SLEEP PRACTICES AND NAP QUALITY IN INFANTS TRANSITIONING TO EARLY CHILDHOOD EDUCATION CENTRES: COMPARING NAPS IN THE HOME AND CENTRE

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Abstract

Little literature currently exists on naps in infancy, particularly in Early Childhood Education (ECE) settings. This study follows previous research by Stuart (2011) on children attending ECE Centres. The objective of the current study was to examine the architecture of naps in infants who were transitioning to attendance at an ECE Centre. Four males and one female aged between 4 and 11 months contributed to five case studies. Digital video recordings were made of participants napping in two settings: the home and the ECE Centre. Baseline recordings were made in the home only, and recordings were made in both settings as infants transitioned to the ECE Centre, and once they were deemed to be "settled" at the centre. The recordings were then coded to determine sleep states and amount of caregiver interaction. The results showed that all infants displayed a reaction to the transition to ECE attendance. However, the transition to the ECE Centre had a minimal effect on most infants' home naps. Overall, naps were longer and more efficient at home than at the ECE Centre, and infants engaged in more Active Sleep than Quiet Sleep in both settings. Caregiver interaction during naps also differed between the settings. This is an important area of study as attendance at ECE Centres in New Zealand is increasing (Ministry of Education, 2011b), and as such, suggestions for future research have been made.

Chapter One

Literature Review

Sleep is a vital aspect of every person's life, and it plays an important role in all areas of functioning. Quality sleep is especially important during infancy, as it helps to consolidate learning, aids physical growth, and has a role in cognitive and emotional development (Mindell & Owens, 2003). Sleep is a complex state, as it can be influenced by both biological and environmental factors (Blampied & France, 1993).

The study of infant sleep in Early Childhood Education Centres (ECECs) is particularly important, as it is possible that there may be differences between the sleep of children who attend ECECs and those who do not, such as shorter sleep duration (Nevarez, Rifas-Shiman, Kleinman, Gillman, & Taveras, 2010). The number of children under 3 years of age in New Zealand who attend formal child care has more than doubled in the decade since 1990, and these young children now represent a significant proportion of all children in early childhood education (Ministry of Education, 2011b). As most children attending ECECs have one to two naps per day, many children are now sleeping in multiple settings including the home and centre. As well as differences in setting, these children are also experiencing differences in caregivers when they nap at ECECs, and this could possibly also mean differences in sleep practices. This raises questions about the structure of sleep in children who attend ECECs, and how it compares to the structure of their naps at home. Furthermore, the policies and procedures of ECECs regarding sleep must also be considered as these may affect the architecture of children's naps.

Although there is a large research base regarding infant sleep, there is a lack of specific research into the naps or day sleep of infants. There is also a shortage of studies on sleep in ECECs, which is an area of great interest given the increasing number of children currently attending out of home care in New Zealand (Ministry of Education, 2011b). Since 1997, the average number of hours young children spend in education and care services has increased by

50% to 23.7 hours per week (Ministry of Education 2011a). Owing to the high proportion of children attending ECECs, and the increasing amount of time these children spend in centres, it is therefore vital that more research be conducted in these settings. Specifically, given the importance of sleep for development, sleep in ECECs must be studied to discern whether infants' sleep differs in centres compared to the home, and to further examine the role of ECECs in infant sleep.

There are a number of important research areas relating to infant naps in ECECs which will be covered in this review. Firstly, it is important to understand what exactly constitutes sleep, why sleep is important, and how it develops. These factors will be discussed as an introduction to the topic. The architecture of infant sleep will also be addressed, including a discussion of how this differs from the architecture of adult sleep. The review will also cover the development of sleep regulation and self-soothing in infants as this is an important part of understanding infant sleep. Parental involvement, sleep practices, and the role of attachment in infant sleep will be examined, as these are all areas of interest in the current research. The existing research on infant naps and naps in ECECs will be discussed and related to the current study. Other influences on infant sleep such as culture, ECEC policies, and transitions to ECECs will be addressed. Finally, a section on measuring infant sleep will also be included.

What is sleep?

Sleep can be defined in a number of ways. Carskadon and Dement (1989) define sleep as a reversible behavioural state of decreased responsiveness and interaction with the environment. Fox (1999) describes sleep as a state of natural unconsciousness from which one can be aroused. Chokroverty (2010) states that the behavioural criteria for sleep include a lack of mobility, slow eye movements, a sleeping posture, a reduced response to internal stimuli, an elevated arousal threshold, and impaired cognitive functioning. It is apparent from these definitions that sleeping involves a decreased level of consciousness when compared to wakefulness. Sleep is also a time when the body and nervous system can rest and recuperate (Fox, 1999). During sleep, the brain also lowers the body's blood pressure, heart rate, metabolic rate, and rate of respiration (Davis, Parker, & Montgomery, 2004). Furthermore, the body's core temperature and muscle tone also decreases during sleep (Fox, 1999). However, sleep can also be a period of intense brain activity, as the brain can often be more active during sleep than during wakefulness (Davis et al., 2004).

It is also possible to view sleep as a behavioural process which can be influenced by environmental factors such as parental interactions and physical surroundings (Blampied & France, 1993). Researchers have suggested that the act of falling asleep is a behaviour elicited to produce sleep (Bootzin, 1977, as cited in Blampied & France, 1993). The process of falling asleep can be affected by environmental and biological factors, and this process is reinforced by sleep itself (Blampied & France, 1993). Factors that influence the process of falling asleep include a period of low behavioural activity, routines for falling asleep, and internal cues for sleep.

Sleep Architecture

Humans have two processes which regulate sleep and wakefulness: the circadian and the homeostatic. The circadian process is the 24 hour biological and behavioural sequence, which includes sleeping and waking based on the light-dark cycle (Davis et al., 2004). The homeostatic process describes how the requirement for sleep builds during the hours of wakefulness and is then relieved by sleep (Davis et al., 2004). The homeostatic process also has a role in restoring alertness and allowing the body to recover (Davis et al., 2004). These processes each operate separately, but together affect the timing and duration of sleep and wakefulness.

A third factor, the ultradian rhythm, refers to the cycling of different sleep stages and includes Rapid Eye Movement (REM) and Non-Rapid Eye Movement (Non-REM) sleep (Davis et al., 2004). These processes all mature during development as infants become synchronized with the light-dark cycle and social cues for sleep (Anders, 1994).

Non-REM sleep consists for four stages, from the lightest to the deepest sleep (Davis et al., 2004; Mindell & Owens, 2003). Stage 1 Non-REM sleep is characterised by reduced body movements and responsiveness, and is a transitional phase between wakefulness and sleep (Davis et al., 2004). Stage 2 is typified by decreased eye movements and respiration, and can be described as the onset of true sleep (Davis et al., 2004). Stages 3 and 4 are very similar and are characterised by a relaxed body position, and difficulty arousing from sleep (Davis et al., 2004). Rapid eye movements, muscle paralysis, and changes in respiration and heart rate are common characteristics of REM sleep. Dreaming also occurs during this state, and the muscle paralysis experienced is thought to protect from the acting out of these dreams (Davis et al., 2004; Mindell & Owens, 2003).

In adults, REM sleep accounts for approximately 20% of the total sleep period, Stage 2 Non-REM sleep accounts for 50%, and the other stages of Non-REM account for the remainder of sleep (Davis et al., 2004). The sleep of young infants is generally classified as either Active Sleep (AS) or Quiet Sleep (QS) (Sterman et al., 1977). Active sleep is similar to REM sleep in adulthood in that it is a light sleep characterised by eye and body movements, and that infants may be aroused from this state easily (Middlemiss, 2004; Sterman et al., 1997). Quiet sleep is similar to the Non-REM sleep of adults in that few movements occur and arousal is difficult (Middlemiss, 2004; Sterman et al., 1977).

The Importance of Sleep

Sleep is the primary activity of the brain during the early stages of development, and is associated with a number of important functions for infant maturation (Mindell & Owens, 2003). Sleep is not only essential for normal growth and development, but also for adequate immune function (Davis et al., 2004). It also plays an important role in healing body tissues, restoring energy, and increasing learning efficiency and capacity, all of which are vital aspects of infant development (Davis et al., 2004). It is also thought that sleep protects infants from an overload of information and stimulation that cannot always be processed (Mindell & Owens, 2003).

Specific types of sleep have a number of other important functions. For example, Non-REM sleep aids in maintaining the immune system, and REM sleep helps to increase attention. REM sleep is also involved in the consolidation of memory, and the growth and development of the Central Nervous System (Mindell & Owens, 2003). However, each REM and Non-REM cycle must be completed for an infant to gain the restorative benefits of sleep (Siren-Tiusanen & Robinson, 2001).

A lack of sleep or poor sleep quality can have a negative impact on a child's ability to concentrate, as well as their physical, cognitive, behavioural, social, and emotional functioning (Davis et al., 2004; Mindell & Owens, 2003). Inadequate night sleep in children can result in daytime sleepiness, which is associated with performance impairment and mood dysregulation (Mindell & Owens, 2003). One study found that disrupted sleep (in the form of variable bedtimes and amounts of sleep) in 4 to 5 year olds predicted less optimal adjustment to ECEC attendance when controlling for parent and family factors (Bates, Viken, Alexander, Beyers, & Stockton, 2002).

In children, a lack of sleep can result in impaired verbal fluency and creativity, impaired problem solving, decreased efficiency in task completion, and poor overall academic performance (Mindell & Owens, 2003). Furthermore, poor sleep can lead children to display oppositional behaviour, inattention, hyperactivity, and mood disturbances, and is associated with an increased prevalence and severity of parent and teacher reported behaviour problems (Mindell & Owens, 2003). A number of studies have also found an association between poor sleep and an increased Body Mass Index (BMI) and obesity in children and adolescents (Adam, Snell, & Pendry, 2007; Lumeng et al., 2007). Sleep problems can also exacerbate any medical, psychiatric, developmental or psychosocial problems present in childhood (Mindell & Owens, 2003).

In adults, chronic loss of as little as two hours sleep per night can accumulate to become "sleep debt" (Mindell & Owens, 2003). If this sleep loss is not recovered, people may experience decreased alertness, a tendency to nap, or microsleeps – sleeps of a few seconds during the day, which one may or may not be aware of (Mindell & Owens, 2003). Sleep deprivation may also lead to a loss in productivity, and can increase the likelihood of accidents in the home, workplace, or while driving (Chokroverty, 2010). There are marked individual differences in the abilities of humans to tolerate inadequate sleep; however it is common for people to overestimate their ability to function after a night of poor sleep (Mindell & Owens, 2003).

The quality of sleep also plays an important role in its function. A study of children under 3 years of age found that those with high-quality sleep displayed lower levels of cortisol on awakening than those with poorer quality sleep (Scher, Hall, Zaidman-Zait, & Weinberg, 2010). Higher levels of cortisol have been associated with externalising and internalising problems in older children. However, these findings were produced from correlational research so no cause and effect relationships can be confirmed.

The Development of Sleep

The sleep architecture of young infants differs from that of adults in a number of ways. By 6 weeks of age, neonates develop a circadian rhythm as their sleep begins to consolidate (Bamford et al., 1990; Coons & Guilleminault, 1984). As sleep consolidates, the number of sleep onsets decreases, as does the number of onsets in REM sleep (Coons & Guilleminault, 1984). As the nervous system becomes more organised and mature, sleep efficiency increases; and by 3 months of age most infants' night sleep consists of highly structured REM and Non-REM stages (Coons & Guilleminault, 1984). By this age, the overall structure of night sleep becomes similar to that of adults in that the first part of the night is characterised by Non-REM sleep and the later part by REM sleep (Coons & Guilleminault, 1984).

In young infants, sleep consists mainly of Active Sleep, and sleep sessions generally begin with this type of sleep (Davis et al., 2004; de Weerd & van den Bossche, 2003). The presence of AS at sleep onset diminishes over the first 3 months of life, although this takes longer in some infants (de Weerd & van den Bossche, 2003; Ellingson & Peters, 1980). Many children enter AS at sleep onset up to the age of 6 months; however, if the child enters QS first, it may be a sign that he or she is stressed (Thoman & Acebo, 1995). At birth, infants spend around half the sleep period in AS and half in QS (de Weerd & van den Bossche, 2003); over the first 5 weeks of life, the proportion of AS decreases and QS increases (Thoman & Whitney, 1989). By 6 months of age the proportion has changed to approximately 30% AS to 70% QS; in adulthood, 20% of the total sleep period is spent in REM sleep and the remainder is spent in Non-REM sleep (de Weerd & van den Bossche, 2003).

In infants, the cycles of AS and QS last for approximately 50 minutes (de Weerd & van den Bossche, 2003), while in adults, sleep cycles are generally longer at around 90 minutes (Rama, Cho, & Kushida, 2006). The first cycle of REM sleep may last only a few minutes, and subsequent cycles may be longer (Rama et al., 2006). In both children and adults, brief arousals followed by an immediate return to sleep often occur at the end of each sleep cycle (Mindell & Owens, 2003).

The duration and patterning of sleep is also different depending on the stage of development. At birth, infants alternate between sleep and wakefulness approximately every three to four hours, and 16 to 18 hours per day are spent asleep (Anders, 1994; Davis et al., 2004). Sleep at this age can be inefficient as it occurs frequently for short periods, and can be easily interrupted (Davis et al., 2004). By 6 months of age, infants can sleep for up to six hours at night, and most of the wakeful hours occur during the day interspersed by brief periods of sleep

(Anders, 1994). Sleep patterns have consolidated by 12 months of age, with one to two daytime naps and longer periods of night sleep becoming typical (Anders, 1994). At this age, approximately 14 to 15 hours per day are spent asleep (Anders, 1994), and the number of wakings over a 24 hour period has decreased, predominantly due to a decrease in night wakings (Fagioli, Ficca, & Salzarulo, 2002).

Sleep Regulation

Sleep regulation refers to the infant's ability to control his or her internal states of arousal as they mature (Mindell & Owens, 2003). Parents and caregivers have a vital role to play in the development of this skill, as children learn to regulate their sleep and sleeping patterns through interactions with their caregivers (Blampied & France, 1993). Part of sleep regulation includes learning to sleep at different times from other family members, sleeping in one's own cot, and self-soothing (Blampied & France, 1993). Self-soothing occurs when an infant can control their arousal in order to fall asleep (or back to sleep) without adult interaction (Goodlin-Jones, Burnham, Gaylor, & Anders, 2001). If a child cannot self-soothe and requires parental interaction, they will often "signal" to parents by crying, calling, or any other means of gaining attention (Anders, Sadeh, & Appareddy, 1995).

Being able to self-soothe is a vital component of infant sleep quality, and research has shown that 3 month olds who self-soothe sleep for longer than those who do not (France & Blampied, 1999). This ability develops over the first year of life, with one study of infants aged 3 to 12 months finding that older children were more likely to self-soothe than the younger infants (Goodlin-Jones et al., 2001). More specifically, during the first few months of life, 95% of children will be signallers who require parental interaction to return to sleep; however, by 12 months of age, 60% to 70% of children will be able to self-soothe (Anders et al., 1995). Studies have also shown that infants' self-soothing ability at 12 months of age can predict the frequency of night wakings at 3 years (Gaylor, Goodlin-Jones, & Anders, 2001). Furthermore, predictors of adequate self-soothing ability at 12 months include: infants having decreasing amounts of time out of their cots over the year; displaying high levels of QS at birth; and parents taking longer to respond to awakenings when infants are 3 months old (Burnham, Goodlin-Jones, Gaylor, & Anders, 2002).

Parents must encourage the development of self-soothing and self-regulating behaviours in their infants, as this is not a natural developmental process (Johnson & McMahon, 2008). Parents who display a balance of affection and authority towards their children (authoritative parenting) provide the challenges necessary for children to learn to do things autonomously, for example self-soothing (Johnson & McMahon, 2008).

Sleep Practices

Sleep practices, or sleep hygiene, refers to the modifiable parent and child practices that promote sleep quality and adequate sleep duration, and which prevent daytime sleepiness (Mindell, Meltzer, Carskadon, & Chervin, 2009; Sadeh, Mindell, Luedtke, & Wiegand, 2009). Basic sleep hygiene for infants includes having a consistent schedule for day and night sleep and wake times, and having a bedtime routine, such as being bathed and being read a story each night before bed (Mindell, Meltzer, et al., 2009). These practices are both associated with better sleep consolidation and shorter sleep onset latencies in infants (Mindell, Meltzer, et al., 2009). Television viewing and consuming caffeinated beverages (such as cola) are factors associated with shorter and/or poorer quality night sleep in preschoolers and school aged children (Mindell, Meltzer, et al., 2009).

From 2 months of age onwards, parents should put their infant down when “drowsy but awake” in order to foster self-soothing ability (Mindell & Owens, 2003). Research has found that children who are put down asleep are more likely to have longer sleep onset latencies, shorter night sleep and more night wakings (Mindell, Meltzer, et al., 2009). Infants who are left to fall asleep on their own may be more likely to suck their thumbs or become attached to an object such as a toy, blanket, or pacifier (Lozoff, 1995). Such items are known as transitional objects, and may provide comfort and security to infants when parents are absent (Anders et al., 1995). Thumb-sucking is a common self-soothing behaviour between the ages of 6 months and 4 years, and children who thumb-suck are also more likely to use transitional objects than other children (Anders et al., 1995). Children who suck their thumbs or use transitional objects may be more likely to self-soothe as they use their thumb or the object as a means of settling themselves back to sleep after waking at night (Lozoff, 1995).

There are also factors to do with the physical environment that parents should be aware of when putting their infants to sleep. Firstly, infants should sleep in a smoke-free and well-ventilated room at a cool temperature that adults would be comfortable to sleep in (Mindell & Owens, 2003). The infant should be placed on his or her back, with the face clear of blankets and toys (Mindell & Owens, 2003). If they are to be tucked in, the infant should be placed with his or her feet at the end of the cot, with the blanket no higher than chest level and tucked into the mattress (Mindell & Owens, 2003). Any mobiles should be removed by 5 months of age or when the infant learns to sit up, and cot bumpers should be removed by 12 months or when the infant learns to climb (Mindell & Owens, 2003).

Parent Factors and Sleep

Much research has been conducted into the role of parents in infant sleep. The literature includes studies of parent behaviour, and studies of internal parent factors such as emotional availability, and how each of these affects infant sleep. Studies of parent behaviour appear to suggest that there is a fine line between helping an infant develop good sleep habits and becoming too involved.

One aspect of parent behaviour relevant to infant sleep is whether parents introduce certain sleep habits to their children, such as initiating a regular bedtime routine for infants from an early age (Blampied & France, 1993). Research has shown that a consistent nightly bedtime routine is associated with increased sleep consolidation, decreased night waking, shorter sleep onset latencies, and a general improvement in night sleep (Mindell, Telofski, Wiegand, & Kurtz, 2009). Furthermore, regular bedtime routines for infants have also been shown to improve maternal mood and parental perceptions of their infant's sleep (Mindell, Telofski, et al., 2009).

Sleep patterns in infants are not automatically regulated, so they must learn to alter these according to the sleep practices of their family and culture (France & Blampied, 1999; Siren-Tiusanen & Robinson, 2001). Parents and caregivers play a vital role in helping the infant to learn such regulatory behaviours as being able to sleep at separate times from other family members, sleeping in their own cot, and learning to self-soothe (France & Blampied, 1999).

Although parents play an important role in their children's sleep development, an excess of parental involvement in infant sleep routines can lead to problems. Children who are consistently soothed to sleep by adults can have difficulty learning to fall asleep by themselves (Johnson & McMahon, 2008). These children may then resist going to sleep by crying or attempting to gain parental attention in other ways; and they are also more likely than self-soothing children to wake during the night (Adair, Bauchner, Philipp, Levenson, & Zuckerman, 1999; Johnson & McMahon, 2008). Being able to fall asleep without parental interaction is an important skill for infants to develop, as one study found that 78% of self-soothing infants (aged between 8 and 12 months) were able to sleep through the night without significant frequencies of waking and signalling (Adair et al., 1999). Of the children who consistently had a parent present at bedtime, 40% woke and signalled seven or more times per night (Adair et al., 1999). Having an infant who self-soothes also makes it more likely that parents' will get an adequate night's sleep. Furthermore, if an infant wakes at night and signals, and the parents rapidly and consistently respond, there is a higher chance the infant will develop ongoing sleeping problems later in childhood compared with self-soothing infants (Johnson & McMahon, 2008).

One example of an internal parent factor related to infant sleep is parental hardiness. Parental hardiness is defined as the "ability to manage challenges effectively by transforming stressful experiences into opportunities for learning and personal development despite anxiety" (Johnson & McMahon, 2008). One study found that parents who were less hardy had more negative thoughts regarding their infant's sleep (Johnson & McMahon, 2008). This in turn predicted more parental interaction with the infant at bedtime and over the course of the night, which is known to be associated with childhood sleep problems (Johnson & McMahon, 2008).

As mentioned above, parents' thoughts or cognitions also have a role in infant sleep. One study compared infants with no reported sleep problems and infants whose parents' had sought professional help for sleep problems. The authors found that parents of the problem sleepers were less likely to use limit setting regarding night interactions with their infants, despite valuing limit setting hypothetically (Sadeh, Flint-Ofir, Tirosh, & Tikotzky, 2007). The infants of the parents who had difficulty limit setting were at a greater risk of sleep problems than the control group, as night wakings often lead to signalling and parental assistance (Sadeh et al., 2007). A later study of 89 expectant couples found that parental cognitions shaped before the birth of the child predicted infant sleep quality (Tikotzky & Sadeh, 2009). Specifically, maternal cognitions that emphasised infant distress at night were associated with parental intervention, which is in turn associated with poorer infant sleep (Tikotzky & Sadeh, 2009).

A recent study was conducted to examine the link between maternal emotional availability (sensitivity and responsiveness to infant cues) and infant sleep quality (Teti, Kim, Mayer, & Countermine, 2010). Participants consisted of 35 mother-infant dyads, and infants were aged between 1 to 24 months (Teti et al., 2010). Sleep diaries, video recordings and questionnaires were used to assess maternal emotional availability and sleep quality (Teti et al., 2010). The results showed that higher maternal emotional availability was associated with fewer settling disruptions and night awakenings for the infant (Teti et al., 2010). Therefore, when taking into account the findings of this study and those above, it could be said that infants having few sleep disruptions could be associated with having mothers who are more sensitive and responsive to their cues, who set limits regarding night interactions with their infants, and who have more positive cognitions about their infant's sleep.

Another study examined the relationship between parenting interactions and daytime sleep in preterm infants. Data was collected from 134 preterm infants and their families at 4, 9, and 24 months of age (Schwichtenberg, Anders, Vollbrecht, & Poehlmann, 2011). At 4 and 24 months, infants who napped more experienced more positive maternal affect and involvement, and less intrusive parenting (Schwichtenberg et al., 2011). In addition, more naps at 9 months predicted more positive maternal affect, involvement, and verbalisations during play at 24 months (Schwichtenberg et al., 2011). The authors suggested that infants who had more naps gave parents more respite, and that this may have led to increased positive affect (Schwichtenberg et al., 2011). Furthermore, parents who allowed their children to nap more often may have been more sensitive to their child's cues (Schwichtenberg et al., 2011).

It can be suggested that the link between parenting and infant sleep is bidirectional, as infant sleep or sleep problems can influence parents' moods, behaviours, and reactions (Sadeh, Tikotzky & Scher, 2010). Despite the wealth of research on parent factors and infant sleep, few cause and effect relationships can be drawn, especially in the area of internal parent factors, as many of these studies are correlational. Further longitudinal research would be useful in establishing exactly which parent factors affect children's sleep in the long term, and how they affect it.

Family Practices, Culture, and Sleep

Culture and family values also play an important role in infant sleep. For example, culture may influence whether a child co-sleeps (shares the parents' bed), is breastfed, or put down asleep or awake (Lozoff, 1995). Each of these factors may affect the quality or duration of the infant's sleep. For example, infants who co-sleep are more likely to experience parental interaction at bedtime and during the night, and this can affect the infant's ability to self-soothe (Lozoff, 1995). Cultural and family backgrounds may also influence how parents respond to infant night wakings (Giganti & Toselli, 2002). Family or cultural beliefs may also affect whether or how quickly the mother returns to work (Lozoff, 1995). Having a mother return to work has been associated with sleep problems in young infants, however the direction of causality is unknown (Lozoff, 1995).

A number of studies have examined the link between specific cultural and family practices and infant sleep. One study surveyed 1676 mother-infant dyads when infants were aged 6, 12, and 24 months to examine the relationship between early life risk factors and infant sleep duration (Nevarez et al., 2010). The authors found that television viewing and being introduced to solid foods prior to the age of 4 months were associated with shorter sleep durations in infants (Nevarez et al., 2010). A large study of over 5006 families found that being breastfed, sharing a room, having a bottle during the night, and being taken into the parents' bed was associated with more night wakings in infants between the ages of 0 and 36 months (Sadeh et al., 2009). The results of these two studies are consistent with earlier work by Elias, Nicolson, Bora, and Johnston (1986), who found that bed sharing and being breastfed into the second year of life are associated with shorter sleep periods and a reduced total amount of sleep.

Research has also shown that culture may affect family sleep practices. For example, an internet survey of over 29,000 families from 17 countries found that infants from predominantly Asian regions have later bedtimes, shorter amounts of sleep, and are more likely to share a bed or room with a family member (Mindell, Sadeh, Wiegand, How, & Goh, 2010). Interestingly, no significant differences were found in daytime nap procedures across the sample (Mindell, Sadeh, Wiegand, et al., 2010). Furthermore, although parents were highly involved in sleep onset and maintenance procedures across the sample, 57% of children in predominantly Caucasian regions fell asleep autonomously in their own cots compared to only 4% of children in predominantly Asian areas (Mindell, Sadeh, Kohyama & How, 2010).

Attachment, ECE Centres, and Sleep

Attachment is an important concept in child development that has contributed to the debate about when children should start to attend ECE Centres. The idea of attachment was pioneered by Bowlby (1969; 1973), and refers to a long-term emotional bond between a parent and child. A secure attachment between a child and his or her parents occurs when the adult fulfils the child's need for physical care, safety and security, and when the adult accurately responds to a child's signal or request for needs to be met (Carr, 2006). Having a secure attachment means that children can use their parents as a safe base from which to explore the world (Carr, 2006). Attachment also affects internal working models, which are guides for the development of relationships later in life (Carr, 2006).

Attachment between parents and children can also be insecure, falling into one of three categories: anxious/ambivalent, avoidant, or disorganised (Carr, 2006). Children who are anxiously attached seek contact with their parents, but gain little comfort from such contact and often tantrum or become clingy (Carr, 2006). Children with avoidant attachments do not seek contact with their parents following a separation, and have a tendency to become sullen (Carr, 2006). Children with disorganised attachments display characteristics of both anxious and avoidant attachments; such patterns are often associated with child abuse, neglect, or parental absence (Carr, 2006).

A number of studies have investigated the effects of attending out of home care on infant's attachments to a parent. Roggman, Langlois, Hubbs-Tait and Rieser-Danner (1994) interpreted Bowlby's attachment theory to mean that parent-child attachments could be negatively affected by the repeated separations infants experience from their mothers when they attend out of home care. The authors theorised that these separations would disrupt the caregiving interactions between the parent and child that were necessary to form a secure attachment (Roggman et al., 1994). They tested this theory with 105 infants aged 12 to 13 months but found no consistent relationship between attachment and out of home care (Roggman et al. 1994). However, the results showed that anxious attachments were more likely in infants in part-time care, while avoidant attachments were lowest in infants in full-time care (Roggman et al., 1994).

An earlier study by Belsky and Rovine (1988) aimed to ascertain whether extensive non-maternal care in the first year of life was associated with an insecure attachment between an infant and his or her mother. The caregiving arrangements of 149 infants were obtained at 3, 9, and 12 months, and attachment was assessed at 1 year of age (Belsky & Rovine, 1988). Findings showed that infants who spent 20 or more hours per week in non-maternal care were more likely to display insecure attachments to their mothers than those who spent less than 20 hours per week in care (Belsky & Rovine, 1988). These findings contrast to those of Roggman et al. (1994) above who found that insecure attachments were more likely in infants who spent less time in out of home care. It is possible that different definitions or measures used in these studies could account for the differences in results. There is therefore still a question regarding the effects of out of home care on attachment. It is possible that the proportions of and reasons for parents working outside of home have changed over time. Therefore, research into these factors and their relationship to infant attachments would be useful to obtain a picture of what is currently happening in this area.

Scher (2001) postulated that infant attachments to caregivers could be an important psychosocial factor in the development of sleep regulation. A study of the association between sleep patterns and attachment was therefore conducted in 94 infants and their mothers (Scher, 2001). Findings showed no significant differences in sleep regulation between infants with secure and insecure attachments (Scher, 2001). However, securely attached infants were perceived by their mothers to have more difficulties at bedtime (Scher, 2001). The author suggested that this could be due to a higher level of separation distress and proximity seeking in securely attached infants compared to infants who were insecurely attached (Scher, 2001). The findings of this study suggest that attachment may not have a large effect on children's naps in out of home care; however it is still an important factor to consider.

Research on Naps in Infants

There is currently a lack of literature and normative data on naps in infants; however the few studies that have been conducted will be discussed here. Weissbluth (1995) followed 172 children from 6 months to 7 years of age to investigate changes in nap patterns over time. It was found that the number of naps a child had as well as the amount of time spent napping was associated with age (Weissbluth, 1995). Between the ages of 9 to 12 months, a pattern of two naps per day was well established, as was a pattern of one afternoon nap per day between 15 and 24 months of age (Weissbluth, 1995).

Sadeh and colleagues (2009) surveyed the parents of 5006 children between the ages of 0 to 36 months to gather data on sleep patterns. The results showed that the total amount of day sleep children engage in decreases over time, and that the duration of naps is also dependent on age (Sadeh et al., 2009). This was in contrast to night sleep patterns, which were more dependent on environmental factors such as where the child slept (Sadeh et al., 2009). The overall findings of this study were consistent with those of Weissbluth (1995) above.

A small number of studies have documented the importance of naps in children less than 2 years of age. One study examined the relationship between daytime sleep patterns and nocturnal sleep problems in infants. Participants consisted of 79 children between the ages of 3 to 30 months who had been referred to an outpatient clinic for sleep problems (Skuladottir, Thome, & Ramel, 2004). An intervention was conducted which consisted of the development of day sleep routines, shaping of night sleep by gradual reduction of parent contact, and psychoeducation for parents (Skuladottir et al., 2004). Post intervention, the results showed that day and night sleep duration had increased, and the number of night wakings had increased (Skuladottir et al., 2004). The authors recommended increasing the period of time children were awake for before being put to bed at night, for example this period should be between four to five hours at 8 months of age, and six to seven hours at 18 months of age (Skuladottir et al., 2004).

Watamura, Donzella, Kertes, and Gunnar (2004) examined the relationship between cortisol production and napping in 69 children between the ages of 12 and 36 months. Research has shown that elevated cortisol levels are associated with behavioural and emotional problems, depressive symptoms, increased social isolation, and inhibition and shyness (Scher et al., 2010; Watamura, Sebanc, & Gunnar, 2002). Therefore, increased cortisol in children can be seen as a risk factor for both internalising and externalising problems. In children younger than 30 months, no relationship was found between length of naps and cortisol production (Watamura et al., 2004). However, children over this age who napped no more than once per day were found to have more mature cortisol production patterns (Watamura et al., 2004). The authors acknowledged that their cross-sectional design made it difficult to determine whether this result was due to typical developmental processes (Watamura et al., 2004).

Gomez, Bootzin, and Nadel (2006) familiarised two groups of 15 month olds with a nonsense language but only one group napped before being tested on the language. This group was better able to generalise their learning to new but similar stimuli than those who had not napped (Gomez et al., 2006). The authors concluded that napping is important in consolidating new learning; however they did not determine if REM or Non-REM sleep was more important in this process.

In a follow-on study, participants napped straight after familiarisation and were tested 24 hours later. The same generalisation effect still occurred regardless of how well-rested the infant was before the test (Hupbatch, Gomez, Bootzin, & Nadel, 2009). The authors believe that the acquisition of new information must be followed by a nap within four hours in order for it to be remembered 24 hours later. It is clear that while sleep itself is important for many reasons, daytime naps are also essential in the learning process of infants (Hupbatch et al., 2009).

Research on Naps in ECE Centres

There is currently little research on naps in ECE centres; however the few relevant studies will be discussed here. One study involved seven infants under 2 years old in two centres over five months (Siren-Tiusanen & Robinson, 2001). This qualitative study consisted of detailed observation notes on nap schedules and staff interactions; interviews with staff and parents; and parent-completed sleep diaries (Siren-Tiusanen & Robinson, 2001). The authors found that the five infants who had to adhere to strict group nap schedules often fell asleep at other random times throughout the day and became overtired (Siren-Tiusanen & Robinson, 2001). The two infants who had individualised nap schedules that were appropriate for their age and level of development were observed to fall asleep easier and adhere well to their nap routines (Siren-Tiusanen & Robinson, 2001). The authors stated that a rigid nap schedule could disturb a child's circadian and ultradian rhythms as the nap may not be long enough to complete the REM and Non-REM cycle (Siren-Tiusanen & Robinson, 2001). The child may then lose the restorative benefits of the naps which can lead to irritability, inattention, a lack of energy, and overstimulation (Siren-Tiusanen & Robinson, 2001).

Another study examined the day and night sleep patterns of fifty-two 3 to 5 year old children who attended full time day care (Ward, Gay, Anders, Alkon, & Lee, 2007). The participants were classified into two groups: nappers were children who slept at the day care centre on at least two of the three observation days; non-nappers were children who either did not sleep or slept briefly on only one day at the centre (Ward et al., 2007). The results showed that children in the non-nappers group were on average 9 months older than children in the nappers group, and they also slept longer at night, averaging 586 minutes of night sleep compared to 538 minutes for nappers (Ward et al., 2007). The authors postulated that children in the nappers group had less nocturnal sleep due to a decreased need for sleep as a result of daytime naps, or that perhaps a poor night's sleep increased the need for daytime naps (Ward et al., 2007). This effect could however be due to the fact that this group of children were younger, and therefore displayed less consolidated sleep. As this study was correlational, the direction of causality could not be discerned. It would also have been interesting to compare the sleep patterns of these children to children who did not attend day care at all to see what effect day care attendance may have had on this.

The same authors also examined the daytime sleep behaviours and cortisol levels of children in out of home care. The participants were 38 children aged 3 to 5 years who attended full time day care (Ward, Gay, Alkon, Anders, & Lee, 2008). The findings showed that regardless of whether a child actually slept or not, difficulty in settling to sleep was associated with a rise in afternoon cortisol levels (Ward et al., 2008). Typically, cortisol levels should decrease over the course of the day, so these findings indicate that settling to sleep at day care may be a stressful experience for some children (Ward et al., 2008). The authors suggested that factors affecting children's experiences at day care could include child to teacher ratios, nap schedules, or child and family factors (Ward et al., 2008); however, more research is required to discern exactly what this rise in cortisol levels can be attributed to.

A study by Torok (2009) compared the architecture of naps in the home and ECEC in infants who had sleeping difficulties. Naps of three children between the ages of 20 to 26 months were digitally recorded in both settings then evaluated using an established coding system (Torok, 2009). Overall, naps were longer in the home than the ECEC, and more time was spent in QS than AS (Torok, 2009). However, the author found a variety of individual differences in the naps of the participants, and acknowledged that their sleeping difficulties may have masked any differences in nap architecture between the settings (Torok, 2009).

Following on from the above research, Stuart (2011) examined the nap architecture of infants without sleeping difficulties across the same two settings. The study followed four children aged 15 to 17 months, one who was transitioning to the ECEC, two who were already settled there, and one who was having sleeping difficulties following a major earthquake (Stuart, 2011). The first participant's naps varied during his transition to the ECEC, but then stabilised once he was settled there (Stuart, 2011). The naps of the two children already attending the ECEC were consistent across both settings (Stuart, 2011). The home naps of the child affected by the earthquake were variable, while her naps at the ECEC were more consistent (Stuart, 2011). The overall findings both confirmed and contrasted those of Torok (2009), as naps were again longer in the home than the ECEC, however infants spent more time in AS than QS (Stuart, 2011).

Issues for ECE Centres

ECE centres are a popular method of childcare for families with young children, and the number of children in ECE in New Zealand is increasing. Recent figures show that over 57% of 2 year old children now attend some form of recognised child care, and that the most popular form of this is Education and Care centres (Ministry of Education, 2011a; Ministry of Education, 2011b). A recent study in the United States showed that by 3 months of age, nearly half the children in the study were being cared for by someone other than their mother for at least ten hours per week (National Institute of Child Health and Human Development [NICHD], 2003). Furthermore, between the ages of 3 to 6 months, the average amount of time spent in out of home care was 21 hours per week, increasing to 32 hours per week between the ages of 37 and 54 months (NICHD, 2003).

As discussed in the subsequent section, transitioning to centre attendance can be a difficult and complex process; however ECE centres also have a number of other responsibilities when it comes to childcare following this transition. Firstly, the centre environment should be well organised, with different areas for different activities (such as feeding, sleeping and play) clearly defined (Field, 1994). The environment should also be as open as is practicable, with low moveable barriers to separate different areas (Twardoz, Cataldo, & Risley, 1974). This allows both staff and children to be continually visible to each other, thus enabling easier supervision and ensuring children are not forgotten (Twardoz et al. 1974). Research has shown that children's sleep in is not adversely affected by attending open environment ECE centres, however many centres do have a separate room for resting and sleeping (Twardoz et al., 1974). Naps or rest periods should be in a quiet, darkened area (Field, 1994). Furthermore, research has shown that playing classical music in the sleep areas can reduce the sleep onset latency or amount of time it takes for young children to fall asleep (Field, 1999).

Another important issue for ECE centres is staffing. Field (1994) recommends that the ideal ratio of staff to infants is 1:4, and for toddlers the ratio should be 1:6. Having more staff than this may result in more accidents, as adults may assume someone else is watching over children; or it may result in less interaction between children, as more time is spent with the supervising adult (Field, 1994). As one of the most important tasks of infancy is to develop social interaction skills, optimum staffing levels at ECE centres are imperative as children's interactions with their caregivers are a primary source of social stimulation at this age (Field, 1994).

Developmentally appropriate practice (DAP) is also an important goal for ECE centres. Wien (1996) defines DAP as practice which is age appropriate, adapted to the individual, and responsive to the child as opposed to prescriptive. In practice, DAP suggests that children choose their own activities and set the agenda for these, while teachers provide a range of activities and materials (Maccoby & Lewis, 2003; Wien, 1996). Furthermore, activities should be carried out individually or in small groups, and the schedule of the ECE centre should be flexible so that different activities can happen simultaneously (Wien, 1996). Wien (1996) also suggests that if an ECE centre adheres to strict schedules, this may result in a loss of programme content and quality for the children. This idea may also apply to napping at ECE centres in that being forced to sleep at certain times may disrupt the quality of children's naps.

Finally, research has shown that attending an ECE centre is associated with producing an elevated level of the stress hormone cortisol. This suggests that attending an ECE centre is a stressful experience for young children (Scher et al., 2010). At least three studies of children between the ages of 1 to 5 years have found that the majority of participants displayed increased levels of cortisol over the course of a day at the ECE centre (Scher et al., 2010; Watamura et al., 2002; Watamura et al., 2004). In two of the studies, older children displayed smaller cortisol increases than younger children, and older children who napped less displayed more mature patterns of cortisol production (Watamura et al., 2002; Watamura et al., 2004). Scher and colleagues (2010) found that 1 to 3 year olds with more consolidated sleep displayed lower levels of cortisol than children with more disjointed sleep. As sleep consolidates as children get older, these results suggest that younger infants may be at an even greater risk of elevated cortisol levels when attending ECE centres.

Transitions

Transitions are one of the most challenging times for young children. It can take months for a child to adjust to a new experience such as an ECE centre, and parents and caregivers can underestimate the difficulties the child will face (Daniel & Shapiro, 1996; Essa, Favre, Thweatt, & Waugh, 1999). Infants transitioning to ECE centres are vulnerable as they are in the process of building attachment relationships to parents, and they must now also build an attachment relationship with a caregiver, which takes time (Daniel & Shapiro, 1996; Essa et al., 1999). If a child does not complete the transitional period adequately, he or she may display a number of negative behaviours over an increased length of time, such as elevated levels of distress and/or aggression, appearing bewildered, and having difficulty separating from parents (Datler, Datler, & Funder, 2010).

A study by Ahnert, Gunnar, Lamb and Barthel (2004) followed 70 infants aged 15 months to examine the effects of transitioning to an ECEC on cortisol levels and attachment. The participants were followed over three stages: at home before attending the ECEC, during the transition to the ECEC with the child’s mother present, and the first nine days at the ECEC without the mother present – known as the separation phase (Ahnert et al., 2004). The results showed that during the separation phase, the infant’s cortisol levels rose over an hour following the mothers’ departure to levels 75% to 100% higher than home levels (Ahnert et al., 2004). Infants who were classed as having secure attachments to their mothers displayed significantly lower cortisol levels during the transition phase than those who were insecurely attached (Ahnert et al., 2004). Furthermore, mothers and infants who spent a longer time transitioning to the ECEC were more likely to retain secure attachments (Ahnert et al., 2004). The elevated cortisol levels found in this study confirm that transitioning can be a stressful time for infants, however the results also suggest that the length of time spent transitioning may be an important factor in infants’ adjustment to ECEC attendance.

Having a consistent caregiver at the ECE centre can make the transition easier for an infant as this will enable them to form an attachment relationship, which could not be done if the child saw a different caregiver every day. According to Daniel and Shapiro (1996), ECE centres must put policies in place that direct staff to form attachments with children, but give them the flexibility to form these according to the needs of the individual child. If a child does experience multiple caregiver changes, the child will be less likely to relate to each new caregiver and will instead try to recreate their relationship with the previous caregiver (Cryer, Hurwitz, & Wolery, 2000). Furthermore, an association has been found between a number of caregiver changes and the likelihood of social withdrawal or aggression in children (Cryer et al., 2000).

ECE centres must have policies and procedures that support infants through their transition from home. These include attempting to limit staff turnover by monitoring stress and performance, and aiming to care for the needs of each individual child in a developmentally appropriate manner (Daniel & Shapiro, 1996). Staff training and experience levels are also important, as children's needs must be matched with caregivers' skills in order to ease the transition into out of home care (Daniel & Shapiro, 1996). Visiting the centre with a parent before they start attending may further ease the infant's transition (Cryer et al., 2000). Staff and parents must also communicate regularly about the child's experiences during the transition so they agree on what assistance the infant requires (Daniel & Shapiro, 1996; Shpancer, 1999).

Contrast in Sleep Environments

Little research currently exists on the contrast between infants' sleeping environments in the home and in ECE settings. However, studies have been conducted to compare the night sleep patterns of infants with different home sleeping environments. One study of 40 bed sharers and 40 cot sleepers aged 5 to 27 weeks found that sleep duration was similar for both groups, but that the bed sharers received more maternal interaction, more breastfeeding, and faster and more frequent maternal responses than infants in the cot sleeping group (Baddock, Galland, Bolton, Williams, & Taylor, 2006). Whether or not these environmental factors were associated with differences in sleep architecture between the groups was not investigated.

A study of 314 pairs of twins aged 18 months suggested that both night and day sleep duration is influenced more by environmental factors (approximately 60%) than by genetics (approximately 30%; Brescianini et al., 2011). The proportion of environmental and genetic influences was similar for night wakings in these participants (Brescianini et al., 2011). As the sleep environment is an important factor in the sleep patterns of infants, it is likely that the contrast between home and ECEC sleep environments is also an important issue that requires further investigation.

Measurement of Sleep

Video recording is often used in sleep research as it is a more reliable method of data collection than human observations alone. Video technology can detect small eye movements even when the eyes are closed, which is important for studies of sleep quality and quantity (Hong & Harris, 2009). It is also less expensive and intrusive than Electro-encephalograms (EEGs) which measure electrical activity to the brain and have traditionally been used in sleep clinics (Hong & Harris, 2009: France & Blampied, 1999). Studies using EEGs have found the stress associated with this procedure affects sleep quality in infants (France & Blampied, 1999).

Thoman and Acebo (1995) describe behavioural recording as the “gold standard” for measuring sleep in infants. Behavioural recording involves watching the infant in person as he or she sleeps and noting the infant’s behavioural state at regular intervals during the sleep period (Thoman & Acebo, 1995). This method is preferable as it may be easier to distinguish between behavioural states than when using EEGs, and the observer can also make note of parent interactions. However, behavioural recording is highly labour-intensive and not suitable for time-limited research (Thoman & Acebo, 1995).

Actigraphs are also used to measure sleep quality and quantity. An actigraph is a watch sized microprocessor worn on the wrist or ankle that senses movement and can specify the child’s sleep and wake time, and how much time was spent awake after sleep onset. However, actigraphs cannot provide information on sleep practices or adult interaction (France & Blampied, 1999). Furthermore, they cannot distinguish between different states of wakefulness, for example crying or quietude (Thoman & Acebo, 1995).

Pressure pads placed in the infant’s cot can also be used to examine sleep architecture. This method is one of the least intrusive to the child, but it comes with limitations. For example, the pressure pad cannot distinguish between different types of NREM sleep or states of wakefulness (Thoman & Acebo, 1995). Furthermore, as with actigraphs, the researcher cannot assess self-soothing or parental interaction when using pressure pads (Thoman & Acebo, 1995).

Parent reports and questionnaires such as the Infant Sleep Questionnaire can be used to examine infant's typical sleep patterns and family sleep practices. However, their subjective nature means they are not sufficient for reliably measuring sleep quality or quantity. Parent-completed sleep diaries are also popular measurement devices in the infant sleep literature, but these can present similar problems. A major drawback of sleep diaries is that parents may only report their child to be awake when the child has signalled, so times when the child is awake but quiet may be missed (Anders, 1979). Furthermore, sleep diaries can be a time consuming task to ask of parents who are already busy, especially if they are to fill them in for long periods of time. Despite these issues, parent report measures of infant sleep do hold some utility in the clinical setting (France & Blampied, 1999).

Despite overcoming the problems of some other methods, video recording does present issues aside from those previously mentioned. For example, the presence of a video camera may be intrusive or cause subjects to act differently to how they would typically. Video recording may also be impractical in clinical settings as data retrieval can be time consuming. Thoman and Acebo (1995) state that the method of sleep measurement to be used depends on the duration of sleep to be recorded, cost-effectiveness, and the extra data required, for example parent interactions. Because there is currently no perfect way to measure sleep quality, a combination of the methods most relevant to the particular study should be used.

In the current study, a combination of video recording and parental reports will be used. All naps will be recorded by a video camera in order to capture the sleep states of the infant, parental interactions, and self-soothing processes. The use of video recordings is not only cost-effective, but will enable the data to be analysed efficiently as the recordings will be played back faster than real time. Parent interviews and home sleep diaries will be used in order to supplement the data provided by the recordings. This is also a cost-effective and efficient method of data collection. The parent interviews will provide a historical perspective on each child's sleep and development, while the sleep diaries will be used to gather data on sleep patterns when the video camera is not in use.

Summary

The wealth of literature on infant sleep states that sleep is important for the growth and development of infants and young children, and that sleep disturbances can be common during this time. It is also clear from the literature that while general patterns of sleep development over the lifespan can be suggested, there is a large amount of individual variation in sleep patterns and the need for sleep. This review has highlighted the fact that there is little research on naps in infants in general, and especially on naps in infants without sleep disturbances. There is also a lack of research around transitions to ECE Centres and infant sleep in ECE Centres. Further research in these areas is particularly important, as over half of the preschoolers in New Zealand attend some form of Early Childhood Education (Statistics New Zealand, 2010). This review has also suggested that sleep environments, attachment, family practices, culture, and ECE Centres have a role to play in infant sleep; however, in most cases, more research is needed for such a role to be clearly defined.

Aims

The current research sought to recruit participants between the ages of 6 and 24 months who did not have any parent-reported sleeping difficulties and who were about to begin attending an ECE Centre. The participants' sleep was studied through the use of a case study design across participants, and video recordings were used to gather data. Video recordings occurred in the home before each child began attending the ECE Centre; in both the home and centre while the child transitioned to the centre; and in both the home and centre when the child was deemed to be settled at the centre. The main aim of the current study was to determine whether the architecture of participants' naps differed between the two settings. A secondary aim of the research was to examine the sleep practices used in the home and ECEC and to assess any differences in practices between settings for each participant.

Chapter Two

Method

Design

This project employed a case study design across participants. It was originally intended to be a multiple baseline design, however due to the February 2011 earthquake in Christchurch, access to participants was delayed and due to time pressure Baseline recordings could not be systematically allocated. Parents of all participants reported that neither their children's behaviour nor sleep patterns were considerably affected by the earthquake, however.

The *Baseline* phase occurred prior to each participant commencing attendance at the Early Childhood Education (ECE) Centre. The *Transition* stage began as soon as the participant started to attend the Centre, and consisted of two phases: *Transition Centre (TC)* and *Transition Home (TH)*. Each participant also engaged in a *Follow-up* stage which again consisted of two phases: *Follow-up Centre (FC)* and *Follow-up Home (FH)*. The naps of each participant in each stage were recorded three times, as demonstrated in the below table.

Table 1

Phases of the study

	Baseline	Transition	Follow-up
Naps recorded at Home	Three recordings	TH: three recordings	FH: three recordings
Naps recorded at ECE Centre		TC: three recordings	FC: three recordings

Participants

The target participants for this research were children aged 6 to 24 months who did not have known sleeping problems and who attended an ECE Centre at least one full day per week. Participants were recruited through an ECE Centre local to the University of Canterbury where this research was completed. An initial meeting was held with the director of this Centre to explain the research and what would be required of the centre. A letter was sent to the Parents' Committee at the centre to explain the research and to obtain the Committee's permission for the research to be conducted in the centre. The centre director then approached parents whose children would be suitable for the project, and passed this information to the researcher. The researcher then made phone contact with each parent to explain the research and to discuss the possibility of their child's participation. If the parents were interested in participating and their child was suitable for the project, they were provided with an information sheet and were given the opportunity to ask the researcher questions. Informed consent was gained from five sets of parents.

The child participants in this study were five infants aged between 4 to 11 months at the start of Baseline data collection. One infant from below the target age range was included as her Transition fitted the researcher's schedule, and the researcher was concerned about finding enough participants for the study. Information about each child and his or her family is summarised in Tables 2 to 6. The information in the tables was reported by parents during the initial interview. All names are pseudonyms, and all ages are the ages of the participants at the start of Baseline data collection.

Table 2

Participant information (Ashley)

Name:	Ashley
Age:	4 months
Gender:	Female
Family composition:	Ashley lives with her mother and father and is their first child.
Sleep history:	Ashley sleeps in a bassinet in her parents' room for the first part of the night, then in her parents' bed from 2am to minimise disruption. Her daytime naps occur in a bassinet on the lounge floor.
Naps at home:	Ashley usually has a 45 minute nap around three hours after waking in the morning. Her afternoon naps depend on what the family is doing, but she can nap in the car or stroller. Ashley sleeps for a total of two hours during the day, but how this is made up changes from day to day.
Night-time sleep:	Ashley sleeps around ten hours per night. She sleeps solidly from 8pm to 2am, and then wakes every two hours for a feed. She is usually breastfed to sleep but is easy to settle.
ECE Centre attendance:	Wednesdays and Thursday from 9:30am to 4pm.
Development:	Ashley was born two weeks late and has since been developing typically.

Table 3

Participant information (Ben)

Name:	Ben
Age:	9 months
Gender:	Male
Family composition:	Ben lives with his mother and father and is their only child.
Sleep history:	Ben usually sleeps between 10 to 12 hours per night, and recently has decreased his number of night wakings to once per night. According to his mother, Ben did not have a regular daytime sleep pattern at the start of the study.
Naps at home:	According to his mother, Ben “struggles” to sleep during the day, but in the afternoon he is changed, given some water then put into his stroller and will sometimes sleep for one to two hours. He usually naps with a pacifier.
Night-time sleep:	Ben is put down at 9pm and wakes at 5am to be changed and fed. He will then sleep for another two to three hours. Before bed, he is breastfed, and then held until he falls asleep before being put in his cot.
ECE Centre attendance:	Tuesday and Friday 8:30am to 4:15pm.
Development:	Ben’s development has so far been typical.

Table 4

Participant information (Caleb)

Name:	Caleb
Age:	6 months
Gender:	Male
Family composition:	Caleb lives with his mother and father and is their only child.
Sleep history:	Caleb sleeps in a cot in his parents’ room, and sometimes naps in their bed. According to his mother, Caleb’s sleep fits around his parents’ routine. He generally sucks his thumb when falling off to sleep.
Naps at home:	Caleb usually has a nap two hours after waking for the day, and it lasts around one hour. He has one to two naps in the afternoon, and can have a number of smaller sleeps, depending what he and his family are doing.
Night-time sleep:	Caleb does not have a night-time sleep routine according to his mother, but she will usually put him down awake and sing to him. He takes around 15 minutes to go to sleep and wakes around four times per night.
ECE Centre attendance:	Mondays and Thursdays from 9am to 4pm.
Development:	Caleb’s development has so far been typical.

Table 5

Participant information (Ethan)

Name:	Ethan
Age:	8 months
Gender:	Male
Family composition:	Ethan lives with his mother, father, and three year old brother.
Sleep history:	Ethan sleeps in a cot in his parents' room. He has gradually reduced his night-wakings from three to one, and has just begun to sleep through the night at times.
Naps at home:	Ethan usually has a morning nap of approximately 2 hours between 10am and 2pm, but will have a second nap in the afternoon if he has woken early.
Night-time sleep:	Ethan has a regular night-time bed routine including a bath and a bottle. If he wakes during the night, Ethan needs to be fed but then settles easily.
ECE Centre attendance:	Tuesdays and Wednesdays 8:15am to 5:15pm
Development:	Ethan is developing typically and he has reached all his milestones at the expected age.

Table 6

Participant information (Jamie)

Name:	Jamie
Age:	11 months
Gender:	Male
Family composition:	Jamie lives with his mother and father and is their only child.
Sleep history:	Jamie does not currently sleep through the night. He sleeps in a cot in his own room and sleeps with a pacifier to ease his reflux (see below).
Naps at home:	Jamie usually has one nap at around 9am and another at around 2pm. The naps last one to two hours, but the afternoon nap is shorter than the morning one.
Night-time sleep:	Jamie goes to sleep by 7pm and usually wakes by 5:30am. He can wake anything from once to over 20 times per night. His night-time routine consists of a bath, bottle, brushing teeth and a story.
ECE Centre attendance:	Monday to Friday 8:15am to 5:15pm.
Development:	Jamie has had severe and chronic reflux from two weeks old. He has reached all his milestones on time and according to his mother Jamie is an "easy" baby apart from his reflux, which is "normal" for him now.

Settings

The settings in this study included the Early Childhood Education Centre, which all participants attended, as well as each participant's Home. The ECE Centre caters for children from birth to 5 years of age, with a special unit for children aged 0 to 2 years. All participants in this study attended the special infant unit. The unit has a low ratio of children to teachers, and staff are professionally trained and experienced. The unit has a purpose built sleep room, which contains six cots plus extra mattresses for older children to use when sleeping on the floor. The sleep room is separate from the play area and a staff member is present in the room at all times.

“Soothing” music is played in the sleep room, and it is kept as dark and quiet as possible throughout the day.

The Home sleeping environments were different for each participant. All of Ethan’s naps occurred in his cot in his parents’ bedroom. The room was always quiet, the curtains were drawn, and the amount of light in the room depended on the time of day the nap occurred. Ashley slept in a rocker on the floor of the lounge for her Home naps. The room was light and quiet, and sometimes music was played softly in the background. Caleb’s Home naps occurred in his parents’ bedroom, either in or on their bed or in Caleb’s own cot. The room was light and quiet. Jamie slept in his own cot in his own room for his Home naps. The room was dark and quiet, and at times music was played softly in the background. Ben slept in his stroller for his Home naps, and this was placed either in the lounge/dining area or in his own bedroom. Both areas were quiet, however his bedroom was darker than the lounge/dining area as the curtains were generally closed.

Materials and Measures

Materials used in this study were a Sony Handycam video camera with Super Night Shot (0 lux infrared light system) as well as a tripod to mount the camera on. All sleep data were then viewed on the researcher’s computer at twice the speed of real time to ensure efficiency of coding. The data were coded using a system developed by Anders (1979), a procedure which has been utilised in other sleep studies such as France (1989), Henderson (2001), and Torok (2009). The coding system and sleep states are set out in Tables 7 and 8 below. A state was assigned to each minute of the nap as it was viewed. The original coding system developed by Anders (1979) also included a “grizzly” state (Code 5) and a “drowsy” state (Code 3). As the current study focuses on arousal states, Codes 3 and 5 were excluded in order to make the distinction between arousal states as clear as possible. Furthermore, the “out of cot” state (Code 7) was not present in Anders' (1979) original system. It was included in the current study as it was important to note if a child had been taken out of the sleep area at any time during the nap period.

Table 7

Coding system and sleep/arousal states for children

Code	State	Scoring
7	The child is out of bed or cot	Any length of the child being out of bed is scored
6	The child is crying	Any length of the child crying is scored
4	The child is awake	Any length of the child being awake is scored
2	The child is in active sleep (AS)	Active sleep is characterised by sudden, involuntary body movements, such as twitching. When the child is settling, any length of AS state is scored. Once settled, a child must make 2 movements within 3 minutes for AS onset, followed by 2 movements every 5 minutes for AS to continue.
1	The child is in quiet sleep (QS)	Quiet sleep is characterised by an absence of body movement. A child must not make any movements for 3 minutes for QS to be coded.

Table 8

Coding system and sleep states for caregivers

Code	State	Scoring
2	Interaction	The caregiver is present with interaction. Any length of touching or talking to the child is scored.
1	No interaction	The caregiver is present without interaction. Any length is scored.
0	Absent	The caregiver is absent. Any length is scored.

One of the first nap recordings was viewed by the researcher and a colleague also conducting sleep research. Scoring discrepancies were discussed and the results were then taken to the researcher's supervisor to ensure the coding procedure was as accurate as possible.

The nap variables presented graphically (see Figures 1 to 3) are i) *caregiver interaction*, ii) *proportion of time spent out of the cot during the nap*, iii) *sleep onset latency*, iv) *proportion of time spent crying during the nap*, v) *sleep duration*, vi) *sleep efficiency*, and vii) *the proportion of time spent in Active Sleep (AS)* during the nap. These have been presented in as close to chronological order (across each nap time) as possible. Other variables that were calculated but not presented graphically include i) *total nap duration*, ii) *proportion of time spent awake during the nap*, iii) *the proportion of the nap the caregiver was absent*, and iv) *the proportion of time the caregiver was present but not interacting with the infant*. These were not presented graphically because total nap duration comprises variables that are already graphed (sleep onset latency plus sleep duration); proportion of time spent awake is covered by the sleep efficiency graphs; proportion of caregiver time with no interaction or absent is the inverse of the time caregivers spent interacting with participants, which is of more direct relevance. The data for each of these variables can be found in Appendices A to E.

Procedures

After recruiting each participant, the researcher ascertained the date that each child would start attending the ECE Centre in order to complete the Baseline phase prior to this date. An appointment was then made with one or both parents where the researcher interviewed the parents in their home. The interview consisted of questions about the child's developmental history, sleep history, and behaviour. Following the interview, the researcher set up the video camera and tripod in a position agreed upon by the parents, and then recorded the first nap in the Baseline phase. The parents were instructed in how to turn the recording function of the camera on and off so they could set the camera to record before putting the child down for a nap. The researcher did not stay in the room during recording as this may have interfered with the child's nap. Two more naps were recorded at home in the Baseline phase, at times convenient to the family. For some recordings, the researcher came and set up the equipment and returned after the nap to collect it. On some occasions where naps were to be recorded in the home on consecutive days, the researcher set up the equipment and left it with the family for two to three days before collecting it. This was to reduce the interference caused by the researcher coming into the home, and also to reduce the researcher's travel especially to participant's homes located some distance away. Baseline recordings for each participant occurred over a period of one to two weeks before the child started at the ECE Centre.

As each participant began attending the ECE Centre, the researcher began the Transition Centre phase. To record naps in the ECE Centre, the researcher set up the video camera and tripod in the morning and returned at the end of the day to collect it. The tripod was placed on a shelf at the end of one cot in the sleep room, so the camera could be pointed down into the cot. The position of the camera meant it did not interfere with the routines of the sleep room and could not be reached by the children so therefore kept the environment safe. The researcher instructed the Director of the ECEC in how to turn the recording function of the camera on and off, and this information was passed to the other staff. Before putting a child down for a nap, the staff member caring for that child would set the camera to record. After each recording, the researcher spoke to the staff member who had put the child down to sleep that day to discuss what settling procedures the child had required to fall asleep.

The Transition Home phase of data collection was also conducted at this time. The procedures for this phase were identical to those of the Baseline phase described above, however the parent interview was not repeated. The two Transition phases were recorded over a period of one to three weeks. Specific days that recordings occurred were subject to the schedules of the researcher, the ECE Centre and the family of the participant.

Six weeks after each participant started at the ECE Centre, the researcher liaised with staff to ascertain whether or not the child had "settled" into attendance at the Centre. To meet this criterion, each participant had to be deemed to be engaging in activities at the Centre, exploring the surroundings, eating well, accepting the nap routines and settling to sleep quickly. These criteria were agreed upon by the researcher, the Head Teacher of the ECE Centre, and the researcher's supervisor. Once the staff agreed that the child was settled, the researcher contacted the child's parents for their perspective. If the parents were in agreement with the staff, the Follow-up phases were commenced. The Follow-up Home procedures were identical to the procedures for the Baseline and Transition Home recording phases; the parent interview was not repeated. The Follow-up Centre procedures were identical to those of the Transition Centre phase. Again, the two Follow-up phases were recorded over a period of one to three weeks, and specific recording days occurred to fit the schedules of the researcher, the ECE Centre and the family of the participant.

Ethics

Prior to commencing the research project, approval for the study was gained from the University of Canterbury Human Ethics Committee, New Zealand (see Human Ethics Committee letter of approval, Appendix F). Informed consent was gained from the participating parents as described above. It was made clear to all participants that their participation and involvement was voluntary, and that they could withdraw at any stage up to the point of data analysis, and that in this event all their data would be destroyed (see Information Letter, Appendix G, and Consent Forms, Appendix H).

Chapter Three

Results

Inter-Rater Reliability

The reliability of the coding process was assessed using inter-rater reliability. Another researcher experienced in coding sleep-related behaviour independently watched 15 of the nap recordings (20% of the total) and noted each movement made (movement being the basic unit of computation for determining sleep state), as well as times when the infant was awake, crying, or out of bed, and times when caregivers were present or interacting with the participants. These recordings were randomly selected. The percent reliability index was computed using the following equation:

$$\text{Reliability index (\%)} = \frac{\text{Number of agreements}}{\text{Number of agreements} + \text{Number of disagreements}} \times 100$$

As can be seen in Table 9, the mean inter-rater reliability index for infant sleep and arousal states was 92.3%, which demonstrates a satisfactory level of reliability. Table 10 shows the inter-rater reliability for caregiver behaviours, the mean being 98.8% which is also a satisfactory level of reliability.

Table 9

Inter-rater reliability index percentage for infant sleep and arousal states

Recording number	Reliability Index (%)
Recording 1	94%
Recording 2	98%
Recording 3	96%
Recording 4	99%
Recording 5	98%
Recording 6	96%
Recording 7	88%
Recording 8	97%
Recording 9	84%
Recording 10	84%
Recording 11	86%
Recording 12	85%
Recording 13	89%
Recording 14	97%
Recording 15	94%
Mean reliability index	92.3%

Table 10

Inter-rater reliability index percentage for caregiver behaviour

Recording number	Reliability Index (%)
Recording 1	100%
Recording 2	98%
Recording 3	100%
Recording 4	99%
Recording 5	100%
Recording 6	100%
Recording 7	98%
Recording 8	97%
Recording 9	99%
Recording 10	99%
Recording 11	99%
Recording 12	99%
Recording 13	98%
Recording 14	98%
Recording 15	98%
Mean reliability index	98.8%

Sleep Environments and Practices

When participants began attending the ECEC (i.e. at Transition), each participant had a unique Home environment in which he or she napped, and the sleep practices and settling procedures used by parents in the Home were also unique to each participant. At Transition, the sleep environment at the ECEC was the same for each participant: children slept in cots in the sleep room which was dark, well ventilated, and had quiet music playing in the background. There were six cots in the sleep room so often other children were present during participants' naps. A caregiver was also present in the sleep room at all times. In general, the sleep practices at the ECEC were similar across participants, as they were put down awake by a caregiver and soothed to sleep.

The Home Centre Contrast Scale (HCCS).

For each participant, therefore, there was potential for varying differences between Home and ECEC settings and practices at Transition. These differences are summarised at Transition, based on a 5 point scale (0-4), where 0 (no difference) = *Same*, 1 = *Small Contrast*, 2 = *Moderate Contrast*, 3= *Large Contrast*, and 4 = *Extreme Contrast*. This scale has been dubbed the Home Centre Contrast Scale (HCCS).

Table 11 summarises the differences in the sleep environments across settings at Transition and computes the HCCS score for each participant. Table 12 details the practices in each environment, for each child and the summary rating which was consequently assigned.

Computing the Home Centre Contrast Scale.

For each participant at Transition, four variables of the sleep environment and settling procedure were considered in both the Home and Centre. Standard Sleep Room Conditions were considered present if the child was placed in a cot, in a darkened room. If an infant was given any food, drinks, or a pacifier as part of the nap routine, this variable was ticked. If the caregiver remained with the infant until he or she fell asleep, Caregiver Presence was ticked. If the infant was put down for their nap awake, this variable was ticked. For each infant, the number of variables that were different in each setting was counted, and this number was used to give a rating of the differences in sleep environments and practices between the Home and ECEC. The maximum possible HCCS score was 4.

Table 11

Ratings of differences in sleep environments for each participant at Transition

	Ashley		Ben		Caleb		Ethan		Jamie	
Variable	Home	Centre	Home	Centre	Home	Centre	Home	Centre	Home	Centre
Standard Sleep Room Conditions	X	✓	X	✓	X	✓	✓	✓	✓	✓
Food/ Drink /Pacifier	✓	X	✓	X	X	X	X	X	✓	✓
Caregiver Presence	✓	✓	X	✓	✓	✓	X	✓	X	X
Put Down Awake	X	✓	✓	✓	✓	✓	✓	✓	✓	✓
Total Differences	3		3		1		1		0	
Rating	Large Contrast		Large Contrast		Small Contrast		Small Contrast		Same	

✓ = Variable Present X = Variable Absent

Table 12

Differences in sleep practices across settings at Transition

Participant	Home Nap Practices	ECEC Nap Practices	Rating
Ashley	Ashley slept in a rocker on the floor of the lounge for all Home naps. She was breastfed to sleep (or until sleepy) by her mother off camera before being placed in the rocker. Ashley's mother would often rock the bassinet or sing to Ashley for the first few minutes of the nap.	Ashley first slept in the sleep room at the ECEC. She did not receive any food or a pacifier. Ashley was put down awake by her primary caregiver or another member of staff. The caregiver would pat Ashley's stomach and say "shh" to settle her to sleep. After the Transition recordings, Ashley slept in a stroller in another part of the ECEC for six weeks until she became more settled.	Large Contrast
Ben	For all Home naps, Ben was put down in his stroller. During baseline, his stroller was placed in the lounge. During the other phases, it was placed in his bedroom. Ben was put down by his mother who gave him a drink of water and put his pacifier in before leaving immediately. He was always put down awake.	Ben slept in the sleep room at the ECEC and was put down by his primary caregiver or another staff member. He was put down awake with his pacifier in, and a caregiver patted his back until he fell asleep.	Large Contrast

Participant	Home Nap Practices	ECEC Nap Practices	Rating
Caleb	Caleb slept in his parents' room for all naps, either in or on their bed or in his own cot. He did not receive any food or a pacifier. Caleb was put down by his mother. He was usually put down awake, and his mother would sit with him with her hand on him until he was asleep. He was put down asleep on one occasion, and his mother left immediately. Caleb often sucked his thumb at the beginning of his naps.	Caleb slept in the sleep room and was put down by his primary caregiver or another member of staff. He did not receive any food or a pacifier. Caleb was put down awake and his caregiver rubbed or patted his back or stomach, and said "shh." He often sucked his thumb at the beginning of naps.	Small Contrast
Ethan	Ethan slept in his cot in his parents' room. He did not receive any food or a pacifier. For three naps, Ethan was put down awake by his nanny who rubbed, rocked, and sang to Ethan until he was sleepy. For all other naps, he was put down awake by his mother who tucked him in and left immediately.	Ethan slept in a cot in the sleep room. He did not receive any food or a pacifier. Ethan was put down awake by his primary caregiver or one of the other staff. The caregiver would rub or pat his back and say "shh" until he was asleep.	Small Contrast

Participant	Home Nap Practices	ECEC Nap Practices	Rating
Jamie	Jamie slept in a cot in his own room. He was put down awake with his pacifier in by his mother who then left immediately. His mother often had to come back in before Jamie was asleep in order to replace his pacifier or tuck him in if he had sat up. She would leave again immediately after doing this.	Jamie slept in a cot in the sleep room. He was put down awake with his pacifier in by his primary caregiver or one of the other staff. The caregiver would at times pat Jamie’s back or sit with him, and at other times left immediately.	Same

Individual Results

The nap variables for each participant described here are caregiver interaction, proportion of time spent out of the cot/bed during the nap, sleep onset latency, proportion of time spent crying during the nap, sleep duration, sleep efficiency, and the proportion of time spent in Active Sleep (AS) during the nap. These variables are presented graphically in Figures 1, 2, and 3 below.

Participant One: Ashley.

Proportion of caregiver interaction (Figure 1).

During Baseline, Ashley's proportion of caregiver interaction was low and stable (2% to 9%). At the Centre, the proportion was high and variable (39% to 100%) at Transition, and lower but still variable (18% to 55%) at Follow-up. In contrast, Ashley's proportion of caregiver interaction was low and stable during Transition (1% to 15%) and Follow-up (6% to 16%) at Home.

Proportion out of cot (Figure 1).

At Baseline, Ashley did not spend any time out of her bed during the naps. In contrast, the proportion of time spent out of cot at the Centre was variable and high during Transition, decreasing during the phase (47% down to 2%). The proportion out of cot was low and stable (0% to 2%) at Follow-up. During the Home phases, Ashley was not removed from her cot at any stage

Sleep onset latency/latency until recording ceased (Figure 2).

During Baseline, Ashley's sleep onset latency was stable and short (around 1 minute). In contrast, at the Centre, Ashley did not sleep during the first two naps, and recording stopped after

23 minutes on the first day and 38 minutes on the second day. During the third nap, she took 13 minutes to fall asleep. Her sleep onset latency was therefore highly variable and much longer than Baseline during this phase. During Follow-up at the Centre, Ashley's sleep onset latency was stable and short (3 to 8 minutes). At Home, sleep onset latency was stable and short during both phases (0 minutes), apart from the first nap during Transition, when Ashley took 6 minutes to fall asleep.

Proportion crying (Figure 2).

At Baseline, Ashley did not cry during any of the naps. At the Centre, Ashley cried during every nap, and the proportion of time she spent crying was high and variable with a peak on the second day during Transition (26% to 52%). At Follow-up, the proportion of crying was variable and increasing (13% to 25%). Ashley did not cry during any Home naps.

Sleep duration (Figure 3).

During Baseline, Ashley's sleep duration was stable (44 to 50 minutes). At the Centre, this pattern was disrupted as Ashley did not sleep during the first two naps, and during the third nap she only slept for a short time (29 minutes). At Follow-up at the Centre, sleep duration was variable but longer than during Transition (35 to 74 minutes). Sleep duration was also variable during Transition at Home (43 to 92 minutes), but became shorter and more stable at Follow-up (25 to 34 minutes).

Sleep efficiency (Figure 3).

During Baseline, Ashley's sleep efficiency was stable and high (92% to 96%). In contrast, Ashley's sleep efficiency at the Centre was variable and low as she only slept on one occasion during Transition (0% to 63%); her sleep efficiency was therefore increasing during this phase. Although Ashley slept during each nap at Follow-up, the pattern of variable and low sleep efficiency at the Centre continued (58% to 83%), and sleep efficiency was decreasing during this phase. At Home, Ashley's sleep efficiency was stable and high across both Transition (82% to 100%) and Follow-up (89% to 97%).

Proportion of Active Sleep to Quiet Sleep (Figure 3).

This variable refers to the proportion of the time asleep spent in Active Sleep (AS) or Quiet Sleep (QS), not the proportion of the total nap period as for sleep efficiency and caregiver interaction. Therefore, as the proportion of AS and QS add to 100%, this variable will be discussed as the proportion of AS. A figure representing the proportion of time each participant spent in QS can be found in Appendix I.

During Baseline, Ashley's proportion of AS was stable (52% to 64%). At the Centre, Ashley's proportion of AS and QS during the first two naps was 0% for both as she did not sleep. During the third nap, the proportion of AS was low (10%). At Follow-up, the proportion of AS was variable (53% to 77%). At Home, Ashley's proportion of AS was variable and high during Transition (72% to 100%), which contrasted to the proportion of AS during Baseline. At Follow-up, the proportion of AS was stable (62% to 80%).

Participant Two: Ben.

Proportion of caregiver interaction (Figure 1).

During Baseline, Ben's proportion of caregiver interaction was stable and low (4% to 6%). In contrast, the proportion of caregiver interaction at the Centre was high, variable, and increasing across both Transition (19% to 41%) and Follow-up (23% to 38%). At Home, the pattern remained similarly stable and low compared to Baseline during Transition (2% to 3%). At Follow-up, the proportion of caregiver interaction was stable and decreasing (13% down to 3%).

Proportion out of cot (Figure 1).

During Baseline, Ben was not removed from his stroller during any of the naps. At the Centre, Ben was removed briefly from his cot on the third day during Transition (5%). He was also removed briefly on the third day at Follow-up (2%). At Home, Ben remained in his stroller during Transition and was removed briefly on the first two days at Follow-up (8% and 1%).

Sleep onset latency (Figure 2).

During Baseline, Ben's sleep onset latency was stable (5 to 9 minutes). In contrast, Ben's sleep onset latency at the Centre was variable during Transition (2 to 16 minutes), however it was more stable at Follow-up (4 to 6 minutes). At Home, Ben's sleep onset latency was similar to Baseline in that it was stable during both Transition (5 minutes) and Follow-up (3 to 8 minutes).

Proportion crying (Figure 2).

During Baseline, the proportion of the nap that Ben spent crying was stable and low (1% to 3%). At the Centre, the proportion of crying was also stable and low during Transition (1% to 6%), and at Follow-up, Ben did not cry at all. At Home, the overall proportion of crying was similar to the Centre as Ben did not cry during Transition, and the proportion of crying was stable and low during Follow-up (0% to 1%).

Sleep duration (Figure 3).

During Baseline, Ben's sleep duration was variable (92 to 154 minutes). At the Centre, Ben's sleep duration was variable and shorter than Baseline at both Transition and Follow-up (both 40 to 90 minutes). At Home, Ben's sleep duration was longer than at the Centre during both phases. During Transition, sleep duration was stable (116 to 137 minutes); during Follow-up it was variable (113 to 249 minutes).

Sleep efficiency (Figure 3).

During Baseline, Ben’s sleep efficiency was stable and moderately high (76% to 93%). At the Centre, sleep efficiency was variable at Transition (63% to 95%), but became more stable at Follow-up (79% to 94%). At Home, the pattern of Ben’s sleep efficiency was similar to Baseline in that it was stable and moderately high during both Transition (73% to 90%) and Follow-up (79% to 95%).

Proportion of Active Sleep to Quiet Sleep (Figure 3).

During Baseline, Ben’s proportion of AS was variable and decreasing (100% down to 69%). At the Centre, the proportion of AS was variable and lower than Baseline during Transition (47% to 71%). A similar range was demonstrated at Follow-up, when the proportion of AS was decreasing (87% down to 35%). At Home, Ben’s proportion of AS was similar to Baseline during Transition in that it was variable (76% to 100%), however it was increasing during this phase. At Follow-up, the proportion was more stable compared to Transition (64% to 66%).

Participant Three: Caleb.

Proportion of caregiver interaction (Figure 1).

During Baseline, Caleb’s proportion of caregiver interaction was stable and low (1% to 8%). At the Centre, the proportion was higher than Baseline. The proportion of interaction was stable during Transition (29% to 41%) but more variable during Follow-up when it was decreasing (40% down to 14%). At Home, Caleb’s proportion of caregiver interaction was stable and low with a peak on the second day during both Transition (3% to 15%) and Follow-up (0% to 14%).

Proportion out of cot (Figure 1).

During Baseline, the proportion of the nap that Caleb spent out of his cot was stable and low (0% to 3%). Similarly, the proportion out of cot was stable and low during Transition at the Centre (0% to 3%). Caleb remained in his cot during Follow-up at the Centre. At Home, Caleb was not removed from the cot during Transition or Follow-up.

Sleep onset latency (Figure 2).

During Baseline, Caleb's sleep onset latency was stable and low (0 to 2 minutes). At the Centre, Caleb's sleep onset latency was variable and high during Transition (4 to 16 minutes). The same range was demonstrated during Follow-up when sleep onset latency was decreasing (4 to 16 minutes). At Home, Caleb's sleep onset latency was stable and lower than at the Centre during both Transition (0 to 2 minutes) and Follow-up (0 to 1 minute).

Proportion crying (Figure 2).

Caleb did not cry during any of the Baseline naps. At the Centre, the proportion of the nap that Caleb spent crying was variable and high during Transition (11% to 30%), and a similar range was demonstrated at Follow-up (3% to 31%). At Home, Caleb's proportion of crying was stable and decreasing during Transition (6% down to 0%). At Follow-up, the proportion was also stable but a peak occurred on the second day (0 to 11%). Although he cried during the majority of Home naps, the proportion was lower than during Centre naps.

Sleep duration (Figure 3).

During Baseline, Caleb's sleep duration was variable (32 to 89 minutes). At the Centre, sleep duration was stable and short during Transition (22 to 30 minutes), and longer, more variable, and increasing during Follow-up (44 to 89 minutes). Sleep duration at Home followed a similar pattern to the Centre in that it was stable and short during Transition (28 to 40 minutes), then longer and more variable at Follow-up (31 to 65 minutes).

Sleep efficiency (Figure 3).

During Baseline, Caleb's sleep efficiency was stable and high (89% to 99%). At the Centre, sleep efficiency was stable and lower than Baseline during Transition (65% to 79%) and more variable and increasing at Follow-up (66% to 91%). At Home, Caleb's sleep efficiency was higher and more stable than when he napped at the Centre. This pattern was similar for both Transition (85% to 95%) and Follow-up (88% to 96%).

Proportion of Active Sleep to Quiet Sleep (Figure 3).

During Baseline, Caleb's proportion of sleep spent in AS was stable (73% to 82%). At the Centre, the proportion of AS was stable during Transition (83% to 100%), but variable and lower at Follow-up (41% to 68%). At Home, The proportion of AS followed a similar pattern to the Centre in that it was stable at Transition (81% to 100%) and variable and lower at Follow-up (26% to 58%).

Participant Four: Ethan

Proportion of caregiver interaction (Figure 1).

During Baseline, Ethan's proportion of caregiver interaction was variable (2% to 24%). A similar range of caregiver interaction was demonstrated at the Centre during Transition (9% to 24%), and at Follow-up (9 to 26%). In contrast, Ethan's proportion of caregiver interaction was stable and low at Home during both Transition (2% to 13%) and Follow-up (3% to 5%).

Proportion out of cot (Figure 1).

Ethan was not removed from his cot during any of the Baseline naps. At the Centre, the proportion of the nap that Ethan spent out of his cot was stable and low during both Transition and Follow-up (both around 1%). Similarly, the proportion out of cot was stable and low during both Home phases (also around 1%).

Sleep onset latency (Figure 2).

During Baseline, Ethan's sleep onset latency was variable and decreasing (19 down to 2 minutes). At the Centre, Ethan's sleep onset latency varied with a peak on the second day during Transition (6 to 12 minutes).This pattern was similar but more stable at Follow-up (9 to 13 minutes). At Home, sleep onset latency was longer than during Centre naps. Sleep onset latency was more stable at Transition (13 to 17 minutes) than Follow-up (17 to 23 minutes), although the pattern was similar across the phases.

Proportion crying (Figure 2).

At Baseline, the proportion of the nap that Ethan spent crying was stable and low (1% to 2%). This pattern continued at the Centre, as the proportion crying was stable and low during Transition (1% to 4%). At Follow-up, Ethan did not cry during any Centre naps. At Home, Ethan did not cry during Transition. The proportion of crying at Follow-up was low with a peak on the third day (0% to 10%).

Sleep duration (Figure 3).

During Baseline, Ethan's sleep duration was variable and increasing (70 to 112 minutes). At the Centre, sleep duration was also variable with a low point on the second day of Transition (60 to 104 minutes). This pattern was similar at Follow-up (50 to 119 minutes). Overall, Ethan's sleep duration at Home was also variable at Transition (80 to 150 minutes) and at Follow-up (63 to 129 minutes).

Sleep efficiency (Figure 3).

During Baseline, Ethan's sleep efficiency was stable and moderately high (78% to 94%). At the Centre, Ethan's sleep efficiency was stable with a low point on the second day during both Transition (78% to 90%) and Follow-up (76% to 91%). Similarly, Ethan's sleep efficiency was also stable and high at Home, both during Transition (75% to 87%) and at Follow-up (74% to 87%).

Proportion of Active Sleep to Quiet Sleep (Figure 3).

During Baseline, the proportion of sleep Ethan spent in AS was variable and increasing (29 to 58%). At the Centre, the proportion of AS was more stable. It was higher during Transition (52% to 62%) and lower at Follow-up (30% to 42%). At Home, Ethan's proportion of AS was stable during Transition (59% to 68%) so the pattern was similar to that of Transition Centre. In contrast, the proportion of AS during Follow-up Home was variable and decreasing (80% down to 18%).

Participant Five: Jamie

As Jamie attended the ECEC full time from Monday to Friday, all Transition and Follow-up Home recordings were completed on weekends, and all Centre recordings were completed during the week. Two of the three Baseline naps were also recorded on weekend days.

Proportion of caregiver interaction (Figure 1).

During Baseline, Jamie's proportion of caregiver interaction was stable at a low level (2% to 5%). At the Centre, the proportion was stable and higher than Baseline during Transition

(13% to 23%). This pattern continued during Follow-up (6% to 15%). In contrast, Jamie's proportion of caregiver interaction was variable and increasing at Home during both Transition (8 to 47%) and Follow-up (2 to 23%).

Proportion out of cot (Figure 1).

During Baseline, Jamie was not removed from his cot during any of the naps. At the Centre, the proportion of the nap Jamie spent out of his cot was stable and low during both Transition (0% to 3%) and Follow-up (0% to 2%). This pattern continued at Home as the proportion out of cot was stable and low during Transition (0% to 1%), and Jamie was not removed from his cot during Follow-up.

Sleep onset latency (Figure 2).

During Baseline, Jamie's sleep onset latency was variable (1 to 23 minutes). At the Centre, Jamie's sleep onset latency was stable and short during Transition (2 to 7 minutes). At Follow-up, sleep onset latency was stable but higher than during Transition (13 to 17 minutes). In contrast, Jamie's sleep onset latency was variable and increasing during Home naps at both Transition (8 to 27 minutes) and Follow-up (9 to 30 minutes).

Proportion crying (Figure 2).

At Baseline, Jamie cried once briefly. At the Centre, the proportion of crying was variable and generally low during Transition with a peak on the first day (1% to 16%). At Follow-up, Jamie cried once briefly. At Home, he cried once briefly during both Transition and Follow-up.

Sleep duration (Figure 3).

During Baseline, Jamie's sleep duration was variable (108 to 146 minutes). At the Centre, Jamie's sleep duration was variable during Transition (48 to 88 minutes) and more stable at Follow-up (67 to 82 minutes). At Home, the pattern continued, as sleep duration was also variable during Transition (40 to 74 minutes) and stable at Follow-up (69 to 93 minutes).

Sleep efficiency (Figure 3).

During Baseline, Jamie's sleep efficiency was stable and high (80% to 97%). At the Centre, this pattern continued, as sleep efficiency was also stable and high during both Transition (72% to 87%) and Follow-up (73% to 75%). Jamie's sleep efficiency was again stable and high during both phases at Home, apart from the third nap during Transition which was noticeably less efficient that the other naps. Sleep efficiency during Transition ranged from 84% down to 53%, and at Follow-up the range was 69% to 83%.

Proportion of Active Sleep to Quiet Sleep (Figure 3).

During Baseline, the proportion of sleep Jamie spent in AS was variable and increasing (33 to 79%). At the Centre, the proportion of AS was in contrast to Baseline as it was more stable. The proportion was low during Transition (15% to 23%) and higher at Follow-up (33% to 54%). At Home, the proportion of AS followed a similar pattern to Centre naps as it was stable and low at Transition (0% to 10%) and stable and higher at Follow-up (31% to 46%).

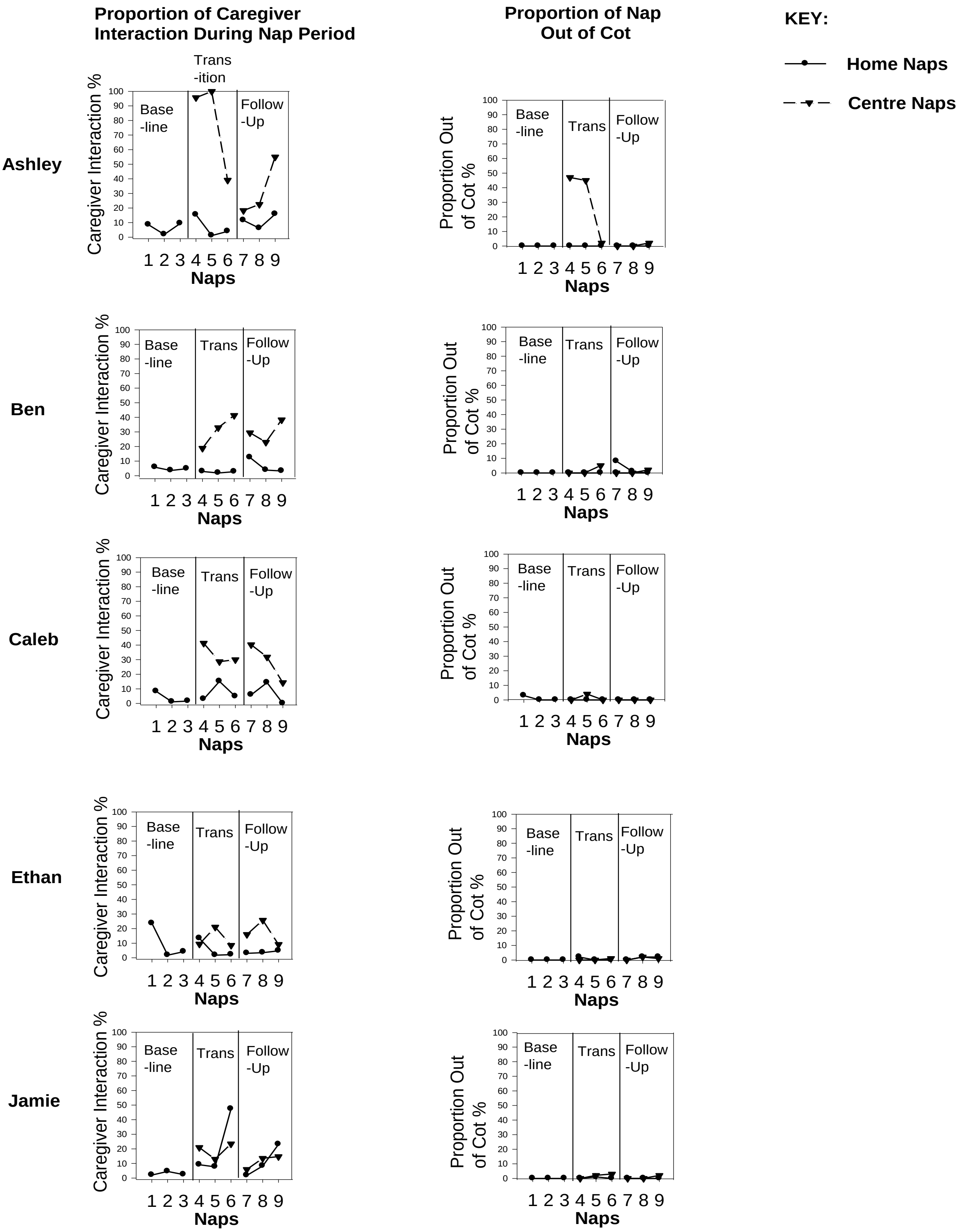

Figure 1. Proportion of Caregiver Interaction (%) and Proportion of the nap spent Out of Cot (%) for all participants across the Home and Centre settings.

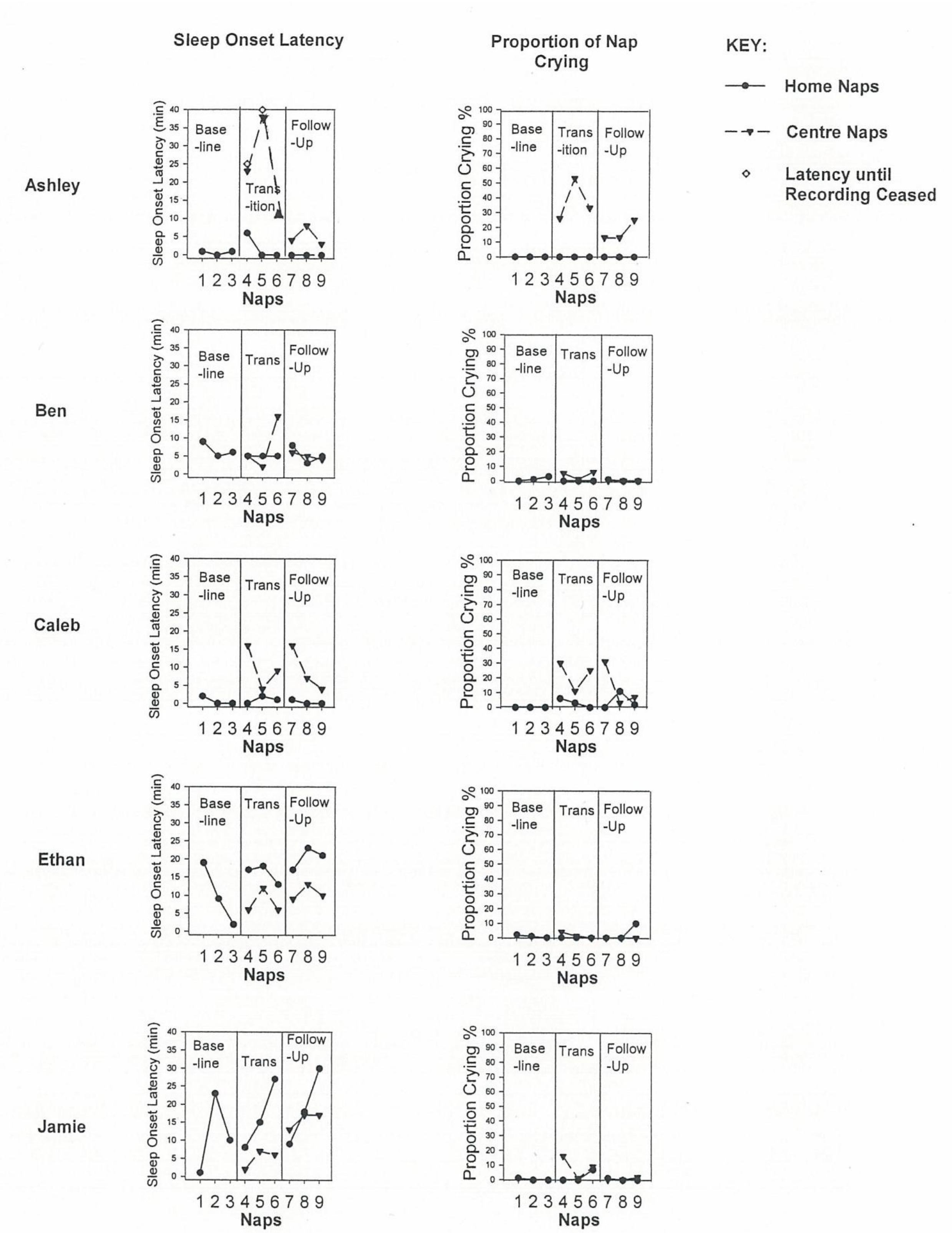

Figure 2. Sleep Onset Latency (minutes) and Proportion of the nap spent Crying (%) for all participants across the Home and Centre settings.

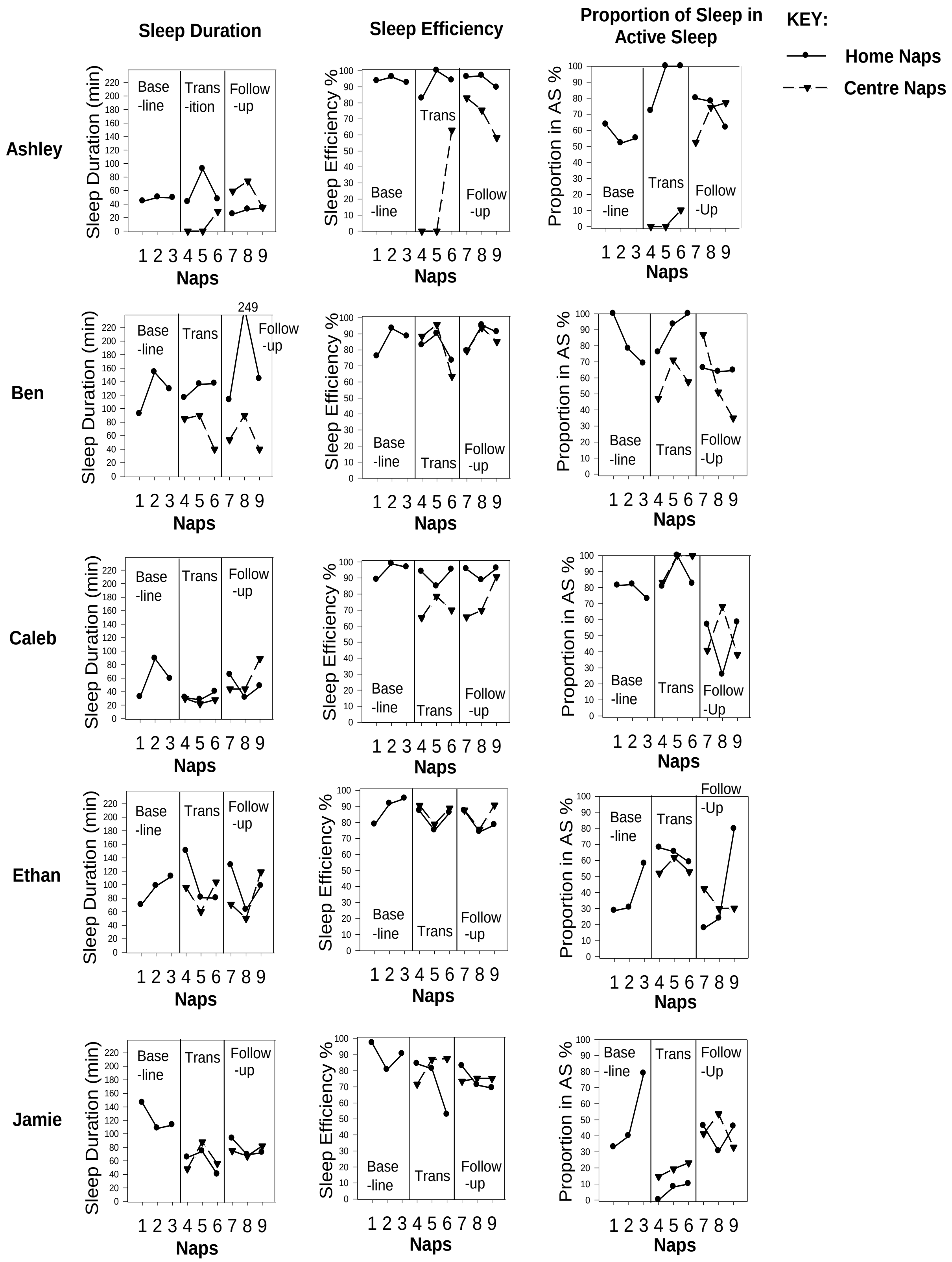

Figure 3. Sleep Duration (minutes), Sleep Efficiency (%), and the Proportion of the nap spent in Active Sleep (%) for all participants across the Home and Centre settings.

Overall Results

The data for each nap for each participant were used to calculate overall means for each sleep variable in each setting. Table 13 displays the overall mean (standard deviation) and ranges of each sleep variable in the Home and ECEC settings. The average total nap period and length of sleep were both longer in the Home than the Centre, and the average sleep onset latency was shorter at Home. More time was spent awake in the Home, while more time was spent crying at the Centre. The amount of time spent out of the cot was slightly higher at the Centre, but overall this was very low across both settings. More time was spent in AS in the Home than the Centre; however the amount of time spent in QS was similar across both settings. The average sleep efficiency was higher in the Home than the Centre.

The time that caregivers were absent was longer in the Home than at the Centre, but the time spent present with no interaction was longer in the Centre. The amount of time that caregivers spent interacting with the participants was also higher at the Centre.

Table 13

Overall means (standard deviations) of sleep variables across Home and Centre settings

	Home Naps		ECEC Naps	
Sleep Variables	Means	Ranges	Means	Ranges
Total nap period (mins)	97.96 (52.14)	26 - 261	75.03 (27.44)	23 - 131
Length of sleep (mins)	83.78 (45.97)	22 - 249	58.97 (29.69)	0 - 119
Sleep onset latency (mins)	7.67 (8.47)	0 - 30	10.57 (8.29)	2 - 38
Time awake (mins)	12.09 (11.18)	0 - 50	9.07 (7.06)	0 - 27
Time crying (mins)	0.84 (2.19)	0 - 13	5.5 (6.44)	0 - 21
Time out of cot (mins)	0.6 (2.21)	0 - 14	1.47 (3.59)	0 - 17
Time in AS (mins)	52 (28.97)	0 - 159	28.7 (16.44)	0 - 64
Time in QS (mins)	32.24 (26.76)	0 -106	30.27 (21.42)	0 -83
Sleep efficiency (%)	86.84 (9.71)	52.63 - 100	73.64 (22.42)	0 - 95.74
Caregiver Variables	Means	Ranges	Means	Ranges
Caregiver absent (mins)	81.71 (60.27)	0 -245	0 (0)	0
Caregiver present no interaction (mins)	9.76 (20.03)	0 - 91	57.27 (30.59)	0 -119
Caregiver present with interaction (mins)	6.38 (7.28)	0 - 36	17.83 (7.43)	6 - 038

Chapter Four

Discussion

The purpose of this study was to investigate whether or not the transition to Early Childhood Education (ECE) affected the architecture of infants' naps, both at home and in the ECEC, and whether infants experienced different caregiver behaviours between settings. A further question was whether any such changes were still evident during a follow-up period once the child was otherwise settled in the ECEC. Any changes were then interpreted in the light of differences in sleep practices between the two settings.

Markedly different responses in the sleep architecture of individual children were evident during the Transition to the ECEC. The contrast between each participant's Home and Centre nap settings, including differences in caregiver behaviours, appeared to play an important role in determining these responses to that transition. This idea will be discussed in relation to each participant.

Individual Results

Participant One: Ashley.

Ashley had a Home Centre Contrast Scale rating of 3 (Large Contrast). There was a visible response to the changed sleep environment at Transition. Ashley did not sleep on the first two days at the Centre, so there were noticeable differences between the Home and Centre in all seven of Ashley's graphed sleep and caregiver variables at Transition.

At Transition, Ashley's proportion of caregiver interaction was higher at the Centre than at Home. This is likely due to the fact that at Home, she was breastfed until sleepy before being put down for a nap, whereas this was not possible at the Centre, so more caregiver intervention was required in order to settle Ashley to sleep. This, together with the contrasting sleep environments, helps to explain why Ashley spent more time out of her bed; she spent more time crying; her sleep onset latency was longer on the one occasion that she slept; she slept for a shorter period (on that one day) which was less efficient, and she spent more time in Active Sleep (AS) during her one nap at the Centre.

At Follow-up, five of Ashley's seven graphed sleep variables remained noticeably different between the Home and Centre. Ashley continued to receive more caregiver interaction, took longer to fall asleep, spent more time crying, and had less efficient naps in the Centre when compared to Home at Follow-up. This indicates a continued reaction to the changed environments and handling procedures reflected in longer sleep duration at the Centre, possibly indicating that she was more tired in this setting and therefore needed more sleep.

On the other hand, the time that Ashley spent out of her bed had become more similar between the settings at Follow-up when compared to Transition. This may be evidence for adjustment to the new environment. The proportion of time that Ashley spent in AS was also more similar, at this time, between settings. Interpretation of changing AS over time is difficult in Ashley's case however as little sleep occurred during Transition.

Ashley's sleep and caregiver variables at Home were consistent over the course of the study, with the exception of sleep duration. Of all the participants, Ashley had one of the highest Home Centre Contrast Scale scores and demonstrated the most marked response to the Transition to the ECEC. In addition, her parents reported that she was very unsettled at the Centre in general. The ECEC staff reported going to considerable lengths to settle Ashley, changing her nap location from a cot to a stroller to a cot again in the process. Interestingly, Ashley's parents did not detect a difference in her home behaviour over this time.

Participant Two: Ben.

Ben had a Home Centre Contrast Scale rating of 3 (Large Contrast). There was a visible response to the changed sleep environment at Transition, as three of his seven graphed sleep and caregiver variables differed between the Home and Centre at this time.

At Transition, Ben's proportion of caregiver interaction was higher at the Centre than at Home, as although he was put down awake in both settings, at Home he was left to settle himself to sleep, while at the Centre a caregiver soothed him to sleep. The differences in caregiver behaviour and sleep environment also help to explain why Ben's sleep duration was shorter in the Centre than at Home. Ben also spent less time in AS at the Centre than at Home during Transition.

At Follow-up, two of Ben's nap variables continued to differ between the settings. Ben continued to receive more caregiver interaction and have shorter naps at the Centre when compared to Home. This may indicate a continued reaction to the different sleep environments and caregiver behaviours. However, the fact that Ben's proportion of AS became more similar between the settings may be some evidence of adjustment to the new environment.

Ben's sleep and caregiver variables were consistent at Home over the course of the study, with the exception of sleep duration on one day at Follow-up. As Ben's length of sleep was consistent at Home, but different between the Home and ECEC, it is possible that Ben was not getting as much day sleep overall (when compared to Baseline) on days he attended the ECEC. Ben's mother and ECEC staff reported that he transitioned easily to ECEC attendance; however his mother did report that he was often tired after a day at the Centre. Like Ashley, Ben had a large Home Centre Contrast Scale score and a visible response to the Transition, although his response was not as marked as Ashley's.

Participant Three: Caleb

Caleb's Home Centre Contrast Scale score was 1 (Small Contrast). There was a visible response to the changed sleep environment at Transition, as there were noticeable differences between the Home and Centre in four of the seven graphed sleep and caregiver variables at this time.

At Transition, Caleb's proportion of caregiver interaction was higher in the Centre than at Home. He was put down awake and soothed to sleep by a caregiver in both settings, although on one occasion at Home he was put down asleep. It is possible that the differences in caregivers and the sleep environment lead Caleb to be unsettled at nap time in the Centre and therefore require more caregiver interaction to get to sleep. These differences could also help to explain why Caleb's sleep onset latency was longer, why he cried more, and why his naps were less efficient in the Centre than at Home.

At Follow-up, three of Caleb's sleep variables remained noticeably different between settings. Caleb continued to receive more caregiver interaction, took longer to fall asleep, and had less efficient naps in the Centre when compared to Home at this time. This may indicate that a reaction to the different sleep environments was still present. Furthermore, although Caleb's proportion of crying was similar between settings at Follow-up, he spent a high proportion of the nap crying on the first day at the Centre, which could be further evidence of a continued reaction.

While there was a noticeable change in Caleb's sleep and caregiver variables when attending the Centre, they were markedly more consistent at Home. The only exception to this was sleep duration, which decreased at Transition then increased again at Follow-up. This pattern may be evidence of a reaction to the Transition which resolved once Caleb was settled at the ECEC. Caleb's mother and ECEC staff reported that he transitioned well to the Centre.

Despite a small Home Centre Contrast Scale score, Caleb also demonstrated a marked reaction to the Transition to the ECEC.

Participant Four: Ethan

Ethan's Home Centre Contrast Scale score was 1 (Small Contrast). There was a visible response to the changed sleep environment at Transition, as three of his seven graphed sleep and caregiver variables differed between the Home and Centre at this time.

At Transition, Ethan received more caregiver interaction at the Centre than at Home. Although he was put down awake in both settings, at Home he was generally left to settle himself to sleep, while at the Centre a caregiver soothed him to sleep. During the first and third day of Baseline and the first day of Transition Home, Ethan was put to bed by his nanny. She put Ethan down awake and sang, talked, and patted him until he fell asleep. This contrasted to the handling procedures of Ethan's mother, and accounts for the higher proportions of caregiver interaction on these days.

The differences in caregiver behaviour and sleep environment between settings help to explain why Ethan's sleep onset latency was shorter at the Centre than at Home. Sleep duration also differed between settings, as the duration of the first Home nap was longer than that of the first Centre nap. This Home nap occurred the day after the first Centre nap was recorded, which was also Ethan's first day at the ECEC. The longer nap at Home may therefore be evidence of a response to the transition.

At Follow-up, the same three variables remained different between the settings, which indicates a continual reaction to the changed environments. Caregiver interaction continued to be higher, sleep onset latency was shorter, and sleep duration was shorter (during the first nap) at the Centre when compared to Home.

A number of Ethan's sleep variables during his Home naps were consistent over the course of the study, though others were inconsistent. This made it difficult to interpret whether Ethan's Transition and attendance at the ECEC affected his naps at Home considerably. Ethan's naps at the Centre were similar across Transition and Follow-up, however. Ethan's mother and staff at the ECEC described him as a good sleeper and reported that he settled easily into ECEC attendance. Ethan also had a smaller Home Centre Contrast Scale score, yet he also displayed a clear reaction to the Transition to the ECEC.

Participant Five: Jamie

Jamie's Home Centre Contrast Scale score was 0 (Same). There was a visible response to the changed sleep environment at Transition, as five of the seven graphed variables differed between settings at this time.

At Transition, Jamie's proportion of caregiver interaction was similar during the first two naps in each setting, but the proportion was higher at Home than at the Centre on the third day. Although Jamie generally experienced similar handling behaviours in both settings, on the third day at Home, Jamie sat up and vocalised continually after being put down, which resulted in his mother returning to settle him on each occasion, therefore increasing the proportion of interaction. Jamie's sleep behaviour also contributed to his reduced sleep efficiency during this nap.

Although Jamie's sleep environments were the most similar of all the participants', they were not exactly the same. Differences in these sleep environments, including experiencing different caregivers, could account for Jamie's shorter sleep onset latency and higher proportion of AS at the Centre, as well as the higher proportion of crying on the first day at the Centre compared to Home.

At Follow-up, none of Jamie's sleep variables differed noticeably between settings. This may indicate that he was no longer experiencing a reaction to the different environments. It is possible that as he attended the Centre five full days per week, Jamie quickly became accustomed to the new environment, and that this contributed to the stability of his naps between settings at Follow-up. Furthermore, Jamie's mother worked at the preschool unit of the ECEC, and so was able to visit him throughout the day, which may also have contributed to Jamie quickly becoming settled. Jamie's mother and ECEC staff reported that Jamie was clingy when his mother left during Transition, but otherwise adapted well to the new environment.

Over the course of the study, some of Jamie's sleep and caregiver variables at Home were changeable, and others were consistent. Jamie's proportion of AS was lower in both settings at Transition when compared to Baseline, possibly as he was stressed. The stress of sleeping in a new environment is associated with an increase in QS and reduced AS in night sleep in infants; however the literature does not state whether this also applies to day sleep (Halpern, MacLean, & Baumeister, 1995). It is unclear whether Jamie's reduced AS at Home was a reaction to the transition, particularly as his night sleep was not examined. Jamie's sleep environments were very similar between settings; however he still displayed a marked reaction to the Transition to the ECEC.

Overall Results

Despite large differences in Home Centre Contrast Scale (HCCS) scores between participants, all infants displayed a reaction to the transition. Ashley had the largest HCCS score and the most visible reaction, however Ben's reaction was more similar to that of the other participants despite his large HCCS score. It is therefore apparent that infants react to the transition to the ECEC regardless of environmental differences, and the extent is not fully explicable just by reference to the HCCS score, suggesting that there are important individual differences also mediating infants' sleep during the home-centre transition. This reaction to the transition continued at Follow-up for four of the five participants. Despite this, the transition to the ECEC had a minimal effect on the home naps of three of the five participants.

The variability in sleep architecture demonstrated by this study raises a number of questions regarding attachment and caregiver behaviour. For example, it is possible that having an unfamiliar caregiver at the Centre accounted for some of the differences in sleep variables between settings. The caregivers of Ashley, Caleb, and Jamie all behaved in similar ways between settings; however these participants had the highest numbers of differing sleep variables between settings at Transition. Therefore, it may be that caregiver behaviour is less important than whether the child is being put down by the primary attachment figure when it comes to maintaining nap architecture across settings. The fact that the number of differing variables between settings for these three participants reduced at Follow-up could indicate that they had become more settled at the ECEC, and forming an attachment to their primary caregiver in this setting may have contributed.

Centre policy dictates caregiver differences, and it is difficult to separate this from other environmental effects. However, it appears that the unfamiliarity of the environment is a determining factor in the reaction to transition; otherwise a wider range of reactions related to the Home Centre Contrast Scale would be expected. Average sleep duration was considerably longer in the Home than at the ECEC, and sleep efficiency was also higher at Home. Furthermore, the average time participants spent crying and out of bed was longer in the ECEC than at Home. These findings can be explained by the unfamiliar sleep environments. At Home, participants napped in a familiar environment and were put down by a familiar caregiver. Overall, participants spent more time in AS than QS during their naps. Interpretation of different proportions of AS is difficult as there is no normative data on AS in naps, and this variable differed markedly across participants in this study.

The results are likely to have been influenced by individual differences such as temperament, sleep architecture, and self-soothing ability. For example, Ashley and Caleb often vocalised or cried soon after waking from their naps. This could be because they had not yet learned to self-soothe. However, this could also be explained by differences in caregiver behaviour, as Ashley and Caleb's parents were more active in soothing their children to sleep than the parents of the other infants. Previous research has also documented individual differences in sleep patterns during infancy (Dittrichova, Paul, & Vondracek, 1976; Mindell & Owens, 2003).

Torok (2009) also found that infants' sleep differed markedly between the home and ECEC. The current study supports the findings of Torok (2009) in that caregiver interaction was lower, sleep duration was longer, sleep onset latency was shorter, and sleep efficiency was higher at Home when compared to the Centre.

Stuart (2011) also found differences in infants' sleep between the settings. Sleep duration in the Stuart (2011) study was also longer in the Home. However, Stuart (2011) found caregiver interaction was higher, sleep onset latency was longer, and sleep efficiency was lower at Home than at the Centre, which contrasts to the findings of the current study. These differences may have been due to one participant in Stuart's (2011) study requiring a high level of caregiver interaction in order to fall asleep at home, and because Stuart (2011) used two participants who were already "settled" at the ECEC, whereas all participants in the current study were new to the ECEC.

The finding that nap architecture is characterised more by AS than QS supports the findings of Stuart (2011), but contrasts those of Torok (2009) whose participants engaged in more QS than AS. These differences could be due to the fact that participants in the Torok (2009) study were described as having sleep difficulties, while those in Stuart's (2011) and the current study were reported to be “typical sleepers.” Torok’s (2009) participants were also older than those in the current study, so would have been more likely to engage in QS as the proportion of QS increases with age (Thoman & Whitney, 1989).

Theoretical Questions

Questions regarding differences in the physical sleep environments of infants have been raised by this study. Although Ethan and Jamie experienced standard ECEC sleep room conditions at Home, a number of their sleep variables differed between settings at Transition, as did those of participants who had different physical sleep environments at Home. It is possible that being in a novel environment, combined with being put down by someone other than the primary attachment figure, contributed to the differences in sleep variables between settings demonstrated in this study, regardless of how similar the environments between settings.

A question raised in the literature review was whether infants who attended ECECs experienced shorter sleep durations than non-attendees. Although the naps of participants in the current study were not compared to those of children not attending ECECs, the findings go some way to answering this question. As sleep duration was found to be longer in the Home than in the Centre, it is quite possible that overall, these participants’ average nap duration would be shorter than that of children who did not attend out-of-home care.

Research on night sleep in infants has found that by 6 months of age, more time is spent in QS than AS during night sleep (de Weerd & van den Bossche, 2003). In contrast, more time was spent in AS than QS during the naps in this study. This may be a reflection of differing architecture between day and night sleep in infants. It is also possible that proportions of AS and QS in the naps of infants are affected by other factors, such as stress or being overtired. Further research is required in order to answer these questions.

Limitations of the Study

One limitation of the current study is the small sample size, which meant that not all possible patterns of interaction between the child and the environment were examined. The limited number of participants used in the study was due to time constraints; however a reasonable amount of data was collected for each participant. In addition, the data collected is useful for further understanding the naps of typically developing children, and for guiding future research.

A further limitation is that recording naps over consecutive days may have reduced the detection of any development and adjustment that occurred during the recording period. Nap recordings for each phase were always completed within three weeks, but the recordings were made at times most convenient to the participant and his or her family. This meant that at times Home recordings were made over consecutive days while ECEC recordings were made weekly, for example. Despite this, no evidence of developmental changes across the time series was apparent.

As Jamie attended the ECEC five days per week, Home recordings were made on weekends and Centre recordings were made during the week. This may have affected the data as it is possible that weekday naps differ from weekend naps due to the differing contexts that infants' experience (for example spending weekends with their families). However, with this participant it was not possible to record Home naps during the week due to his ECEC attendance.

A further limitation of this study was that at times it was difficult to see certain things when watching the recordings back. For example, on occasion it was difficult to identify exactly when a caregiver left the sleep area at Home due to the angle of the camera. Also, during a small number of recordings, participants moved in their sleeping areas to positions that made it difficult to tell what sleep state they were in. These issues could have affected the accuracy of the data.

A final limitation of the current study is that a number of the Home sleeping environments were considerably different to the ECEC sleep room, and that this could not be controlled. For example, two participants napped in the lounge at Home, one in a buggy and one in a rocker. Another participant often napped in or on his parents' bed. In each of these cases, the room was light, and the overall environment differed from the dark sleep room at the ECEC where infants napped in cots. These environmental differences made it difficult to discern whether any changes in sleep architecture at the ECEC were due to the transition or to the change in environment.

Implications for Research

The current research on the attachment relationships of children in out-of-home care is inconclusive, and focuses on the attachment relationship between the parent and child. Although attachment was not measured in the present study, questions about the role of attachment in the sleep architecture of children in childcare have been raised by the findings. Future research should attempt to discern the role of attachment by examining sleep in children who receive childcare in their own home from a caregiver who is not an attachment figure. If the caregiver could behave in the same way as the attachment figure, and if the sleep environment did not change, the role of attachment in day sleep could be estimated. It would also be interesting to examine whether children who attend out-of-home care but have a consistent caregiver in this environment develop attachment relationships, and how long this takes.

This study described each participant's sleep environment; however future research could also investigate the effects of different environments on children's sleep. It would be interesting to see if children's sleep environments in ECECs could be made more like their home sleeping environments, and if this could occur, what effect it would have on their sleep patterns. Alternatively, it could be beneficial to examine sleep in different physical environments, but to have the child's primary attachment figure putting them down and behaving in the same manner in each environment. Thus, the influence of different physical sleep environments could be separated from attachment and caregiver behaviour.

The recordings with each participant in this study were conducted over the course of two to four months as they transitioned to ECEC attendance. It would be useful for future research to take a more longitudinal approach than was possible in the scope of this study in order to examine sleep architecture in both settings 6 to 12 months after infants have transitioned to ECEC attendance.

This study gathered minimal data about each participant's night sleep patterns through the use of home sleep diaries completed by parents. In the future, it would be useful to record and analyse night sleep as well as daytime naps to obtain a full picture of each child's sleep. This may lead to a better understanding of exactly how the transition to out-of-home care effects children's overall sleep patterns without just focussing on naps. It would also be valuable to undertake research into naps while children transition to ECECs with more participants, including group studies to evaluate the differences in sleep patterns between children who transition at different times.

In the current study, participants attended the ECEC for between two to five days per week. It would be interesting to examine any differences in the sleep patterns of children who attend out-of-home care for different amounts of time each week. This was not specifically compared in this study, but in future it could be useful to assess these children's sleep architecture across settings in more detail. The naps of one participant in this study were recorded on both weekdays and weekends. Future research could examine the naps of children on weekends and weekdays to determine any differences. This would be especially useful for children who attend ECECs five days per week.

The Centre phases of this study were conducted in an Early Childhood Learning Centre with its own policies regarding infant sleep. It would be fascinating for future studies to examine the differences in sleep practices and policies at different types of childcare providers such as kindergartens, play centres, Kohanga Reo, and in-home care services. Naps and night sleep could then be analysed to assess the likelihood of different sleep policies affecting children's sleep patterns.

Another factor that could be explored is the number and content of sessions that children visit the ECEC before they start their actual transition. The staff of the ECEC used in this study prefer children to visit the centre a number of times with their parent(s) before they begin attending, however this was not something specifically considered in this project. It could be beneficial to examine whether the number, content, and timing of these introductory sessions affects children's transition experiences, especially in terms of their sleep patterns.

Implications for Practice

The similarities and differences found in sleep variables across the two settings in this study have raised a number of implications for practice. The changes in sleep behaviours and architecture seen during the transition to ECEC attendance may indicate that this transition is a difficult experience for young children. It is important that ECE professionals recognise how stressful these transitions could be, and that centres implement policies to make these times easier for infants. As stated in the literature review, policies that can help ease transitions include having the child visit the centre before they begin attending, and maintaining communication with parents to ensure both parties are in agreement regarding the child's transition experience.

The ECEC used in this study had a very well set-up sleep room that was spacious, dark, quiet, and well ventilated. The literature states that these are important qualities for sleep areas for both adults and children, and it is important that ECECs take these factors into account when setting up sleep areas for children (Mindell & Owens, 1993). The staff at the ECEC were also highly trained and experienced, and appeared to value regular communication with parents. It is important that training programmes for ECEC staff cover the importance of sleep for infant development, as well as ways of ensuring children receive adequate sleep in centres. Centre policies should also emphasise communication with parents regarding children's' sleep needs and behaviours, including discussing the infant's wake time and night sleep quality when the infant is dropped off.

Conclusion

This study demonstrates that infants display a reaction to transitioning to ECE Centres, regardless of how similar their sleep environments are between the home and centre. Being cared for by someone other than the primary attachment figure appears to play a major role in this reaction. Other factors that are likely to contribute include differences in caregiver behaviour, infant temperament and self-soothing ability, and individual differences.

The general findings of this study indicate that the nap architecture of the participants was somewhat different between the two settings; however participants differed in exactly which sleep variables changed between settings. Three of the five participants experienced markedly different sleep practices and caregiver behaviours between the settings, and the transition to the ECEC had a minimal effect on the Home naps of three of the five participants.

As much research has shown that sleep is important for infant development and functioning across many areas (Davis et al., 2004; Mindell & Owens, 2003), it is important to consider how ECEC attendance affects infant sleep. The overall findings of this study showed that in the Centre, caregiver presence was higher, sleep duration was shorter, and sleep efficiency was lower. It can therefore be suggested that sleep "quality" was lower in this setting when compared to participants' homes. As night sleep was not examined in this study, the effect of ECEC attendance on night sleep cannot be determined. The effects of reduced sleep quality at the ECEC on sleep over a 24 hour period, and the subsequent effect on infants' development and functioning, must be explored further.

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Appendix A

Ashley's Sleep and Caregiver Variables across Phases including Means and Standard Deviations

Total nap period (minutes)

Day:	Baseline (B)	Transition Centre (TC)	Transition Home (TH)	Follow-up Centre (FC)	Follow-up Home (FH)
1	47	23	52	71	26
2	52	38	92	98	33
3	53	46	50	60	38
MEAN	50.7	35.7	64.7	76.3	32.3
SD	3.2	11.7	23.7	19.6	6

Sleep duration (minutes)

	B	TC	TH	FC	FH
1	44	0	43	59	25
2	50	0	92	74	32
3	49	29	47	35	34
MEAN	47.7	9.7	60.7	56	30.3
SD	3.2	16.7	27.2	19.7	4.7

Latency to sleep onset or cessation of recording (minutes)

	B	TC	TH	FC	FH
1	1	23	6	4	0
2	0	38	0	8	0
3	1	13	0	3	0
MEAN	0.7	24.7	2	5	0
SD	0.6	12.6	3.5	2.6	0

Proportion awake (%)

	B	TC	TH	FC	FH
1	6.4	26.1	17.3	4.2	3.9
2	3.9	2.6	0	11.2	3
3	7.6	2.2	6	15	10.5
MEAN	5.9	10.3	7.7	10.2	5.8
SD	1.9	13.7	8.8	5.5	4.1

Proportion crying (%)

	B	TC	TH	FC	FH
1	0	26.1	0	12.7	0
2	0	52.6	0	13.3	0
3	0	32.6	0	25	0
MEAN	0	37.1	0	17	0
SD	0	13.8	0	6.9	0

Proportion out of cot (%)

	B	TC	TH	FC	FH
1	0	47.8	0	0	0
2	0	44.8	0	0	0
3	0	2.2	0	1.7	0
MEAN	0	31.6	0	0.6	0
SD	0	25.5	0	1	0

Proportion in AS (% of time asleep)

	B	TC	TH	FC	FH
1	63.6	0	72.1	52.5	80
2	52	0	100	74.3	78.1
3	55.1	10.3	100	77.1	61.7
MEAN	56.9	3.4	90.7	68	73.3
SD	6	5.9	16.1	13.5	10.1

Proportion in QS (% of time asleep)

	B	TC	TH	FC	FH
1	36.4	0	27.9	47.5	20
2	48	0	0	25.7	21.9
3	44.9	89.7	0	22.9	38.3
MEAN	43.1	29.9	9.3	32	26.7
SD	6	51.8	16.1	13.5	10.1

Sleep efficiency (%)

	B	TC	TH	FC	FH
1	93.6	0	82.7	83.1	96.2
2	96.2	0	100	75.5	97
3	92.5	63	94	58.3	89.5
MEAN	94.1	21	92.2	72.3	94.2
SD	1.9	36.4	8.8	12.7	4.1

Proportion caregiver absent (%)

	B	TC	TH	FC	FH
1	0	0	0	0	0
2	0	0	0	0	0
3	0	0	0	0	0
MEAN	0	0	0	0	0
SD	0	0	0	0	0

Proportion caregiver present no interaction (%)

	B	TC	TH	FC	FH
1	91.5	4.4	84.6	81.7	88.5
2	98.1	0	98.9	78.6	93.9
3	90.6	60.9	96	45	84.2
MEAN	93.4	21.7	93.2	68.4	88.9
SD	4.1	34	7.6	20.3	4.9

Proportion caregiver present with interaction (%)

	B	TC	TH	FC	FH
1	8.5	95.7	15.4	18.3	11.5
2	1.9	100	1.1	22.5	6.1
3	9.4	39.1	4	55	15.8
MEAN	6.6	78.3	6.8	31.9	11.1
SD	4.1	34.0	7.6	20.1	4.9

Appendix B

Ben's Sleep and Caregiver Variables across Phases including Means and Standard Deviations

Total nap period (minutes)

Day:	Baseline (B)	Transition Centre (TC)	Transition Home (TH)	Follow-up Centre (FC)	Follow-up Home (FH)
1	121	96	140	68	168
2	165	94	151	96	261
3	146	63	187	47	158
MEAN	144.0	84.3	159.3	70.3	195.7
SD	22.1	18.5	24.6	24.6	56.8

Sleep duration (minutes)

	B	TC	TH	FC	FH
1	92	85	116	54	113
2	154	90	136	90	249
3	129	40	137	40	144
MEAN	125.0	71.7	129.7	61.3	168.7
SD	31.2	27.5	11.8	25.8	64.0

Sleep onset latency (minutes)

	B	TC	TH	FC	FH
1	9	5	5	6	8
2	5	2	5	5	3
3	6	16	5	4	5
MEAN	6.7	7.7	5	5	5.3
SD	2.1	7.4	0	1	2.5

Proportion awake (%)

	B	TC	TH	FC	FH
1	24	6.3	17.1	20.6	11.3
2	6.1	3.2	9.9	6.3	3.8
3	8.9	25.4	26.7	12.8	8.9
MEAN	13	11.6	17.9	13.2	8
SD	9.6	12	8.4	7.2	3.8

Proportion crying (%)

	B	TC	TH	FC	FH
1	0	5.2	0	0	1.2
2	0.6	1.1	0	0	0
3	2.7	6.4	0	0	0
MEAN	1.1	4.2	0	0	0.4
SD	1.4	2.8	0	0	0.7

Proportion out of cot (%)

	B	TC	TH	FC	FH
1	0	0	0	0	8.3
2	0	0	0	0	0.8
3	0	4.8	0	2.1	0
MEAN	0	1.6	0	0.7	3
SD	0	2.7	0	1.2	4.6

Proportion in AS (% of time asleep)

	B	TC	TH	FC	FH
1	100	47.1	75.9	87	66.2
2	78.2	71.1	93.4	51.1	63.9
3	69.0	57.5	100	35	64.6
MEAN	82.4	58.6	89.8	57.7	64.9
SD	15.9	12	12.5	26.6	1.2

Proportion in QS (% of time asleep)

	B	TC	TH	FC	FH
1	0	52.9	24.1	13	33.8
2	21.8	28.9	6.6	48.9	36.1
3	31	42.5	0	65	35.4
MEAN	17.6	41.4	10.2	42.3	35.1
SD	15.9	12.0	12.5	26.6	1.2

Sleep efficiency (%)

	B	TC	TH	FC	FH
1	76.	88.5	82.9	79.4	79.2
2	93.3	95.7	90.1	93.8	95.4
3	88.4	63.5	73.3	85.1	91.1
MEAN	85.9	82.6	82.1	86.1	88.6
SD	8.9	16.9	8.4	7.2	8.4

Proportion caregiver absent (%)

	B	TC	TH	FC	FH
1	93.4	0	97.1	0	83.3
2	96.4	0	98	0	93.9
3	93.8	0	97.3	0	96.8
MEAN	94.5	0	97.5	0	91.3
SD	1.6	0	0.5	0	7.1

Proportion caregiver present no interaction (%)

	B	TC	TH	FC	FH
1	0.8	81.3	0	70.6	4.2
2	0	67	0	77.1	2.3
3	1.4	58.7	0	61.7	0
MEAN	0.7	69.0	0	69.8	2.2
SD	0.7	11.4	0	7.7	2.1

Proportion caregiver present with interaction (%)

	B	TC	TH	FC	FH
1	5.8	18.8	2.9	29.4	12.5
2	3.6	33	2	22.9	3.8
3	4.8	41.3	2.7	38.3	3.2
MEAN	4.7	31	2.5	30.2	6.5
SD	1.1	11.4	0.5	7.7	5.2

Appendix C

Caleb's Sleep and Caregiver Variables across Phases including Means and Standard Deviations

Total nap period (minutes)

Day:	Baseline (B)	Transition Centre (TC)	Transition Home (TH)	Follow-up Centre (FC)	Follow-up Home (FH)
1	36	46	33	67	68
2	90	28	33	63	35
3	61	40	42	98	50
MEAN	62.3	38	36	76	51
SD	27	9.2	5.2	19.2	16.5

Sleep duration (minutes)

	B	TC	TH	FC	FH
1	32	30	31	44	65
2	89	22	28	44	31
3	59	28	40	89	48
MEAN	60	26.7	33	59	48
SD	28.5	4.2	6.2	26	17

Sleep onset latency (minutes)

	B	TC	TH	FC	FH
1	2	16	0	16	1
2	0	4	2	7	0
3	0	9	1	4	0
MEAN	0.7	9.7	1	9	0.3
SD	1.2	6	1	6.2	0.6

Proportion awake (%)

	B	TC	TH	FC	FH
1	8.3	4.4	0	3	4.4
2	1.1	7.1	12.1	27	0
3	3.3	5	4.8	7.1	2
MEAN	4.2	5.5	5.6	12.4	2.1
SD	3.7	1.5	6.1	12.8	2.2

Proportion crying (%)

	B	TC	TH	FC	FH
1	0	30.4	6.1	31.3	0
2	0	10.7	3	3.2	11.4
3	0	25	0	7.1	2
MEAN	0	22	3	13.9	4.5
SD	0	10.2	3	15.2	6.1

Proportion out of cot (%)

	B	TC	TH	FC	FH
1	2.8	0	0	0	0
2	0	3.6	0	0	0
3	0	0	0	0	0
MEAN	0.9	1.2	0	0	0
SD	1.6	2.1	0	0	0

Proportion in AS (% of time asleep)

	B	TC	TH	FC	FH
1	81.3	83.3	80.6	40.9	56.9
2	82	100	100	68.2	25.8
3	72.9	100	82.5	38.2	58.3
MEAN	78.7	94.4	87.7	49.1	47
SD	5.1	9.6	10.7	16.6	18.4

Proportion in QS (% of time asleep)

	B	TC	TH	FC	FH
1	18.7	16.7	19.4	59.1	43.1
2	18	0	0	31.8	74.2
3	27.1	0	17.5	61.8	41.7
MEAN	21.3	5.6	12.3	50.9	53.0
SD	5.1	9.6	10.7	16.6	18.4

Sleep efficiency (%)

	B	TC	TH	FC	FH
1	88.9	65.2	93.9	65.7	95.6
2	98.9	78.6	84.8	69.8	88.6
3	96.7	70	95.2	90.8	96
MEAN	94.8	71.3	91.3	75.4	93.4
SD	5.3	6.8	5.7	13.5	4.2

Proportion caregiver absent (%)

	B	TC	TH	FC	FH
1	88.9	0	93.9	0	92.7
2	97.8	0	84.9	0	85.7
3	96.7	0	94.2	0	96
MEAN	94.5	0	91.0	0	91.5
SD	4.9	0	5.3	0	5.2

Proportion caregiver present no interaction (%)

	B	TC	TH	FC	FH
1	2.8	58.7	3	59.7	1.5
2	1.1	71.4	0	68.3	0
3	1.6	70	0	85.7	4
MEAN	1.8	66.7	1	71.2	1.8
SD	0.9	7	1.7	13.3	2

Proportion caregiver present with interaction (%)

	B	TC	TH	FC	FH
1	8.3	41.3	3	40.3	5.9
2	1.1	28.6	15.2	31.8	14.3
3	1.6	30	4.8	14.3	0
MEAN	3.7	33.3	7.6	28.8	6.7
SD	4	7	6.6	13.3	7.2

Appendix D

Ethan's Sleep and Caregiver Variables across Phases including Means and Standard Deviations

Total nap period (minutes)

Day:	Baseline (B)	Transition Centre (TC)	Transition Home (TH)	Follow-up Centre (FC)	Follow-up Home (FH)
1	89	106	172	81	148
2	107	76	108	66	85
3	118	117	93	131	125
MEAN	104.7	99.7	124.3	92.7	119.3
SD	14.6	21.2	42	34	36.1

Sleep duration (minutes)

	B	TC	TH	FC	FH
1	70	96	150	71	129
2	98	60	81	50	63
3	112	104	80	119	98
MEAN	93.3	86.7	103.7	80	96.7
SD	21.4	23.4	40.1	35.4	33

Sleep onset latency (minutes)

	B	TC	TH	FC	FH
1	19	6	17	9	17
2	9	12	18	13	23
3	2	6	13	10	21
MEAN	10	8	16	10.7	20.3
SD	8.5	3.5	2.6	2.1	3.1

Proportion awake (%)

	B	TC	TH	FC	FH
1	18	5.7	10.5	11.1	12.8
2	7.5	19.7	25	22.7	24.7
3	5.9	10.3	14	8.4	8.8
MEAN	10.5	11.9	16.5	14.1	15.5
SD	6.6	7.2	7.6	7.6	8.3

Proportion crying (%)

	B	TC	TH	FC	FH
1	2.3	3.8	0	0	0
2	0.9	1.3	0	0	0
3	0	0	0	0	10.4
MEAN	1.1	1.7	0	0	3.5
SD	1.1	1.9	0	0	6

Proportion out of cot (%)

	B	TC	TH	FC	FH
1	0	0	2.3	0	0
2	0	0	0	1.5	2.4
3	0	0.9	0	0.8	2.4
MEAN	0	0.3	0.8	0.8	1.6
SD	0	0.5	1.3	0.8	1.4

Proportion in AS (% of time asleep)

	B	TC	TH	FC	FH
1	28.6	52.1	68	42.3	17.8
2	30.6	61.7	65.4	30	23.8
3	58	52.9	58.8	30.3	79.6
MEAN	39.1	55.6	64.1	34.2	40.4
SD	16.4	5.3	4.7	7	34.1

Proportion in QS (% of time asleep)

	B	TC	TH	FC	FH
1	71.4	47.9	32.0	57.7	82.2
2	69.4	38.3	34.6	70	76.2
3	42	47.1	41.2	69.7	20.4
MEAN	60.9	44.4	35.9	65.8	59.6
SD	16.4	5.3	4.7	7	34.1

Sleep efficiency (%)

	B	TC	TH	FC	FH
1	78.7	90.6	87.2	87.7	87.2
2	91.6	79	75	75.8	74.1
3	94.9	88.9	86	90.8	78.4
MEAN	88.4	86.1	82.7	84.8	79.9
SD	8.6	6.3	6.7	7.9	6.6

Proportion caregiver absent (%)

	B	TC	TH	FC	FH
1	77.5	0	86.6	0	96.6
2	98.1	0	97.2	0	97.7
3	95.8	0	97.9	0	95.2
MEAN	90.5	0	93.9	0	96.5
SD	11.3	0	6.3	0	1.2

Proportion caregiver present no interaction (%)

	B	TC	TH	FC	FH
1	0	90.6	0	84	0
2	0	79	0.9	74.2	0
3	0.9	91.5	0.0	90.8	0
MEAN	0.3	87	0.3	83	0
SD	0.5	7	0.5	8.3	0

Proportion caregiver present with interaction (%)

	B	TC	TH	FC	FH
1	23.6	9.4	13.4	16.1	3.2
2	1.9	21.1	1.9	25.8	3.5
3	4.2	8.6	2.2	9.2	4.8
MEAN	9.9	13	5.8	17	3.8
SD	11.9	7	6.6	8.3	0.9

Appendix E

Jamie's Sleep and Caregiver Variables across Phases including Means and Standard Deviations

Total nap period (minutes)

Day:	Baseline (B)	Transition Centre (TC)	Transition Home (TH)	Follow-up Centre (FC)	Follow-up Home (FH)
1	150	67	77	102	112
2	134	101	91	89	97
3	125	64	76	109	104
MEAN	136.3	77.3	81.3	100	104.3
SD	12.7	20.6	8.4	10.1	7.5

Sleep duration (minutes)

	B	TC	TH	FC	FH
1	146	48	65	75	93
2	108	88	74	67	69
3	113	56	40	82	72
MEAN	122.3	64	59.7	74.7	78
SD	20.6	21.2	17.6	7.5	13.1

Sleep onset latency (minutes)

	B	TC	TH	FC	FH
1	1	2	8	13	9
2	23	7	15	17	18
3	10	6	27	17	30
MEAN	11.3	5	16.7	15.7	19
SD	11.1	2.6	9.6	2.3	10.5

Proportion awake (%)

	B	TC	TH	FC	FH
1	1.3	11.9	15.6	26.5	16.1
2	19.4	9.9	17.6	24.7	28.9
3	9.6	0	40.8	21.1	30.8
MEAN	10.1	7.3	24.7	24.1	25.2
SD	9	6.4	14.0	2.7	8

Proportion crying (%)

	B	TC	TH	FC	FH
1	0.7	16.4	0	0	0.9
2	0	1	0	0	0
3	0	9.4	6.6	1.8	0
MEAN	0.2	8.9	2.2	0.6	0.3
SD	0.4	7.7	3.8	1.1	0.5

Proportion out of cot (%)

	B	TC	TH	FC	FH
1	0	0	0	0	0
2	0	2.0	1.1	0	0
3	0	3.1	0	1.8	0
MEAN	0	1.7	0.4	0.6	0
SD	0	1.6	0.6	1.1	0

Proportion in AS (% of time asleep)

	B	TC	TH	FC	FH
1	32.9	14.6	0	41.3	46.2
2	39.8	19.3	8.1	53.7	30.4
3	78.8	23.2	10	32.9	45.8
MEAN	50.5	19	6	42.6	40.8
SD	24.8	4.3	5.3	10.5	9

Proportion in QS (% of time asleep)

	B	TC	TH	FC	FH
1	67.1	85.4	100	58.7	53.8
2	60.2	80.7	91.9	46.3	69.6
3	21.2	76.8	90	67.1	54.2
MEAN	49.5	81	94	57.4	59.2
SD	24.8	4.3	5.3	10.5	9

Sleep efficiency (%)

	B	TC	TH	FC	FH
1	97.3	71.6	84.4	73.5	83
2	80.6	87.1	81.3	75.3	71.1
3	90.4	87.5	52.6	75.2	69.2
MEAN	89.4	82.1	72.8	74.7	74.5
SD	8.4	9.1	17.5	1	7.5

Proportion caregiver absent (%)

	B	TC	TH	FC	FH
1	98	0	90.9	0	97.3
2	95.5	0	92.3	0	91.8
3	97.6	0	51.3	0	76.9
MEAN	97	0	78.2	0	88.7
SD	1.3	0	23.3	0	10.5

Proportion caregiver present no interaction (%)

	B	TC	TH	FC	FH
1	0	79.1	0	94.1	0.9
2	0	87.1	0	86.5	0
3	0	76.6	1.3	85.3	0
MEAN	0	80.9	0.4	88.7	0.3
SD	0	5.5	0.8	4.8	0.5

Proportion caregiver present with interaction (%)

	B	TC	TH	FC	FH
1	2	20.9	9.1	5.9	1.8
2	4.5	12.9	7.7	13.5	8.3
3	2.4	23.4	47.4	14.7	23.1
MEAN	3	19.1	21.4	11.3	11
SD	1.3	5.5	22.5	4.8	10.9

Appendix F

Ethics Approval

HUMAN ETHICS COMMITTEE

Secretary, Lynda Griffioen
Email: human-ethics@canterbury.ac.nz

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Ref: HEC 2011/24

13 May 2011

Nicola McNab
Health Sciences Centre
UNIVERSITY OF CANTERBURY

Dear Nicola

The Human Ethics Committee advises that your research proposal "Sleep practices and nap quality in infants transitioning to early childhood centres: a comparison between the home and centre" has been considered and approved.

Please note that this approval is subject to the incorporation of the amendments you have provided in your email of 3 May 2011.

Best wishes for your project.

Yours sincerely

pp L C Griffioen

Dr Michael Grimshaw
Chair, Human Ethics Committee

Appendix G

Information Sheets

Health Sciences Centre

Child and Family Psychology Programme[1]

Dr Karyn France PhD MNZCCPsyc, Coordinator

64-3-3642610, karyn.france@canterbury.ac.nz

Information Sheet for Parents

To the Parents/Caregivers,

My name is Nicki McNab and I am currently studying towards a Master of Arts in Child and Family Psychology at the University of Canterbury. This qualification requires me to complete a thesis, which involves conducting individual research in a relevant area. I have chosen to undertake research into the sleep state organisation of infant's naps in Early Childhood Education Centres. There has been very little research on infant naps, so the findings of my study may be an important contribution to this area of knowledge. I will study infants between the ages of 6 and 24 months.

If your child is in this age bracket, you are invited to participate.

The procedures involved in this study are as follows:

- To determine how attending an Early Childhood Education (ECE) Centre influences the sleep state organisation of infants' naps I will be comparing naps in centres to that of naps in the home.

[1] The Child and Family Psychology Programme is taught jointly across the Health Sciences Centre and the School of Educational Studies and Human Development

- In order to measure nap architecture, I will use a video camera which works in the dark. The sleep state organisation of each nap will be determined by counting the amount of time in rapid eye movement and non rapid eye movement sleep; sleep efficiency (the percentage of time spent awake and asleep); and the number of sleep/wake transitions that occur during the nap. Each recording will be coded using a well-known procedure to establish these measurements.

- Recordings of your child's naps will be taken in your home before they begin attending the ECE centre. Once your child has begun attending the ECE centre, naps will be recorded at the centre and in the home. Once you and the staff think your child is settled at the ECE centre, naps will again be recorded at home and the centre. Here is a summary of the recordings over the study:

	Before attending centre	**During transition**	**When settled at centre**
Child observed at home	Phase 1: three observations	Phase 2: three observations	Phase 4: three observations
Child observed in the centre		Phase 3: three observations	Phase 5: three observations

- In each time phase, your child's naps will be recorded three times. Because there are five different phases, I will record your child's sleep a total of 15 times. Each measurement session is expected to take between 2 to 4 hours, depending on the length of the infant's nap.

- Video cameras with infrared lights (which are invisible to the naked eye) will be used to record the naps. I will either attach the camera to the wall, or put it on a tripod or another flat surface depending on where your child is sleeping. The camera will only be focused on your child and I will not be observing children during recordings.

- Before each nap session, I will come to your home or the ECE centre to set up the video camera, and I'll come back afterwards to remove it. You may have the opportunity to keep the video camera in your home and record nap sessions yourself to save on the amount of intrusion I may cause you. Each nap recording session will take between two to four hours depending on the length of your child's nap.

- You will also be asked to complete a short, semi-structured interview. This interview will include questions on your child's developmental history, sleep history, and the sleep practices you use with your child. I will arrange a time to interview you before the first nap session. You will also be asked to complete a 24 hour sleep diary to provide more information about your child's sleep patterns.

Participation in this project is completely voluntary. If you decide to participate, you will need to sign a form that gives your consent to you and your child's participation in this study. After consent is given, you can withdraw from the study at any time before the data is analysed. This would also mean a withdrawal of all information and data you have provided. I will notify you of the last date at which you can withdraw before data analysis begins.

If your child is near to 24 months of age, I will explain the recording procedure to them in an age appropriate way, and get their verbal assent before I record them. The confidentiality of yourself and your child will be assured as I will use pseudonyms in all written material that forms part of the study, as well as in the final report. Only myself and my supervisor will have access to the data, and when not in use data will be stored in a locked filing cabinet or password-protected computer. This study has received approval from the University of Canterbury Human Ethics Committee.

Thank you for taking the time to consider this study. If you would like more information or if you have any questions (either now or in the future), please do not hesitate to contact myself or my supervisors.

Nicki McNab

My Contact Details:

Nicki McNab
nicki.mcnab@pg.canterbury.ac.nz
021 2700 667

My Supervisors' Contact Details

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Appendix H

Consent Forms

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Health Sciences Centre

Child and Family Psychology Programme[2]

Dr Karyn France PhD MNZCCPsyc, Coordinator

64-3-3642610, karyn.france@canterbury.ac.nz

Consent Form for Parents of Children Participating in Nap Study

- I have read the attached information sheet and understand the nature of my own and my child's participation in this project.
- I consent to the researcher obtaining information from staff at my child's Early Childhood Learning Centre regarding my child's sleep patterns at the centre, as described in the attached information sheet.
- I understand that this project is entirely confidential and that neither I nor my child will be identified at any stage of the study.
- I understand that my own and my child's participation in this study is voluntary and that I may withdraw at any time before the data is analysed. I will be notified of the final date to withdraw from the study.
- I have been given the opportunity to ask the researchers questions, and I understand that if I have any questions in the future I can contact the researcher at any stage.

[2] The Child and Family Psychology Programme is taught jointly across the Health Sciences Centre and the School of Educational Studies and Human Development

- I acknowledge that this study has been approved by the University of Canterbury Human Ethics Committee.

- I agree and consent to myself and my child participating in the study described in the attached information sheet.

- I ______________________________ (please print name) consent to participate in the study described in the attached information sheet.

- I give consent for my child ______________________________ (please print name) to participate in the study described in the attached information sheet.

Signature: ________________________

Date: __________________

Health Sciences Centre

Child and Family Psychology Programme[3]

Dr Karyn France PhD MNZCCPsyc, Coordinator

64-3-3642610, karyn.france@canterbury.ac.nz

Letter of Agreement for Head Teacher of the Early Childhood Learning Centre

As the Head Teacher, I understand the nature of this project, and give consent for it to be undertaken in the Early Childhood Learning Centre using a number of our clients as participants.

I understand that if parents/caregivers wish to be involved in the study, they will be required to sign a form consenting to their child's participation as well as their own.

I also understand that once parental consent has been obtained, staff at the centre will act as third party informants to provide data on participating children's sleep routines.

I acknowledge that this study has been approved by the University of Canterbury Human Ethics Committee, and I understand that the project is entirely confidential, and that the identities of participants, staff and the centre will remain anonymous.

I, ________________________________ (please print name) consent to the involvement of the Early Childhood Learning Centre in this project.

Signature: __________________________   Date: ___________________

[3] The Child and Family Psychology Programme is taught jointly across the Health Sciences Centre and the School of Educational Studies and Human Development

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Health Sciences Centre

Child and Family Psychology Programme[4]

Dr Karyn France PhD MNZCCPsyc, Coordinator

64-3-3642610, karyn.france@canterbury.ac.nz

Coding Assistant Confidentiality Agreement

I understand that my assistance on this project will expose me to confidential information including the identities of participants and other parties involved in the study.

I will ensure the confidentiality and anonymity of all parties involved in this study remains intact. I will not discuss or report any confidential information, and will ensure data is stored securely.

I, ______________________________ (please print name) agree to keep any information I am exposed to during my involvement in this project entirely confidential.

Signature: ________________________

Date: __________________

[4] The Child and Family Psychology Programme is taught jointly across the Health Sciences Centre and the School of Educational Studies and Human Development

Appendix I

Figure Showing Proportion of Sleep Spent in Quiet Sleep

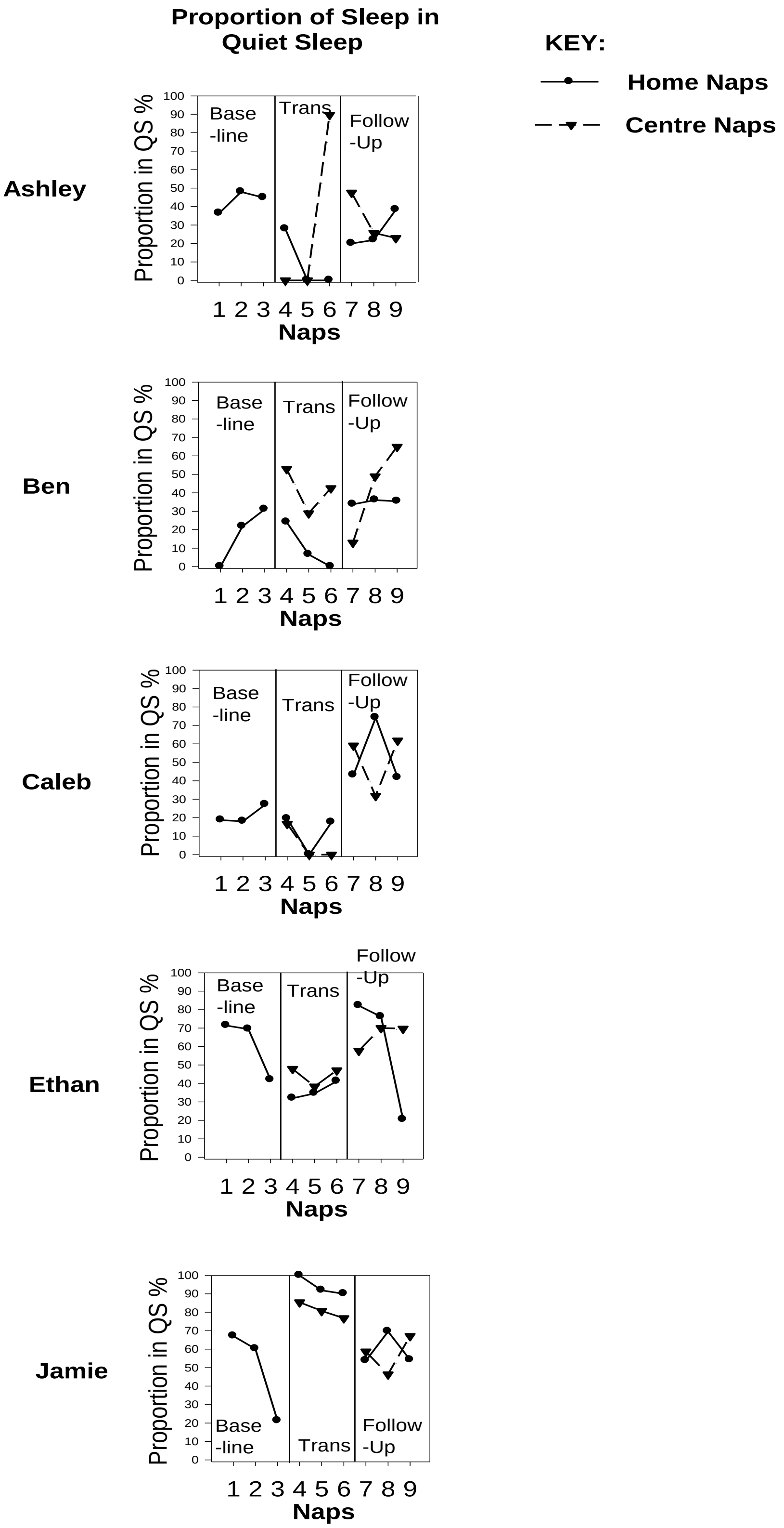

Figure 4. Proportion of the nap spent in Quiet Sleep (%) for all participants across the Home and Centre settings.