanton et al., 2013; Finan, Swierzbiolek, Priest, Warren, & Yap, 2018; Munns, Watts, Hegney, & Walker, 2016; Mytton, Ingram, Manns, & Thomas, 2014; Peacock-Chambers, Ivy, & Bair-Merritt, 2017) and postnatal care (Shaw, Levitt, Wong, & Kaczorowski, 2006), could direct the development of cost-effective sleep interventions that support overall child development. Informed by this evidence synthesis, researchers could adapt and evaluate Play2Sleep by partnering with health services to integrate components of Play2Sleep into existing perinatal education classes, particularly those that span both the late prenatal and early postnatal periods.

Adopting Precision-Care Models: What Infant Sleep Interventions Work Best for Whom and When?

Amid calls to better understand the underlying mechanisms of early childhood interventions on childhood development by determining who, what, and where to target (Shonkoff, 2017), it would be advisable to integrate principles of precision medicine into

the future development and refinement of infant sleep interventions and programs.

Precision medicine is a process by which in depth knowledge of an individual's specific biopsychosocial and environmental traits and biological markers are used to develop a personalized approach to disease prevention and treatment (Koenig, Fuchs, Hansen, von Mutius, & Kopp, 2017). Applying a public health perspective to precision medicine could help ensure that these personalized approaches also incorporate an understanding of the social determinants of health (Khoury, Iademarco, & Riley, 2016). Such an approach would contribute to a better understanding of how to optimize Play2Sleep and determine what adaptations and elements will work best for whom and when.

Families may respond differently to infant sleep interventions based on their individual characteristics and unique family contexts. This would apply to both prevention and treatment interventions. For example, in a large randomized controlled trial (RCT) of a complex behavioral intervention designed to prevent sleep and settling difficulties (Cook et al., 2012), families of infants who fed frequently were more likely to experience improvements in infant sleep and crying in response to the intervention than those who did not feed frequently (Hiscock et al., 2014). In the present study, the qualitative themes of *information overwhelm* and *learning infant cues* suggested that the intervention intensity or dose may need to be modified to better help certain families (i.e., those experiencing more severe sleep disturbances or fatigue) achieve more meaningful improvements in parent-child interaction quality. Additional research is needed to examine the evolution of parent-child interactions in families with infant sleep disturbances, as well as predictors and modifiers of infant sleep disturbance trajectories (severity, chronicity, and outcomes). This research could inform the development of

interventions that are tailored for families based on their risk of continued interaction and/or sleep difficulties. This knowledge should create a better understanding of which families are at highest risk of negative long-term developmental outcomes. Such work would result in evidence-based recommendations that could be used to personalize Play2Sleep based on characteristics of families. For instance, certain families may need a more intensive approach to modify certain elements of parent-child interactions. This could be achieved by ‘stretching out’ the information about parent-child interactions into more ‘bite-size’ chunks over several visits to increase the ability of parents to receive the information and practice applying it. Other possible adaptations include modifying intervention delivery to a blended face-to-face and online modality, combining group and individual sessions, and adapting content for specific populations such as families of preterm infants or parents with mental health concerns.

In its original form, Play2Sleep is likely too costly to be provided to all families experiencing infant sleep difficulties. A stepped model of care may be a more cost-effective approach, proposed for other psychosocial behavioral health interventions such as cognitive behavioral therapy for insomnia with adults (Espie, 2009), and interventions for both childhood (Chatterton et al., 2019) and adult anxiety (Ho, Yeung, Ng, & Chan, 2016). Applying a precision public health approach will help to better understand which families need what level of intervention. For example, targeting increased doses of Play2Sleep to higher risk families, including those experiencing severe fatigue, parental anxiety, and reduced co-parenting quality and/or availability of supports (including father involvement) could result in improved efficacy, cost-effectiveness, and child development outcomes.

Workforce Development to Increase Health Services Readiness

Despite the important role sleep plays in child development outcomes, there is a significant gap in the healthcare system in the lack of available and accessible health care services for behavioral sleep difficulties (Corkum et al., 2018). Pediatric healthcare providers typically lack the requisite knowledge, training, time, and institutional support to help families with behavioral sleep problems (Boerner, Coulombe, & Corkum, 2015). Only 18% of American pediatricians reported receiving formal training in sleep, with less than a quarter having obtained any continuing medical education in sleep (Faruqui et al., 2011). As such, workforce development will be crucial to address the knowledge barrier for providing accessible and evidence-based care related to management of infant sleep disturbances and future implementation of Play2Sleep.

Nurses are recognized as credible health care professionals who are well-trained in developing relationships with families of young children and could play a key role in closing the above service gap. Despite calls to better integrate sleep and circadian education into undergraduate and graduate nursing education (Lee et al., 2004), nurses often receive minimal formal education and nursing-specific continuing education, remaining unprepared to assist families with sleeping difficulties (Corkum et al., 2018). To develop nurses' abilities to support sleep health in individuals, families, and communities, nurse leaders must continue to advocate for the inclusion of basic sleep and circadian knowledge in formal nursing programs. The development and implementation of evidence-based post-degree nursing professional development opportunities could also assist nurses in supporting sleep as a foundational component of health throughout the lifespan. As evidenced by a recent initiative, public health nurses are well-positioned to

become leaders in providing accessible information about infant sleep to both parents and other community-based health professionals (Hall et al., 2019). Enhancing education and training opportunities for nurses will support their role in knowledge translation and mobilization among their own clients (individuals, families, and communities), as well as among other community-based workers who work with families of young children.

Additional research using integrated knowledge translation approaches could facilitate mobilization of evidence-based sleep information among nurses and other professionals working with families of young children, and help ensure implementation and sustainability of interventions that support healthy sleep patterns in families.

Engaging Parents and Providers in Infant Sleep Research

Public engagement in infant sleep research is sparse. Parent and provider engagement in infant sleep research could support the development of more acceptable interventions and higher quality educational programs and health care services.

Engagement with parents and providers should help ensure research questions, designs, and findings are meaningful, practical, and resonate with the real-world lived experiences of end-users (Manafó, Petermann, Mason-Lai, & Vandall-Walker, 2018). Thus, purposeful and meaningful engagement of knowledge users (parents, health care providers, and community partners) in designing and conducting infant sleep intervention research could improve intervention acceptability, resulting in findings that are more easily translated into practice. For example, working with both parents and perinatal program managers to design research aimed at testing potential Play2Sleep adaptations could improve later implementation and uptake.

An additional opportunity for parent and provider engagement in infant sleep research is the development of patient (parent) reported outcome measures (PROMS). As evidenced by this research, parents and researchers may have differing definitions of what constitutes a sleep problem. While some promising developments have been made in standardizing parent- and child-reported sleep outcomes for older children and adolescents (Bevans et al., 2018), no such efforts have been described for sleep outcomes in infancy and early childhood. Parent and provider engagement could support the development of PROMS specific for infant sleep disturbances. This could improve the integration of outcomes that are important and meaningful to parents and families in future research endeavors.

Conclusion

Nearly one in four Canadian families (about 95,000 infants/year) report having infant sleep disturbances. This research capitalized on sleep as a parent-identified priority (Bright et al., 2018; Devolin et al., 2013) to foster early connections between families and evidence-based information on sleep and parent-child interactions. Play2Sleep reduced maternal-reported infant nocturnal wakefulness and the number of paternal-reported infant naps. To improve the effectiveness of Play2Sleep, as well as other infant sleep interventions, researchers and clinicians should be cognizant of the amount and timing of information parents receive regarding infant sleep. It may also be important to consider parental ability to work together and facilitate parental reflection on their beliefs, attitudes, fears, anxieties, and concerns related to infant sleep. Families may benefit from improved formal and informal support provided in a non-judgmental manner that

acknowledges the individual and relational contexts of families who are experiencing infant sleep disturbances.

Providing evidence-based sleep information while also supporting parent-child interactions during infancy, a critical period in development, should help optimize social, emotional, behavioral, and cognitive developmental outcomes. Helping families manage infant sleep disturbances could increase parental and family wellbeing, potentially mitigating suboptimal caregiving contexts that may result from increased family stress and parental mental health concerns to promote healthy brain architecture in early childhood. As such, this research is aligned with national and international priorities, including promoting healthy sleep to improve the health of Canadians (Canadian Sleep Society, 2017), engaging in translational research to close the knowledge-to-practice gap in pediatric sleep research (Gruber et al., 2016), and understanding how to better increase access to integrated health services that support healthy developmental trajectories and strong foundations of mental health (Institute of Human Development Child and Youth Health, 2018). Nurse scientists are well-positioned to become leaders in supporting families to address infant sleep disturbances as a means of supporting overall health and wellbeing of infants, parents, and families.

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APPENDIX A: CONSENT FORM

MOTHER AND FATHER CONSENT FORM

TITLE: Play2Sleep: Using play to improve infant sleep

INVESTIGATORS:

Principal Investigator/Supervisor:

Karen M. Benzies, PhD, RN
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This consent form is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or information not included here, please ask. Take the time to read this carefully and to understand any accompanying information. You will receive a copy of this form.

BACKGROUND

Many babies have sleep problems. Babies who do not sleep make parents tired and less able to help their baby play and learn. Families try many ways to help their baby to sleep. Coaching parents to read and respond to their baby's cues about sleep could reduce infant sleep problems. This study will include 120 participants (60 mothers and 60 fathers) from Calgary. Researchers will look at different types of home visits to help families to improve sleep for babies between 5 months to 7 months old.

WHAT IS THE PURPOSE OF THE STUDY?

Researchers want to know if different types of home visits make a difference in a baby's sleep. They want to know if different types of home visits affect how mothers and fathers think about sleep problems, and if the visits affect emotional health.

WHAT WOULD I HAVE TO DO?

1. If you agree to be in the study, you and your baby's other parent will have two home visits when your baby is between 5 and 7 months old. These visits are extra to standard care, and will be done by Elizabeth Keys, a University of Calgary graduate student, who is completing the study as part of her thesis.
2. Before each visit, Elizabeth will email you a link to an online survey. Filling in the survey takes about 40 minutes. Elizabeth will remind you to fill out the survey before the home visit.

3. During the home visits, you will be video-recorded playing with your baby. Each visit takes about 1 hour. Elizabeth will arrange the visit at a time that is good for your family.
4. After the last home visit, we may ask you and your baby's other parent to do a face to face interview together about your experiences during this study. Because there will be another person (your baby's other parent) taking part in the interview with you, we cannot guarantee total confidentiality of the data you provide during the interview. These interviews will be audio recorded to make interview transcripts. We will not use your real name in these transcripts. We only need 10 families from each group, so you may not be selected for an interview.

WHAT ARE THE RISKS?

There are no physical risks with taking part in this study. You may feel uneasy being recorded while playing with your baby or filling out the survey.

WILL I BENEFIT IF I TAKE PART?

If you agree to take part in this study there may or may not be a direct benefit to you or your baby. Your baby's sleep or your bond with your baby may improve during the study but there is no promise that this research will help you. The information we get from this study may help other parents who are facing sleeping problems. If you wish, we will send you a report of the study results.

DO I HAVE TO PARTICIPATE?

Your participation in the study is voluntary and you may withdraw at any time without risking the health care of you or your baby. After the study is complete, you may withdraw your data until the data analysis is underway by contacting Elizabeth Keys or Dr. Karen Benzies. If you wish to withdraw, we will destroy all relevant study relating to the aspect of participation you wish to end. If you wish to withdraw from the study, we will ask if you would like to provide a reason for leaving. If so, this will be recorded to improve study processes.

You have the right to refuse to answer any question. You can stop the recording(s) at any time. You are free to withdraw at any time by telling the researcher that you wish to withdraw. The researcher may withdraw you from the study if there is incomplete information. If one parent chooses to withdraw from the study, the researcher may withdraw the remaining family member's data as well. If new information becomes available that might affect your willingness to take part, you will be told immediately.

WILL I BE PAID FOR PARTICIPATING, OR DO I HAVE TO PAY FOR ANYTHING?

There are no costs to take part in this study. You will not be paid to be in the study. Each family will be offered a \$10 gift certificate at each home visit to thank you for your time. If you do not want the gift certificate, you may donate it to the Calgary Urban Projects Society (CUPS).

WILL MY RECORDS BE KEPT PRIVATE?

Your recordings and surveys will be kept confidential. The exception is when professional codes of ethics or the law require reporting. In that case, we cannot uphold your right to confidentiality and privacy.

Only the researchers will have access to your survey and interview data and your video. We will keep these in locked file cabinets separate from consent forms for at least 5 years. Your name will not be on any of the surveys or recordings.

Once the study is complete, the Child Data Centre of Alberta will store study data in a secure database and allow other researchers to re-use the data. Researchers will only be provided with data that cannot be used to identify you, and legal agreements include penalties for misuse of the data. Any researcher who wants to use this data must have the new project reviewed by an ethics board, sign a confidentiality agreement, and sign an agreement restricting data use only to the approved project. Your data may be combined with other data to increase the usefulness of the data, as subject to scientific and ethical oversight as mentioned above.

A description of this clinical trial will be available on www.clinicaltrials.gov. This website will not include information that can identify you. At most, the website will include a summary of the results. You can search this website at any time.

IF I SUFFER A RESEARCH-RELATED INJURY, WILL I BE COMPENSATED?

If you suffer injury from taking part in this research, no compensation will be provided to you by the University of Calgary or the Researchers. You still have all your legal rights. Nothing said in this consent form alters your right to seek damages.

SIGNATURES

Your signature on this form indicates that you have understood to your satisfaction the information regarding your participation in the research project and agree to take part as a participant. In no way does this waive your legal rights nor release the investigators or involved institutions from their legal and professional responsibilities. You are free to withdraw from the study at any time without risking your health care. If you have further questions concerning matters related to this research, please contact:

Dr. Karen M. Benzies (403) [REDACTED]

If you have any questions concerning your rights as a possible participant in this research, please contact the Chair, Conjoint Health Research Ethics Board, University of Calgary at 403- [REDACTED]

- ☐ Yes, you may contact me about follow-up of my child's sleep
- ☐ No, you may not contact me in the future

Use of the information I provide beyond this project	Yes	No
I agree for the data I provide to be securely stored at the Child Data Centre of Alberta to facilitate future research.	<input type="checkbox"/>	<input type="checkbox"/>
I understand that information about me collected from this project may be made available to other researchers through the Child Data Centre of Alberta in a format that cannot be used to identify me.	<input type="checkbox"/>	<input type="checkbox"/>
I understand that information about me collected from this project may be linked to other information but my identity will be protected.	<input type="checkbox"/>	<input type="checkbox"/>
I understand that other researchers will have access to this data only if they agree to preserve the confidentiality of the information, and with appropriate ethics approval as requested in this form.	<input type="checkbox"/>	<input type="checkbox"/>

Participant's Name	Signature and Date
Investigator/Delegate's Name	Signature and Date
Witness' Name	Signature and Date

The University of Calgary Conjoint Health Research Ethics Board has approved this research study.

A signed copy of this consent form has been given to you to keep for your records and reference.

APPENDIX B: INTERVIEW GUIDES

Table 3.5. *Semi-Structured Interview Guides*

Intervention Group
<p>How has sleep been going for your family? (probe for elaboration of any sleep strategies/tools/resources used)</p> <p>What are some of your successes? Your concerns?</p> <p>Tell me about any changes in your parenting since participating in this study?</p> <p>Tell me about any changes in your family and relationships since participating in this study?</p> <p>Tell me about a time when you were most proud of the way you managed your baby's sleep?</p> <p>Tell me about a time when you were most proud of the way your partner managed your baby's sleep?</p> <p>Tell me about a time, that you used some of the pointers from when we watched the videos?</p> <p>How do you think you and your partner's parenting and/or concerns about infant sleep may have changed since watching the videos?</p> <p>What was most helpful or interesting to you in this study?</p> <p>What was most difficult or uninteresting to you in this study?</p> <p>Tell me about watching the videos together.</p> <p>What was helpful?</p> <p>What was difficult?</p> <p>What would you change about the videos?</p> <p>What recommendations do you have if we decide to use this intervention with other new parents? (probe for timing of start, number of visits)</p>
Comparison Group
<p>How has sleep been going for your family? (probe for elaboration of any sleep strategies/tools/resources used)</p> <p>What are some of your successes?</p> <p>Your concerns?</p> <p>Tell me about any changes in your parenting since participating in this study?</p> <p>Tell me about any changes in your family and relationships since participating in this study?</p> <p>Tell me about a time when you were most proud of the way you managed your baby's sleep?</p> <p>Tell me about a time when you were most proud of the way your partner managed your baby's sleep?</p> <p>How do you think you and your partner's parenting and/or concerns about infant sleep may have changed since the start of the study?</p> <p>What was most helpful or interesting to you in this study?</p> <p>What was most difficult or uninteresting to you in this study?</p> <p>What recommendations do you have for sleep intervention with new parents?</p>

APPENDIX C: SUPPLEMENTAL TABLES

Table 4.8. *Comparisons of Sample Mother-Infant and Father-Infant Interactions at 5 months of Age to Normed Reference Values*

	Mothers (5 months)					Fathers (5 months)				
	Sample Mean (SD) (n = 60)	PCITS normed mean (n = 480)	Mean Difference 95% CI [LCI, UCI]	<i>t</i> value	<i>p</i> value	Sample Mean (n = 60)	Reference Value ^b (n = 103)	Mean Difference 95% CI [LCI, UCI]	<i>t</i> value	<i>p</i> value
Total	52.83 (6.77)	58.01 (8.12)	-5.18 [-7.34, -3.02]	4.71	< .001	52.65 (7.57)	56.80 (6.80)	-4.15 [-6.42, -1.88]	3.60	< .001
Parent Total	37.08 (4.87)	42.32 (5.90)	-5.24 [-6.81, -3.67]	6.56	< .001	36.73 (5.44)	38.50 (4.60)	-1.77 [-3.35, -0.19]	2.21	0.029
Sensitivity to Cues	9.05 (1.14)	9.50 (1.47)	-0.45 [-0.84, -0.06]	2.27	0.023	9.35 (1.12)	9.50 (1.10)	-0.15 [-0.50, 0.20]	0.83	0.405
Response to Distress	9.72 (1.73)	10.39 (1.29)	-0.67 [-1.04, -0.30]	3.61	< .001	9.37 (1.98)	9.70 (1.30)	-0.33 [-0.84, 0.18]	1.30	0.197
Social Emotional										
Growth Fostering	7.80 (1.68)	9.51 (1.51)	-1.71 [-2.13, -1.29]	8.09	< .001	7.60 (1.66)	8.20 (1.60)	-0.60 [-1.12, -0.08]	2.28	0.024
Cognitive Growth										
Fostering	10.52 (2.90)	12.92 (3.22)	-2.40 [-3.26, -1.54]	5.47	< .001	10.42 (2.95)	11.10 (2.70)	-0.68 [-1.58, 0.22]	1.51	0.134
Infant Total	15.75 (3.07)	15.69 (4.04)	0.06 [-1.01, 1.13]	0.11	0.912	15.92 (3.23)	18.30 (3.60)	-2.38 [-3.49, -1.27]	4.23	< .001
Clarity of Cues	7.72 (1.22)	7.96 (1.49)	-0.24 [-3.26, -1.54]	1.21	0.228	7.90 (1.34)	8.60 (1.50)	-0.70 [-1.16, -0.24]	2.99	0.003
Responsiveness to										
Caregiver	8.03 (2.16)	7.73 (2.96)	0.45 [-0.48, 1.08]	0.77	0.445	8.02 (2.35)	9.70 (2.40)	-1.68 [-2.44, -0.92]	4.35	< .001
Contingency										
Parent Total	13.08 (3.00)	16.87 (3.20)	-3.79 [-4.65, -2.93]	8.65	< .001	13.42 (3.58)	15.00 (2.90)	-1.58 [-2.59, -0.57]	3.07	0.002
Infant Total	7.33 (1.88)	7.01 (2.78)	0.32 [-0.41, 1.05]	0.86	0.388	7.40 (2.04)	8.90 (2.20)	-1.50 [-2.51, -0.49]	4.31	< .001

Note. Mothers were compared to normed reference values Parent Child Relationship Programs Parent-child interaction teaching scale manual using reference values for mother-child interactions with mothers having > 13 years and infants aged 0 - 12 months, n = 480. Fathers were compared to values published by Harrison, Magill-Evans, Benzie 1999 (2-12 months, n = 103)

Infant Sleep Characteristics of Interviewed Families

Table 5.2. *Maternal- and Paternal-Reported Continuous Infant Sleep Characteristics at Outcome (7 Months) by Interview Subgroup*

	Play2Sleep				Comparison			
	Most Improved		Least Improved		Most Improved		Least improved	
	Mothers	Fathers	Mothers	Fathers	Mothers	Fathers	Mothers	Fathers
	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>
Change in night wakings	3.40 (1.52)	1.66 (1.04)	0.20 (1.64)	1.20 (0.84)	2.00 (0.71)	0.80 (1.79)	0.60 (0.55)	0.60 (1.14)
Bedtime duration (minutes)	30.00 (10.61)	36.00 (8.22)	51.00 (25.10)	51.00 (13.42)	36.00 (8.22)	39.00 (13.42)	63.00 (52.39)	66.00 (54.70)
Bedtime (pm)	6:39 (0:36)	6:45 (0:30)	7:18 (0:26)	7:15 (0:25)	7:09 (0:20)	7:15 (0:18)	8:09 (1:19)	8:15 (1:31)
Number of night wakings	1.60 (0.55)	1.74 (0.73)	3.60 (2.41)	3.80 (2.59)	3.00 (2.00)	2.60 (1.34)	3.40 (1.67)	3.20 (2.17)
Nocturnal wakefulness (minutes)	25.00 (7.07)	43.00 (19.87)	35.00 (16.58)	47.00 (30.33)	139.00 (186.96)	51.00 (43.36)	79.00 (44.22)	47.72 (19.62)
Longest consecutive self-regulated sleep period (minutes)	345.00 (57.45)	336.62 (80.16)	278.00 (98.08)	378.00 (215.92)	360.00 (220.45)	312.00 (155.31)	195.40 (114.89)	277.93 (35.42)
Night sleep duration (minutes)	690.00 (73.48)	646.34 (90.18)	672.00 (34.21)	600.00 (139.10)	636.00 (53.67)	636.00 (49.30)	552.00 (86.43)	565.24 (69.28)
Daytime sleep duration (minutes)	171.00 (79.09)	186.21 (64.90)	138.00 (34.21)	162.00 (58.48)	150.00 (36.74)	168.00 (86.43)	144.00 (25.10)	126.00 (32.86)
Number of naps	3.10 (0.22)	2.91 (0.19)	2.60 (0.42)	3.00 (0.35)	2.40 (0.55)	2.40 (0.55)	2.50 (0.50)	2.60 (0.89)
Mean nap length	56.14 (27.51)	63.06 (21.07)	55.60 (22.06)	54.69 (21.07)	65.00 (22.91)	70.00 (30.62)	59.60 (17.63)	51.00 (13.42)
Total 24hr sleep duration (minutes)	861.00 (110.02)	832.55 (150.15)	810.00 (42.43)	762.00 (185.66)	786.00 (88.49)	804.00 (104.79)	696.00 (93.43)	688.66 (71.46)

Table 5.3. *Maternal- and Paternal-Reported Ordinal Infant Sleep Characteristics at Outcome (7 Months) by Interview Subgroup*

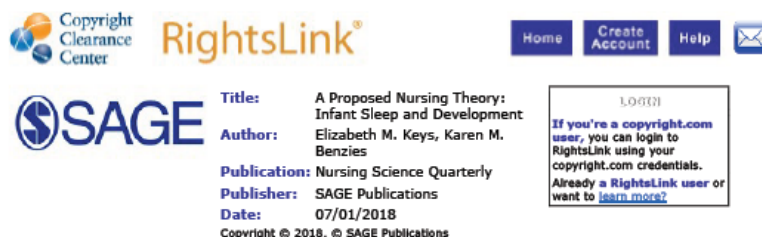
	Play2Sleep				Comparison			
	Most Improved		Least Improved		Most Improved		Least improved	
	Mothers <i>n</i> (%)	Fathers <i>n</i> (%)	Mothers <i>n</i> (%)	Fathers <i>n</i> (%)	Mothers <i>n</i> (%)	Fathers <i>n</i> (%)	Mothers <i>n</i> (%)	Fathers <i>n</i> (%)
Since first home visit, has your baby's sleep improved?								
Yes, quite a bit	5 (100)	2 (40)	3 (60)	2 (40)	3 (60)	2 (40)		
Yes, somewhat		3 (60)			2 (40)	2 (40)	3 (60)	3 (60)
No, stayed the same			2 (40)	3 (60)		1 (20)	1 (20)	2 (40)
No, has gotten worse							1 (20)	
Typically, how difficult is bedtime for your child, for example, fussing, crying, protesting?								
Somewhat easy	4 (80)	2 (40)	3 (60)	1 (20)	2 (40)	1 (20)	2 (40)	1 (20)
Neither easy nor difficult		2 (40)	1 (20)		1 (20)	1 (20)	1 (20)	1 (20)
Somewhat difficult	1 (20)	1 (20)	1 (20)	4 (80)	2 (40)	3 (60)	1 (20)	2 (40)
Very difficult							1 (20)	1 (20)
How long does it typically take your child to fall asleep at night?								
5-15 minutes	5 (100)	4 (80)	3 (60)	2 (40)	3 (60)	3 (60)	4 (80)	2 (40)
16-30 minutes		1 (20)	2 (40)	2 (40)	2 (40)	2 (40)		2 (40)
31-60 minutes				1 (20)				1 (20)
More than 1 hour							1 (20)	
Rate how well your child usually sleeps at night:								
Very well	1 (20)	1 (20)		2 (40)				
Well	3 (60)	1 (20)	2 (40)		1 (20)	1 (20)		
Fairly well	1 (20)	3 (60)	1 (20)	1 (20)	2 (40)	3 (60)	3 (60)	2 (40)
Fairly poorly			1 (20)	2 (40)	1 (20)	1 (20)	1 (20)	2 (40)
Poorly			1 (20)		1 (20)		1 (20)	1 (20)
Do you consider your child's sleep as a problem?								
A very serious problem			1 (20)	1 (20)	1 (20)		2 (40)	2 (40)
A small problem	3 (60)	2 (40)	3 (60)	3 (60)	3 (60)	4 (80)	3 (60)	3 (60)
Not a problem	2 (40)	3 (60)	1 (20)	1 (20)	1 (20)	1 (20)		

APPENDIX D: COPYRIGHT FORMS

This thesis contains two published manuscripts (Chapters 2 and 3) and one manuscript ready for submission (Chapter 4).

Chapter 2. Keys, E. M., & Benzies, K. M. (2018). A proposed nursing theory: Infant sleep and development. *Nursing Science Quarterly*, 31(3), 279-286.
doi:10.1177/0894318418774947

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- Author:** Elizabeth M. Keys, Karen M. Benzies
- Publication:** Nursing Science Quarterly
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Chapter 3. Keys, E. M., Benzies, K. M., Kirk, V., & Duffett-Leger, L. (2018).

Play2Sleep: A mixed methods protocol using play to improve infant sleep. *Frontiers in Psychiatry*, 9, 109. doi:10.3389/fpsy.2018.00109

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Chapter 4. Keys, E. M., Benzies, K. M., Kirk, V., & Duffett-Leger, L. Effect of

Play2Sleep for mothers and fathers of 5-month-old infants. Prepared for submission to *Pediatrics*.

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- Keys, E. M., Benzies, K. M., Kirk, V., & Duffett-Leger, L. (2018). Play2Sleep: A mixed methods protocol using play to improve infant sleep. *Frontiers in Psychiatry*, 9, 109. doi:10.3389/fpsy.2018.00109
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- Keys, E. M., Benzies, K. M., Kirk, V., & Duffett-Leger, L. Effect of Play2Sleep for mothers and fathers of 5-month-old infants. Prepared for submission to *Pediatrics*.

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- Keys, E. M., Benzies, K. M., Kirk, V., & Duffett-Leger, L. Effect of Play2Sleep for mothers and fathers of 5-month-old infants. Prepared for submission to *Pediatrics*.

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