ASSESSING THE VALUE OF MANDATORY SLEEP/REST PERIODS IN EARLY CHILDHOOD EDUCATION AND CARE

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Keywords

Behaviour, body mass index, care, childcare, children, class, cognition, consolidation, development, early childhood, education, emotional climate, health, infants, learning, kindergarten, mandatory, nap, napping, naptime, night-time, nursery, pattern, practice, preschool, policy, rest, sleep, trajectories
Assessing the Value of Mandatory Sleep/Rest Periods in Early Childhood Education and Care
Abstract

Provision for sleep and ‘rest’ is an important component of early childhood education and care (ECEC) programs. In the preschool years many ECEC centres make provision for sleep and rest through the allocation of a scheduled sleep time. To date documentation of the way in which these periods are managed and evidence regarding their effects is scarce. Such documentation and evidence is important. Across the developed world a large majority of children attend ECEC programs in the years prior to school. Emerging research from sleep science suggests that children’s early sleep patterns may be critical for later adult behaviour, and associated with a plethora of developmental outcomes including learning, health and behaviour. The aim of this research program was to provide the first comprehensive study of the prevalence, correlates and consequences of sleep and rest practices within ECEC programs. A series of six key papers are presented examining one specific element of ECEC sleep-rest practice; mandatory naptimes. Mandatory naptimes are defined as a period during scheduled sleep times in which all children are required to lie on their beds without alternate activity permitted. This component of sleep potentially represents the most extreme modification of normally occurring sleep patterns among preschool aged children. Understanding the value of mandatory naptimes for young children has salience both in Australia and internationally, where there remains considerable debate regarding the benefits and costs of allocation of time to sleep and rest in ECEC.

Paper 1 establishes current evidence of the effects of napping in young children, by examining the state of evidence and current findings regarding the independent effects of napping on children’s night sleep, behaviour, cognitive functioning and physical health from birth to 5 years. A systematic review of
published, original research articles examining the effects of napping in children aged 0-5 years was undertaken. Twenty-six articles met inclusion criteria. These were of heterogeneous quality; all had observational designs (GRADE-low). The studies variously reported on salivary cortisol, night sleep, cognition, behaviour, obesity and accidents. The findings regarding cognition, behaviour and health impacts were inconsistent, probably due to variation in age and habitual napping status of the samples. The most consistent finding was an association between napping and later onset, shorter duration and poorer quality of night sleep. This paper concludes that, beyond age 2, there is consistent correlational evidence that night sleep onset, duration and quality are adversely impacted by napping and that the effects of napping on behaviour, cognition and health are less certain.

Papers 2, 3 and 4 were embedded within the landmark, Australian Research Council funded, longitudinal study of ECEC effectiveness, E4Kids. Paper 2 examines the association between the duration of mandatory naptimes and children’s napping patterns in childcare settings. Observations were undertaken in a community sample of 113 preschool rooms (N=2114 children, age 3-6 years). The results showed that 83.5% of childcare settings implemented a mandatory naptime (range=15-145 minutes). Overall 31% of children slept during naptimes. Compared to rooms with ≤30 minutes of mandatory naptime, rooms with 31-60 minutes and >60 minutes of mandatory naptime had a two-fold and four-fold increase, respectively, in the proportion of children napping. Latency to sleep onset did not significantly differ across rooms. The findings of this paper indicate that exposure to mandatory naptimes may increase rates of daytime sleep among preschool aged children in ECEC.
Following from Paper 2, Paper 3 examines the hypothesis that the disjuncture between children’s sleep needs and centre practices may cause conflict for staff, increase stress for children and escalate negative emotional climate in the room. This study was the first to apply the Classroom Assessment and Scoring System (CLASS) Pre-K (Pianta, La Paro, & Hamre, 2008) to observe the emotional climate and behavioural management during sleep time. The CLASS was used to assess emotional climate and behaviour management ratings between non-sleep and sleep sessions, in 113 ECE rooms. The results show a significant drop in emotional climate and behavioural management between the non-sleep and sleep-time sessions. Furthermore, the duration of mandated sleep time accounted for significant independent variance in the observed emotional climate during sleep-time. This paper demonstrated that the CLASS Pre-K presents a sensitive tool to assess emotional climate and behaviour management during sleep-time and indicates for the first time an important relationship between mandatory sleep practices and interaction quality in ECEC settings.

Paper 4 extends the work from Papers 2 and 3 to examine the effects of mandatory naptimes in ECEC on night-time sleep duration, both concurrently and 12 months later once in school. A sample of 168 children (50-72 months; 55% males) attending licensed childcare centres were observed across their morning and throughout their scheduled naptime. Teachers reported each child’s napping in ECEC. Night-time and total sleep duration was reported by parents at two time points, in ECEC and in the second semester of their first school year. General linear models were used to examine group differences in sleep duration between children experiencing 0-60 minutes and >60 minutes of mandatory naptime, adjusting for key confounders of age, gender, temperament, family income, family education, ECEC
quality, type and attendance. Path analysis was conducted to test a mediation model in which mandatory naptime is associated with night-time sleep duration through increased napping in childcare. Exposure to mandatory naptimes of >60 minutes in childcare was associated with decreased duration of night-time sleep that endures beyond childcare attendance. Napping in childcare mediated the relationship between mandatory naptime and duration of night-time sleep.

Finally, Paper 5 and 6 provide directions for translation of the research evidence into sleep practice in ECEC. Paper 5 applies current knowledge in sleep science to provide guidance to practitioners and future directions of research for those in the scientific field. Paper 6 specifically focuses on the historical and legislative context of sleep practice in Australian ECEC and focuses on sleep practice within the specific context of Australia’s national quality standards that guide quality of practice in ECEC.

Collectively this body of research provides the first documentation of current sleep practices in ECEC services for children within the preschool period and evidence of their impacts both within and beyond the ECEC context. In doing so, this thesis provides a formative evidence base to inform ongoing research and provide guidance to support educators in managing the complex individual and organisational needs associated with appropriate provisions for sleep and rest within ECEC settings.
Published or Submitted Manuscripts Resulting from the PhD Research Program


Thorpe, K., Staton, S., Sawyer, E., Pattinson, C., Haden, C., & Smith, S. (In Press) Napping, development and health from 0-5 years: A systematic review. *Archives of Disease in Childhood*. (IF=2.91). (See Chapter 4)
Presentations and Published Abstracts resulting from the PhD Research Program

(Note. Published abstract are provided in full in Appendix A.)


Staton, S., Smith, S., Pattinson, C., Thorpe, K., (2014). History of childcare and age of cessation of napping in preschool aged children. 28th Annual Meeting of the Associated Professional Sleep Societies, Minneapolis, Minnesota. SLEEP. Vol. 37, Abstract Supplement, pA304. (IF=5.05)


Grant Funding and Awards resulting from the PhD Research Program


Thorpe, K., Smith, S., & Staton, S. (2012) Sleep in Early Childhood - Institute for Health and Biomedical Innovation, Queensland University of Technology, Strategic Funding Grant. (Internal University Competitive Grant - $20,000).


Staton, S. (2014). Australasian Sleep Association’s Travel Grant 2014 - For attendance at the 26th Annual Meeting of the Australasian Sleep Association Conference, Perth, Australia.

Masters of Education and Developmental Psychology Thesis Manuscripts*

resulting from the PhD Research Program

Michaela Nothard  “I have to rest all the time because you’re not allowed to play”: Exploring children’s perceptions of autonomy during sleep time in long day ECEC services (Awarded 2014).


Dominique Sinclair  Parent preferences regarding the sleep time in pre-school Early Childhood Education and Care (ECEC) settings (Awarded 2014).


Jasmine Inglis  Masters of Clinical Psychology


*These manuscripts were derived from key questions that arose from the PhD program and were co-supervised by the PhD candidate during the period of their candidature.
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List of Terms

_Early Childhood Education and Care Settings (ECEC)_

Group based, licensed early education and care programs for children in the years prior to school entry; including long-day care, kindergarten or family-day care types.

In the current thesis ECEC services include long-day care and kindergartens only.

For paper 3 the term Early Education and Care (ECE) is used in place of ECEC to conform to terminology used in the USA education context. In papers 1 and 3 the more general term ‘childcare’ is used in place of ECEC as this term is more accessible to the wider readership and is term commonly used in the target journals for these papers.

_Kindergarten_

Centre based ECEC programs provided by a qualified teacher and targeted at children in the year before school entry (3 to 5 years old). Kindergartens are akin to USA ‘preschool’ programs.

_Long-day care_

Centre based ECEC programs ECEC program for children from birth until school entry (5- to 6-years old), with children typically grouped in rooms according to developmental stage or age. Long-day care is equivalent to ‘child care’ centers in the USA.

_Naptime (or sleep time, sleep period, sleep/rest time)_

The terms naptime, sleep period, sleep time and sleep/rest time are used interchangeably within this thesis to refer to a period of time, either mandatory or options, allocated to facilitate sleep or rest of children within the ECEC context.
Although in Australia ‘sleep time’ or ‘sleep/rest times’ are the more commonly used term to refer to these periods, ‘naptime’ is used, particularly in papers 2, 4 and 5, as this term is more accessible to the wider readership and is term commonly used in the target journals for these papers.

*Mandatory naptime*

A period during scheduled sleep times in which all children are required to lie on their beds without alternate activity permitted, regardless of whether they typically nap.

*Scheduled naptime*

Time scheduled for sleep or rest within an ECEC setting, typically indicated as a set duration of time allocated in the daily schedule for a room.

*Actigraphy*

A non-invasive activity monitoring device, typically worn on the write, used to determine sleep and wake patterns.
Acronyms

ABS – Australian Bureau of Statistics
AIC – Akaike's Information Criteria
ARC – Australian Research Council
CLASS – Classroom Assessment Scoring System
E4Kids – Effective Early Education Experiences Study
ECEC – Early Childhood Education and Care
ECE – Early Childhood Education
GRADE – Grades of Recommendation, Assessment, Development and Evaluation
NQS – The National Quality Standards
OECD – The Organisation for Economic Co-operation and Development
PRISMA – Preferred Reporting Items for Systematic Reviews and Meta-Analyses
SEM – Structural Equation Modelling
SEIFA – Socio-Economic Indices for Areas
SES – Socio-economic Status
SOME – Sleep Observation Measure of Early Childhood Education and Care
Preamble

The focus of the body of work presented in this thesis is licensed early childhood education and care (ECEC) services in the Australian context. To orientate the reader not familiar with this context a definition and description of the forms of ECEC in Australia is provided.

**Early Childhood Education and Care (ECEC) Services:** Licensed early education and care programs for children in the years prior to school entry. In the Australian context ECEC includes, but is not limited to, long-day care, kindergarten and family-day care types. The primary forms of service studied in this thesis are centre based long day care and kindergarten programs. In the current study the focus is on children in the year prior to school whose ages range between 3 and 6 years.

**Long Day Care:** Comprises services aimed primarily at 0-5 year olds that are provided in a centre usually by a mix of qualified and other staff. Educational, care and recreational programs are provided based on the developmental needs, interests and experience of each child. Children may attend full-time (5 days up to 12 hours) or part-time and services operate at least 48 weeks per year. Hours of attendance are determined by parent work commitments or other needs. These services are run by profit and community based not-for profit organisations. They may be a single service, but often are affiliated or run through larger organisations including community education, religious and corporate entities.

**Kindergarten:** Comprises a structured early educational programme usually provided by a qualified teacher on a sessional basis in dedicated preschools. Similar educational programs or curricula may be provided within long day care and other
settings. These are primarily aimed at children in the year prior to commencement of full-time universal schooling. The national standard is 15 hours provision per week though this may be up to full time, with programs running for approximately 40 weeks of the year. Provision is typically state funded, though programs are also run through long day care and private schools.

The terms most commonly used to describe kindergarten services in various states and territories are:

- Kindergarten—Tasmania, Western Australia and Queensland
- Kindergarten or Preschool—Victoria
- Preschool— New South Wales, Australian Capital Territory, Northern Territory, South Australia

**ECEC Service Regulation:** All Long Day Care and Kindergarten services in Australia are subject to national quality standards and external evaluation by Australian Children’s Education and Care Quality Authority (AECEQA).

**ECEC Service Quality:** Comparison of observed quality of these services with equivalent service types in the UK and USA indicate they are of similar quality (Tayler et al., 2013).

**Sources:**

*Australian Institute of Health and Well-being*


*Australian Children’s Education and Care Quality Authority*

(website: http://www.acecqa.gov.au/)
Statement of Original Authorship

The work contained in this thesis has not been previously submitted to meet requirements for an award at this or any other higher education institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made.

Signature:

Date:  09/01/2015
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This thesis is dedicated to my daughter, Lyla, for ensuring that it remains only my second most humbling and rewarding achievement of the last three years. Thank you.
Chapter 1: Sleep in Early Childhood Education and Care

This chapter provides an overview of the significance of Early Childhood Education and Care (ECEC) settings (section 1.1) and the personal (section 1.2), policy (section 1.3) and research background that drove the formation of this thesis (section 1.4). Section 1.5 describes thesis program and provides details of the scope of the research. Section 1.6 provides an outline of the research purpose and aims and section 1.7 discussed the significance of the research and its potential impact. Finally, section 1.8 includes an outline of the remaining chapters of this thesis.

1.1 THE SIGNIFICANCE OF ECEC

The first five years of life represent a significant developmental period in which the neurological pathways that underpin lifetime trajectories of learning, social functioning and wellbeing are established (S. Walker et al., 2011). Experiences within the family represent the single most important group of factors explaining child development outcomes, but increasingly children spend time outside the family home in early childhood education and care (ECEC) programs. By the end of the early childhood period most children in developed economies will have spent some time in a non-parental ECEC setting (OECD, 2014). For example, by four years a majority of children attend ECEC in Australia (52.6%) and attendance rates increase such that by five years 99.8% are attending an ECEC setting. A key goal of ECEC programs is to establish positive life trajectories for children (ACECQA, 2013b; Council of Australian Governments, 2009). Consistent with this goal is the imperative to ensure that the experiences children have within ECEC settings make a
positive contribution to their learning, development and health. This thesis by
published papers focuses on the contribution of one aspect of ECEC programming,
scheduled sleep periods.

Three contexts drove the formation of this thesis; 1) a personal context, 2) a
policy context and 3) a research context.

1.2 PERSONAL BACKGROUND TO THE STUDY

This study began with an observation. During the 1990’s I undertook a work
placement in a small childcare setting located in a highly deprived, state-subsidised
public and community housing area in Sydney. As is common in many childcare
settings, immediately following the children’s lunchtime, this service had a 1.5hr
scheduled sleep period for all children. Over the course of my placement I was
surprised by the intensity by which the staff insisted that children slept during these
periods, against the resistance of the preschool aged children to do so. One particular
instance that stuck with me was of a child who showed signs of being fearful to close
his eyes during sleep time and yet each day he was repeatedly instructed “close your
eyes”. Whilst this experience seemed odd to me at the time, I accepted that this was
part of standard childcare practice. I didn’t think of this experience again until 2010
when I had the opportunity to observe sleep times across a large number of ECEC
settings.

In 2010, as part of my role as a senior researcher on the large longitudinal
study of effective early educational experiences (E4Kids), I was involved in
conducting cognitive testing and observation of children across a number of ECEC
services in Queensland, Australia. Whilst our focus was not on sleep practices at this
time, we were often present when sleep times occurred. I became interested in the
large variability in sleep practices we were observing. Like the centre in Sydney I remember from all those years before, many centres seemed to employ practices of extended sleep times in which all children were required to participate without alternative activities allowed. Of particular interest however were the seemingly few children who slept during these times and the seemingly constant struggle of both carers and children to manage behaviour. It was the observation of conflict between educator practice and child response that led to my interest in sleep practices within the context of ECEC and to the formation of the program of research undertaken within this thesis.

1.3 POLICY BACKGROUND TO THE STUDY

In 2009, the Council of Australian Governments (COAG) committed to a new comprehensive National Quality Standard (NQS) to cover all formal ECEC services prior to school entry (e.g. long day care centres, preschools and kindergartens, family day care and outside school hours care; Council of Australian Governments, 2009). The National Quality Standard (NQS) identifies the need for ECEC services to ensure that “each child’s comfort is provided for and there are appropriate opportunities to meet each child’s need for sleep, rest and relaxation” (Quality Area 2: Element 2.1.2; ACECQA, 2013b). Although the importance of sleep for children within the context of childcare is recognised, there are presently no agreed guidelines for sleep practices in ECEC settings. In the absence of specific guidelines, there are a number of factors that may drive the scheduling of sleep or rest time. These include staff beliefs about the benefits of sleep or rest, staff beliefs about legislation, provisions for staff planning, economic motives, and service provider policy (Inglis, Staton, Pattinson, & Thorpe, 2013). Whilst the NQS for ECEC clearly recognises the importance of opportunity for sleep, rest and relaxation
for children in ECEC settings, how this is interpreted in practice is currently unclear. Indeed, issues surrounding the interpretation of this standard have already resulted in a number of legal challenges (ACECQA, 2013a). The evidence available to inform appropriate sleep practices in ECEC settings is extremely limited.

1.4 RESEARCH BACKGROUND TO THE STUDY

Sleep is an important biological process, regulated by the interaction of homeostatic and circadian processes (Achermann, 2004; Borb & Achermann, 1999) and highly influenced by cultural values and perceptions (Jenni & O'Connor, 2005; Owens, 2005). Sleep has a profound effect on the physical and mental health of individuals throughout their lifespan (Carskadon & Dement, 1994; Vassalli & Dijk, 2009). Emerging evidence suggest that sleep early in life is critical for normal brain development, and that perturbation of sleep within this sensitive periods may influence later adult behaviour (Kayser, Yue, & Sehgal, 2014). A growing body of evidence demonstrates significant associations between variations in sleep duration and quality, and children’s cognitive and academic functioning (for a comprehensive review see Gomez, Newman-Smith, Breslin, & Bootzin, 2011), behaviour (Bates, Viken, Alexander, Beyers, & Stockton, 2002; Paavonen, Porkka-Heiskanen, & Lahikainen, 2009; Sadeh, Gruber, & Raviv, 2002), physical health, including obesity (Bell & Zimmerman, 2010; Carter, Taylor, Williams, & Taylor, 2011; Jiang et al., 2009), and psychopathology (Alfano & Gamble, 2009; Paavonen et al., 2009). To date, studies of sleep in early childhood have focused almost exclusively on the effects of variations in timing, length and quality of night or total sleep duration (night and day sleep combined) on children’s development. Consequently research regarding the function and independent effect of day sleep or ‘napping’ within the early childhood period is scarce.
1.4.1 Napping Patterns in Early Childhood

During the early childhood years children’s sleep patterns are characterised by a gradual consolidation of night sleep, and a subsequent reduction in day sleep duration and frequency (Crosby, LeBourgeois, & Harsh, 2005; Iglowstein, Jenni, Molinari, & Largo, 2003; Weissbluth, 1995). Over time the polyphasic sleep/wake pattern seen in early infancy, where children sleep at multiple times during the day, give way to a biphasic sleep/wake pattern where children nap only once (usually by around age 2), and finally a predominantly monophasic pattern of a single night sleep, typical of that seen in adults.

Most studies agree that rates of napping decrease beyond age two, such that by the time children enter school most children will no longer be napping (Blair et al., 2012; Crosby et al., 2005; Iglowstein et al., 2003; Komada et al., 2012; Ottaviano, Giannotti, Cortesi, Bruni, & Ottaviano, 1996; Thorleifsdottir, Björnsson, Benediktsdottir, Gislason, & Kristbjarnarson, 2002; Weissbluth, 1995). Yet, there remains considerable cultural variation regarding the timing of cessation of napping for children over the preschool years. Studies of napping rates in children conducted in Italy (Ottaviano et al., 1996), Iceland (Thorleifsdottir et al., 2002), New Zealand (Carter et al., 2011), Switzerland (Iglowstein et al., 2003), the United Kingdom (Blair et al., 2012) and Japan (Komada et al., 2012) suggest dramatic reductions of napping, beyond age four, such that a minority of children (8.9%, 10%, 16%, <20%, <23% and 28% respectively) continue to nap. In contrast, studies of napping in childhood from the United States report higher rates, ranging from 38% to >70% for 4 year old children across studies (Acebo et al., 2005a; Crosby et al., 2005; Snell, Adam, & Duncan, 2007; Weissbluth, 1995).
Age is recognised as an important biological predictor of napping in children (e.g. Iglowstein et al., 2003). However, new evidence from studies using twin designs to examine relative environmental and genetic influences on early sleep patterns suggest an increasing sensitivity to environmental influence on daytime sleep across the early childhood period (Dionne et al., 2011; Fisher, van Jaarsveld, Llewellyn, & Wardle, 2012; Touchette et al., 2013). For example, Touchette et al. (2013) examined concordance in sleep patterns within monozygotic and dizygotic twin pairs across the first four years of life. They reported that the variance in napping accounted for by shared environment increased across time (79% variance at 48 months) and that longitudinal patterns of daytime sleep from 6 months to 48 months were largely influenced by shared environmental effects (62-98% variance explained). Whilst these studies suggest the importance of environmental influences on children’s napping patterns, the specific environmental factors that may influence children’s napping patterns are currently not well examined.

One potential, and previously unexplored, explanation for variation in napping rates in the preschool age group across studies may be related to the use, provision and practices of childcare services. Studies of children’s night-time sleep patterns and routines suggest that there are multiple social and environmental factors that will influence children’s sleep behaviours (Hale, Berger, LeBourgeois, & Brooks-Gunn, 2009; Hense et al., 2011; Iwata, Iwata, Iemura, Iwasaki, & Matsuishi, 2011; Milan, Snow, & Belay, 2007). Evidence from the home environment also indicates the potential for modification of napping behaviour, through napping promotion, which may well be mirrored in non-parental care settings. For example, Jones and Ball (2013) found that positive parent attitude to napping was associated with increased napping duration among preschool-aged children (Jones & Ball, 2013).
Despite the clear reductions in napping among children beyond age two years across existing studies (Crosby et al., 2005; Iglowstein et al., 2003; Ottaviano et al., 1996; Thorleifsdottir et al., 2002; Weissbluth, 1995), sleep or ‘rest’ periods remain an important feature of ECEC curricula right through to the time children enter school (Desjean-Perrotta, 2008; Fukuda & Sakashita, 2002). Whether a biological transition away from napping within the preschool period (Weissbluth, 1995) may be masked by constraints of ECEC settings, which prioritise and actively encourage daytime sleep, is unknown. To date, there have been no studies that have systematically compared differences in sleep related practices and children’s napping behaviours across the ECEC sector. However, across a range of small studies there are reports of high rates of napping (as high as 90%). These rates are found in samples that recruit those attending full-time childcare settings where sleep periods were obligatory (Ward, Gay, Anders, Alkon, & Lee, 2008) and childcare services in which mandatory naptimes are legislated (Ikeda, Kaneita, Kondo, Itani, & Ohida, 2012). These high rates indicate that there may be a strong effect of the ECEC environments on children’s napping behaviours.

1.4.2 Research on the Effects of Napping

Almost all of the current research evidence regarding the function and effects of napping has been conducted on adult populations (for review see Ficca, Axelsson, Mollicone, Muto, & Vitiello, 2010). In adults, napping is generally recognised as an effective means of easing the increasing propensity for sleep that occurs whilst awake (Achermann, 2004; Borb & Achermann, 1999). Studies with young and middle aged adults, using either laboratory-based experimental designs under conditions of sleep deprivation or intervention designs among shift workers with extreme sleep/wake schedules, suggest that napping may also compensate for the
effects of sleep deprivation on neurocognitive functioning. Napping in these contexts has been found to have benefits for procedural memory (e.g. Backhaus & Junghanns, 2006; Mednick et al., 2002; Mednick, Nakayama, & Stickgold, 2003), declarative memory (e.g. Lahl, Wispel, Willigens, & Pietrowsky, 2008; Schabus, Hödlmoser, Pecherstorfer, & Klösch, 2005), alertness and performance (e.g. Brooks & Lack, 2006; Gillberg, Kecklund, Axelsson, & Akerstedt, 1996; Hayashi, Motosuoishi, & Hori, 2005; Sallinen, Härnä, Åkerstedt, Rosa, & Lillqvist, 1998). Although these findings provide support for the positive benefits of napping on adult functioning, it should be noted that many of these studies have been conducted under specific experimental conditions. While napping in healthy adult populations may confer significant benefits, there is also growing recognition that this relationship is complex and likely moderated by a number of factors, including the timing and duration of the nap, experience with napping, and age (Ficca et al., 2010; Milner & Cote, 2009). For example, research in older adults suggests that napping within this age group is associated with greater risk for a range of health related issues, including cognitive impairment (e.g. Blackwell et al., 2006), falls (e.g. Stone et al., 2006), morbidity (e.g. Campbell, Murphy, & Stauble, 2005) and mortality (e.g. Stone et al., 2009). Due to the limited research evidence available for napping in child or infant populations, the function and effect of daytime napping on children’s neurocognitive performance and broader developmental outcomes is currently unknown (Ficca et al., 2010). For this reason, much of the current rationale for the importance of napping for preschool children is based on existing cultural beliefs and practices, alongside the generalisation of research from studies of night-time sleep in children and studies of napping in adult populations (Desjean-Perrotta, 2008).
To date, there are only a small handful of studies examining the effects of napping in children (for full review see Paper 1 – Systematic Review). Most of these studies have focused on the association between daytime napping and children’s night sleep (e.g. Acebo et al., 2005b; Fukuda & Asaoka, 2004; Fukuda & Sakashita, 2002; Komada et al., 2012; Ward et al., 2008). The existing studies consistently report an inverse relationship between napping in preschool children and children’s night-time sleep; including later sleep onset, reduced duration, and reduced quality of night-time sleep. Acebo et al. (2005) used both maternal report measures and active monitoring to examine sleep patterns of 169, 1- to 5-year-old children over a 1 week period and found that children still napping at ages 4 and 5 were found to have less nocturnal sleep than children who didn’t nap. A similar finding was also reported by Ward et al. (2008) in a sample of 52 children, aged 3 to 5 years, attending full-day childcare centres. Like Acebo et al. (2005) this study found a negative association between napping and night sleep, and additionally more night awakenings for children who napped. One interpretation of these findings is that day sleep may compensate for sleep debt incurred by shortened and interrupted night sleep. Two studies by Fukuda and Sakashita (2002) and Fukuda and Asaoka (2004), however, indicate an alternative direction of effect. These studies compared the sleeping patterns of children who attended Nursery schools in Japan, where children were required by the government to have an obligatory afternoon nap of 1.5 hours as part of their daily routine, to those attending kindergartens where nap periods were optional. Children in Nursery school settings went to bed later and had more sleep related difficulties than did children attending kindergartens (Fukuda & Sakashita, 2002). These effects were also observed into the elementary school years, well after the routine of afternoon naps had stopped (Fukuda & Asaoka, 2004). More recently,
Komada, et al. (2012) also reported a significant association between weekend nap duration and bedtimes on corresponding nights for children aged 2 to 5 years. Together these two studies suggest that promoting daytime sleep might result in disruption to night sleep, and that this disruption is perverse.

In 2011, Lam, Mahone, Mason, and Scharf published a study that examined the effects of napping on preschool children’s cognitive and behavioural functioning. This study used actigraphy, parent report, and standardised cognitive measures to examine the associations between daytime napping, night sleep and cognitive functioning in a sample of 59 typically developing 3 to 5 year-old children receiving full-time, centre based child care. This study showed that whilst children’s night sleep duration was positively associated with cognitive functioning, it had a negative association with napping. Increased napping was associated with both decreased night sleep and poorer outcomes on neurocognitive measures. Although not comprehensive, these initial studies raise two important points. First, that napping in preschool children cannot be assumed to be equivalent to nocturnal sleep and second, that napping in preschool children may not necessarily have the same effects as those found in adult populations.

1.5 THESIS RESEARCH PROGRAM

This thesis by publication includes key papers from a larger research program initiated by the PhD scholar during the period of her candidature and outlined in Figure 1. This research program developed out of an identified need to provide a comprehensive understanding of current sleep practices in ECEC, the effects of these practices on children’s sleep patterns, development and health, and to examine the role of sleep practices in ECEC from the perspective of educators, parents and children.
The papers selected for this thesis focus primarily on one specific element of sleep practice, mandatory naptimes. *Mandatory naptimes* are defined as a period during scheduled sleep times in which all children are required to lie on their beds without alternate activity permitted, regardless of whether they typically nap. This component of sleep time was identified as the chief focus for the current thesis for three key reasons. First, mandatory naptimes potentially represent the most extreme modification of normally occurring sleep patterns among preschool aged children. Given the large number of children who do not typically nap beyond the age of 4 years (Blair et al., 2012; Carter et al., 2011; Galland, Taylor, Elder, & Herbison, 2012; Igloewstein et al., 2003; Ikeda et al., 2012; Komada et al., 2012; Ottaviano et al., 1996; Snell et al., 2007; Thorleifsdottir et al., 2002), the allocation of a mandatory naptime for all children is unlikely to align with biological need. Second, mandatory sleep times in ECEC have been previously hypothesised to explain the association between attendance in nursery schools, and reduced sleep duration and increased sleep problems among children, although this hypothesis has not been directly tested (Fukuda & Asaoka, 2004; Fukuda & Sakashita, 2002). Finally, mandatory naptimes are increasingly controversial, due to the misalignment with contemporary pedagogical principles and practices that emphasise recognizing and responding to individual strengths, interests and needs, maximising learning opportunity and supporting increasing child autonomy (ACECQA, 2013a). Such concerns regarding the value of mandatory naptimes have importance beyond Australia (Fukuda & Asaoka, 2004; Fukuda & Sakashita, 2002). For example in the USA mandatory naptimes for preschool aged children have become a key point of controversy in which the value of sleep is pitched against opportunities for learning within ECEC programs (Owens, 2013).
Figure 1.1. Thesis research program aims and corresponding papers.

Establish current evidence and ECEC practice

Napping 0-5
Thesis Paper 1

Sleep practice
Thesis Paper 2

Stakeholder perspectives
Masters supervisions (see Appendix)
• Parents - Sinclair
• Child - Northard
• Educators - Inglis

Examine impact of mandatory naptime

Napping
Thesis Paper 2

Emotional climate
Thesis Paper 3

Night sleep
Thesis Paper 4

Translation to ECEC policy and practice

International context
Thesis Paper 5

Australian context
Thesis Paper 6

Child Health and Development

Postdoctoral program
• Impacts for non-sleepers
• Objective sleep measurement
• Effects for learning, behavior and health
• Sleep practices 0-3
• On-going translation into guidelines

Sleep and ECEC
Masters supervisions (see Appendix)
• Routines - Marriott
• Problem sleepers - Neil
1.6 PURPOSE

The purpose of this thesis was to assess the value of mandatory naptimes for preschool aged children within ECEC settings. Consistent with this purpose the primary aims and key research questions of this thesis were:

Aim 1: To examine the state of evidence and ECEC current practices regarding daytime sleep:
1) What is the current evidence regarding the effects of napping for young children? (Paper 1)
2) What are the prevalence and characteristics of mandatory naptimes for preschool aged children (3-6 years) in Australian ECEC? (Paper 2)

Aim 2: To examine the impact of mandatory sleep time for children and services:
3) Is there a relationship between mandatory naptimes and children’s nap patterns within ECEC settings? (Paper 2)
4) Is there a relationship between mandatory naptimes and the quality of interactions between children and educators within ECEC environments? (Paper 3)
5) Is there a relationship between duration of mandatory naptimes in ECEC and children’s concurrent and on-going night-time sleep? (Paper 4)

Aim 3: To provide direction for translation of the research evidence into sleep practice and policy in ECEC:
6) What does the evidence from sleep science tell us about sleep practice in ECEC settings? (Paper 5)
7) How should sleep be managed in Australian ECEC context within the frame of the National Quality Standards for Australia? (Paper 6)
1.7 SIGNIFICANCE

1.7.1 The significance of sleep in early childhood

Sleep has been described as the single most important activity of the brain during early childhood, and serves a crucial function in brain development (Dahl, 1996). From the first months of life, sleep is associated with growth, behavioral regulation, physical and emotional health, and learning (Ekelund et al., 2007; Tikotzky et al., 2010). Though only an emerging field, studies of young children’s sleep identify early childhood as a critical developmental period in which there is both a normative developmental transition and significant environmental influences that affect developing sleep patterns (Touchette et al., 2013). Across early childhood, sleep gradually consolidates into the night period. While infants have multiple sleep and wake periods across the day, by the second year of life most children have a single daytime sleep (biphasic sleep), and by the third year monophasic sleep, in which sleep occurs in a single night period, emerges (Iglowstein et al., 2003). Recent evidence from behavioural genetics suggests there is a critical window during early childhood in which environmental factors have a significant influence on these emerging sleep patterns (Dionne et al., 2011; Fisher et al., 2012). The evidence identifies early childhood as a critical period for intervention strategies both to establish sleep health and avoid sleep problems.

1.7.2 The significance of sleep health

Sleep problems in childhood are a significant health concern. Estimates from the Longitudinal Study of Australian Children suggest that almost 30% of Australian children aged 0-7 experience mild to severe sleep problems (Martin, Hiscock, Hardy, Davey, & Wake, 2007). The cost of these sleep problems is an estimated $27.5 million per annum in primary healthcare costs alone (Quach et al., 2013). This is not
surprising. Disruption to sleep has a range of adverse developmental and health consequences for both children and families (Martin et al., 2007). In childhood, disruption of normal sleep patterns has been independently associated with a range of key developmental and health outcomes; including raised risk for obesity (Carter et al., 2011), poor neurocognitive functioning (Touchette et al., 2007), impeded learning (Hupbach, Gomez, Bootzin, & Nadel, 2009), and behavioral problems (Paavonen et al., 2009). Childhood sleep disruptions also affect family functioning, parent productivity and well-being (Martin et al., 2007). Collectively this body of research directs attention to identification of early environmental influences on sleep and the potential to establish behaviors that achieve optimal lifetime sleep health.

1.7.3 The significance of sleep in ECEC

Almost all Australian children attend ECEC services during the early years of life (OECD, 2014). These services enable parent workforce participation and make a positive contribution to children’s early learning and development (Thorpe, Staton, Morgan, Danby, & Tayler, 2010a). All ECEC services have a legislated responsibility to cater for children’s sleep needs. The National Quality Standard (NQS) requires that “each child’s comfort is provided for and there are appropriate opportunities to meet each child’s need for sleep, rest and relaxation” (Quality Area 2: Element 2.1.2; ACECQA, 2013b). Yet there is limited evidence to guide educators in the most appropriate ways to meet these requirements and no evidence-based guidelines to support sleep practices in ECEC services in Australia, or internationally (Staton, Smith, & Thorpe, in press). The imperative for evidence is strong. Since the legislation of the NQS in 2012 there have been a number of legal challenges centred on the provision for sleep in ECEC services (ACECQA, 2013a).
The findings of this study relate to almost all children aged 3-5 years in Australia, as well as an increasing number of children internationally (OECD, 2014). Many of these children will experience a sleep period in an ECEC setting but there will be differences in how these are managed. By providing the first documentation, internationally, of current sleep practice in ECEC settings and their effects on children’s sleep patterns, this study contributes a much needed evidence base to inform early childhood practice and maximise sleep benefits and associated health outcomes for young children.

1.8 THESIS OUTLINE

This thesis by published papers is prepared in accordance with the Queensland University of Technology Thesis by Published Papers Guidelines (See Appendix B). The thesis is comprised of nine chapters. Chapter 1 provided an overview of the research background and outlined the purpose of the research and its significance. Chapter 2 sets the context of this research by providing a detailed overview of the background evidence that informs this thesis. Chapter 3 provides an overview of the research design and methodology. Chapter 4 through 9 includes each of the papers deriving from this thesis that are currently published, accepted or under review for publication. Finally, Chapter 10 provides an overview of the research findings and their implications, discusses the strengths and limitations of the research program, and proposes future directions for research and translation.
Chapter 2: Sleep in Early Childhood

This chapter provides an overview of research regarding children’s sleep patterns (section 2.1) and the known family, child and environmental antecedents of children’s sleep (section 2.2). Section 2.3 provides an overview of research examining the association between children’s early sleep patterns and broader developmental and health outcomes, providing examples across neurocognitive functioning, behaviour and risk of overweight and obesity. A summary of this chapter is provided in section 2.4.

2.1 SLEEP PATTERNS AND SLEEP DEVELOPMENT IN EARLY CHILDHOOD

The first five years of life mark an important period of human development (Fox, 2010; Shonkoff, 2010). Sleep during this time is characterised by dramatic changes in regulation, patterns, propensity and need (Carno, Hoffman, Carcillo, & Sanders, 2003; Davis, Parker, & Montgomery, 2004; Jenni & LeBourgeois, 2006). Although the mechanism for these changes remains uncertain, this process likely reflects the huge developmental maturation of brain structures that occur over this period (Jenni & LeBourgeois, 2006). In early infancy, children spend more hours asleep than awake, with children prior to 1 year of age sleeping approximately 13-15 hours per day in total (Galland, Taylor, Elder, & Herbison, In Press). Over the next 3 years, however, the need for sleep is observed to reduce, with children sleeping on average 11.5 hours a day by age 5 years. This reduction may be best accounted for by the dramatic reduction in day-time sleep (Sadeh, Mindell, Luedtke, & Wiegand, 2009). The shift from polyphasic (multiple daily sleep times), to biphasic (a sleep during the day and a more consolidated sleep period at night) and finally monophasic
sleep patterns (typical of that seen in adults) that occurs across early childhood, coincides not only with changes in total daily sleep time, but also in the length of children’s sleep periods and, likely, the way in which sleep is biologically regulated (Davis et al., 2004).

Sleep and wakefulness in humans can be understood via a two-process model of sleep regulation (Achermann, 2004; Borb & Achermann, 1999; Jenni & LeBourgeois, 2006). This predominant theoretical model explains sleep and wakefulness in terms of the interaction between two intrinsic biological processes. The first is a circadian process (Process C) characterised by alternating periods of increased and decreased sleep propensity across a 24-hour period, driven by an internal biological clock. The circadian propensity for sleep relates to endogenous hormonal processes that are influenced by environmental light-dark cycles and independent of prior sleep and wake periods. The second is a homeostatic process (Process S) in which the propensity for sleep increases the longer a person is awake and conversely decreases whilst asleep. Markers of this process include evidence of decreased sleep latency (sleep-onset time) and increased slow wave sleep propensity following periods of sleep deprivation (Achermann, 2004; Jenni & LeBourgeois, 2006). Although this and other models of sleep processes have been well defined in adult populations, their use in understanding sleep patterns in children has been less extensively examined (Jenni & Carskadon, 2007; Jenni & LeBourgeois, 2006).

Under the two process model of sleep regulation, the cessation of day-time sleep during the preschool period has been postulated to reflect changes in the speed of accumulation of sleep drive (Process S), with a faster accumulation over the first 12 months of life, where length of sleep periods increases dramatically, and a gradual reduction over time (Jenni & Carskadon, 2007; Jenni & LeBourgeois, 2006). This
reduction may be evidenced by an increase in sleep onset latency and a reduced ability to fall asleep during nap times, as well as a decrease in behaviours known to be associated with sleepiness during waking hours (e.g. increased irritability). Although it is known that the Process C component of the 2-process model develops, by around 3-months of age, the ways in which these two processes interact developmentally to establish sleep wake patterns has not been extensively examined.

2.2 PREDICTORS OF CHILDREN’S SLEEP PATTERNS AND SLEEP BEHAVIOURS

Although sleep is often viewed as a strictly biological process, there are many environment and cultural factors that affect the quality, quantity and timing of children’s sleep (Iwata et al., 2011; Owens, 2004; Touchette, Petit, Tremblay, & Montplaisir, 2009). The predictors of children’s sleep patterns and sleep behaviours can be broadly grouped into three main types: those that relate to the individual child’s characteristics (child factors), those that relate to family background characteristics (family background factors) and those that relate to the physical and interpersonal environment in which sleep occurs (environmental factors). An overview of these factors is provided in Figure 2.
2.2.1 Child Factors

Although there is considerable individual variation in sleep patterns between children (Jenni, Molinari, Caflisch, & Largo, 2007), studies of sleep patterns across time document age as of the single most important factors associated with variation in children’s sleep patterns and behaviours (e.g. Blair et al., 2012; Iglowstein et al., 2003). There are, however, a number of other child factors that have been identified as influencing children’s sleep. These include child temperament (e.g. Atkinson, Vetere, & Grayson, 1995), the presence of neurological and developmental disorders (e.g. Goldman, Malow, Newman, Roof, & Dykens, 2009; Konofal, Lecendreux, & Cortese, 2010), early perinatal adversity (e.g. Nevarez, Rifas-Shiman, Kleinman, Gillman, & Taveras, 2010) and gender (e.g. Acebo et al., 2005a).

A number of studies have shown that child temperament has significant implications for sleep patterns and sleep behaviours in young children (e.g. Hayes,
McCoy, Fukumizu, Wellman, & DiPietro, 2011; Touchette et al., 2005). Most of the studies examining the association of sleep and temperament have focused on infants and toddlers (Carey, 1974; Hayes et al., 2011; Jimmerson, 1991; Sadeh, Lavie, & Scher, 1994; Weissbluth, 1984), however, a small handful of studies have also examined this association for children and adolescents (Atkinson et al., 1995; El-Sheikh & Buckhalt, 2005; Moore, Slane, Mindell, Burt, & Klump, 2011; Owens-Stively et al., 1997). While reports of a significant relationship between temperament and sleep problems are relatively consistent, due to the correlational designs of these studies, disentangling cause and effect remains difficult (Scher, Epstein, Sadeh, Tiros, & Lavie, 1992; Touchette et al., 2009). That is, it is unclear if difficult temperaments precede or are reflective of sleep problems, or indeed whether difficulties reflect possible parental responses to child behaviours (Hayes et al., 2011; Hayes, Parker, Sallinen, & Davare, 2001; Owens-Stively et al., 1997).

Difficulty in distinguishing cause and effect in these studies is further compounded by the reliance in many studies of parent report of both sleep and temperament, introducing potential issues of reporter bias (Hayes et al., 2011; Scher et al., 1992). A large body of studies have examined the co-morbidity of diagnosed neurological and developmental disorders and sleep behaviours (for review see Alfano & Gamble, 2009; Owens & Witmans, 2004; Touchette et al., 2009). For example, Anders, Iosif, Schwichtenberg, Tang, and Goodlin-Jones (2011) found that, when compared to developmentally matched typically developing children, those with autism and developmental delay demonstrated significantly greater variations in sleep patterns over a 6-month period. Schwichtenberg, Iosif, Goodlin-Jones, Tang, & Anders (2011) further report significant variations in napping patterns across these three groups. Increased sleep disruptions are also known to exist for a number of
other disorders including attention-deficit hyperactivity disorder, anxiety disorders and depression (Alfano & Gamble, 2009). Although the co-morbidity between different disorders and sleep patterns is widely accepted (Alfano & Gamble, 2009; Owens & Witmans, 2004), to date these associations have not been examined in multi-factorial analysis that might elicit the potential mechanisms for this relationship (Touchette et al., 2009). For these reason, the possible bidirectional relationship between sleep problems and neurological and developmental disorders is, as yet, not fully understood.

There is also some evidence that sleep patterns and sleep problems may be associated with characteristics of early perinatal adversity, although findings in this area are mixed (Blair et al., 2012; Nevarez et al., 2010; Pesonen et al., 2009). Inconsistent findings have also been reported regarding the association between gender and children’s sleep, with some studies reporting associations between gender and specific sleep behaviours (Blair et al., 2012; Iwata et al., 2011), while others report no gender effect (Atkinson et al., 1995). The discrepancies in findings between studies may reflect variation in the choice of outcome measures used, as well as potential interactions between age and gender (Acebo et al., 2005a).

### 2.2.2 Family Background Factors

Family background factors affect both the physical and emotional environment within which children’s sleep occurs and have been shown to be associated with sleep patterns and sleep problems in young children (Jenni & O’Connor, 2005; Touchette et al., 2009). The family factors identified as associated with sleep behaviour include family socio-economic status (Acebo et al., 2005a; Arman et al., 2011; Hale et al., 2009), parent age (Sadeh, Raviv, & Gruber, 2000), parent education (Blair et al., 2012; Hale et al., 2009; Sadeh et al., 2000), family
structure (Blair et al., 2012; Hale et al., 2009) and racial or ethnic background (Blair et al., 2012; Crosby et al., 2005). To date the direct or indirect pathways explaining these associations are not well understood (Jenni & O'Connor, 2005; Touchette et al., 2009). One likely candidate may be an association between family background factors and parental practices relating to sleep time (Hale et al., 2009; Hale, Berger, LeBourgeois, & Brooks-Gunn, 2011). For example, parent-initiated sleep routines have been shown to be significantly associated with socio-economic status, parent education and household size (Hale et al., 2009). Such practices have also shown to directly influence sleep related difficulties and sleep patterns during the early childhood period (Hale et al., 2011; Johnson & McMahon, 2008; Mindell, Sadeh, Wiegand, How, & Goh, 2010; Morrell & Cortina-Borja, 2002; Sadeh et al., 2009). Other potential mechanisms may include the inter-correlation between family background variables and other environmental factors such as family stress (Sadeh et al., 2000) and constraints due to work and lifestyle arrangements (Iwata et al., 2011). There are also distinct cultural variations in sleep practice. Traditions pertaining to sleep vary both within (Milan et al., 2007; Nevarez et al., 2010) and across (Mindell, Sadeh, Kohyama, & How, 2010) geographical locations, and relate not only to variations in climate and seasonality but also to belief systems (Jenni & O'Connor, 2005).

### 2.2.3 Environment Factors

Children’s sleep patterns and sleep related difficulties have also been shown to be associated with a wide range of environmental factors (Owens, 2004; Touchette et al., 2009). This include both those directly pertaining to sleep, for example sleep routines (Hale et al., 2011; Johnson & McMahon, 2008; Mindell, Sadeh, Kohyama, et al., 2010; Morrell & Cortina-Borja, 2002; Sadeh et al., 2009), and sleep settings
(Cain & Gradisar, 2010; Li et al., 2010; Mindell, Meltzer, Carskadon, & Chervin, 2009; Spruyt, O’Brien, Cluydts, Verleye, & Ferri, 2005), as well as broader environment factors such as daytime activities (Iwata et al., 2011; Li et al., 2010; Nevarez et al., 2010), family lifestyle (Iwata et al., 2011; Li et al., 2010), family stress (Sadeh et al., 2000) and marital instability (Mannering et al., 2011).

A number of studies have examined the relationship between parent interactions and practices around sleep times and children’s sleep behaviours (Hale et al., 2011; Johnson & McMahon, 2008; Mindell, Meltzer, et al., 2009; Mindell, Sadeh, Kohyama, et al., 2010; Mindell, Telofski, Wiegand, & Kurtz, 2009; Morrell & Cortina-Borja, 2002; Sadeh et al., 2009; Touchette et al., 2005). These studies suggest that parental approaches to sleep are an important predictor of sleep problems and a potential area for intervention (Mindell, Kuhn, Lewin, Meltzer, & Sadeh, 2006; Mindell, Telofski, et al., 2009; Morgenthaler et al., 2006). For example, Hale, et al. (2011) showed that for a sample of primarily disadvantaged children aged 3- to 5-years ($N=4898$), the use of language based bedtime routines by parents, such as reading a story or singing, were associated with increased sleep duration in this group. Similarly, Morrell and Cortina-Borja (2002) report that when comparing parent practices between children with and without sleep problems, children with sleep problems were more likely to have parents who employed more active physical comforting practices, such as rocking or patting, and less encouraging autonomy practices, such as playing a musical tape or offering a special toy. Although the sample for this study was quite young, with data collected at 13-months-old ($N=467$) and again at 26 months ($N=259$), similar findings also have been reported in older cohorts (Johnson & McMahon, 2008; Mindell, Meltzer, et al., 2009). For example, Johnson and McMahon (2008) found that for children aged 2-5 years ($N=110$), the
number of parent interactions at bedtime was positively predictive of more sleep related problems.

The ability to establish the direction of effect within these studies is difficult. Whether sleep problems are a result of, or maintained by, parental interactions, or alternatively parent behaviours develop as a response to sleep related problems, is currently debated (Johnson & McMahon, 2008). However, a number of intervention studies showing the positive effects of behavioural changes in parent interactions around sleep time (Mindell et al., 2006; Mindell, Telofski, et al., 2009; Morgenthaler et al., 2006), suggest that parents strategies, at the very least, provide a point of focus for the management of sleep problems. Further studies using longitudinal designs to elucidate the mechanisms of the relationship between parent strategies and children’s sleep patterns are needed.

While there is consistent evidence for a relationship between parent practices and children’s night-time sleep, few studies have independently examined this relationship in regards to day-time napping. Mindell, Sadeh, Kohyama, and How (2010) in a study of 29,287 infants aged 0 to 36 months across 17 geographical regions, found that while increased parent interactions were strongly predictive of night-time sleep patterns, particularly in predominately Caucasian regions, developmental age was the primary predictor of day-time sleep duration at age 2, with only minor contributions from parental behaviour and sleep ecology. Whether other predictors become more important later, when a more pronounced shift from polyphasic to monophasic sleep emerges (Blair et al., 2012; Davis et al., 2004), is currently unknown. Further studies of the role of parental behaviours in regards to variations in children’s day-time sleep patterns, particularly during the preschool period, are needed. These studies should also include investigation of the potential
effects of sleep strategies used by other significant care providers, such as those within the childcare context, on children’s sleep patterns. Understanding the effects of carer strategies on children’s napping and night-time sleep patterns in these contexts is a significant issue, given that a of the majority of children attending early education and care environments (OECD, 2014), that the rate of sleep problems within this age group is high (Hiscock, Canterford, Ukoumunne, & Wake, 2007; Ottaviano et al., 1996; Simola et al., 2010) and the current evidence of association between sleep related practices and children’s sleep behaviours (Hale et al., 2011; Johnson & McMahon, 2008; Mindell, Sadeh, Kohyama, et al., 2010; Morrell & Cortina-Borja, 2002; Sadeh et al., 2009).

To date, most studies interested in the predictors of children’s sleep patterns have focused on children’s night-time sleep patterns (e.g. Acebo et al., 2005a), nocturnal sleep duration (e.g. Hale et al., 2011) and sleep problems (e.g. Johnson & McMahon, 2008). Fewer studies have reported on factors influencing children’s day-time sleep behaviours (Thorleifsdottir et al., 2002; Weissbluth, 1984), particularly during the preschool period where considerable variation in the rates of day-time sleep exists (Crosby et al., 2005; Iglowstein et al., 2003; Thorleifsdottir et al., 2002; Weissbluth, 1984). The small number of extant studies have focused primarily on child and family demographic variables: including Socio-economic status (SES; Lavigne et al., 1999), racial identity (Crosby et al., 2005), gender (Weissbluth, 1995) and neurodevelopment disorders (Schwichtenberg et al., 2011).

2.3 CHILDREN’S SLEEP PATTERNS AND LEARNING, BEHAVIOUR AND HEALTH

Child sleep patterns and behaviours have been implicated as a factor affecting a broad range of developmental outcomes. The quantity, quality and regulatory of sleep effects cognitive, behavioural, social and physical functioning (Alfano &
Gamble, 2009; Sadeh, 2007). Research of the effects of children’s sleep on development during the preschool period has centred on five main areas: 1) cognition, 2) behaviour, 3) obesity, 4) psychopathology (e.g. Alfano & Gamble, 2009; Paavonen et al., 2009), and 5) physical injuries (e.g. Owens, Fernando, & Mc Guinn, 2005). Overall, these studies suggest that short sleep duration and sleep disruptions during early childhood may have important consequences how children think, act and feel. As key exemplars, the current evidence of the associations between child sleep and (1) cognition, (2) behaviour and (3) obesity below is reviewed below.

2.3.1 Children’s Sleep and Cognition

That sleep has significant implication for the cognitive functioning of individuals throughout the lifespan has been well documented (Maquet, 2001; M. P. Walker, 2009). Although much of the early evidence regarding the role of sleep in cognitive functioning was derived from adult populations, over the last two decades there has been a growing interest in the effects of sleep disruption on cognitive functioning and academic performance in child and adolescent populations (Astill, Van der Heijden, Van Ijzendoorn, & Van Someren, 2012; Curcio, Ferrara, & De Gennaro, 2006; Gomez et al., 2011; Sadeh, 2007; Sadeh et al., 2002). Most studies, whether employing correlational or experimental designs, suggest a relationship between sleep disruption and reduced cognitive and academic functioning in young children (Fallone, Acebo, Arnedt, Seifer, & Carskadon, 2001; Geiger, Achermann, & Jenni, 2010; Jung, Molfese, Beswick, Jacobi-Vessels, & Molnar, 2009; Molfese, Beswick, Molnar, & Jacobi-Vessels, 2009; Sadeh, Gruber, & Raviv, 2003; Touchette et al., 2007). However, there are variations in the direction and specificity of findings (Geiger et al., 2010; Nixon et al., 2008; Paavonen et al., 2010; Sadeh et al.,
For example, there is some evidence that sleep deprivation in children may be more detrimental to performance on more complex cognitive tasks than on simple cognitive tasks (Sadeh et al., 2002). In addition, Paavonen, et al. (2010) found that short sleep duration in children aged 5 to 9 years was associated with lower visuo-spatial abilities, but not verbal abilities. However, studies in younger children have replicated this finding (Molfese et al., 2009; Touchette et al., 2007).

One explanation for the variation seen across studies may be that sleep is differentially associated with varying cognitive functions across ages. Most studies of sleep and cognition in children have focused on single age point (Geiger et al., 2010; Molfese et al., 2009; Paavonen et al., 2010). However, a handful of studies examining differences across multiple age groups or for a single cohort across time suggest that levels of association may be dependent on age (Friedman, Corley, Hewitt, & Wright, 2009; Sadeh et al., 2002; Touchette et al., 2007). More specifically these studies suggest that younger children may be more vulnerable to the effects of sleep deprivation or disruptions (Sadeh et al., 2002; Touchette et al., 2007). Touchette, et al. (2007) reported on a prospective study of 1492 children tracked from age 2.5 through to 6 years. Rather than measuring sleep at a single time point, these authors grouped children’s sleep patterns in terms of developmental trajectories. They found that children who had chronically shorter sleep duration during early childhood, had increased risk of low performance for receptive language at age 6. In addition they found that children who showed short sleep duration at age 3 had increased risk of poorer performance for non-verbal intellectual skills. Notably, even those with improved sleep beyond age 3 were at higher risk of poorer cognitive functioning at age 6, suggesting possible long-term consequences of early sleep disruption on children’s cognitive development. Similarly a handful of studies
examining the differential effects of sleep on cognitive functioning in relation to family background factors, such as SES, parent education and racial group, suggests that the association between sleep and cognition may be moderated by other environmental factors (Buckhalt, El-Sheikh, & Keller, 2007; Buckhalt, El-Sheikh, Keller, & Kelly, 2009).

To date most studies of children have focused on demonstrating a link between sleep disruption and cognitive or academic functioning (Sadeh, 2007). There has been far less focus on the possible mechanisms that may explain this relationship. There are currently two primary hypotheses regarding the underlying mechanisms explaining the relationship between sleep disruptions and cognition. The first proposes that sleep may play an active role in a range of cognitive processes including cognitive maturation and learning consolidation. This hypothesis is supported by a range of studies showing that pre-sleep learning may be enhanced following sleep periods (M. P. Walker, 2009). The second hypothesis relates to the role of sleep disruption in consequent day-time sleepiness. Although measured in varying ways, studies of day-time sleepiness suggest that children and adolescence with less night sleep and more sleep disruptions show increased levels of day-time sleepiness (Fallone et al., 2001; Sadeh et al., 2003). In turn, day-time sleepiness, and particularly excessive daytime sleepiness, has been found to affect performance on cognitive functioning tasks (Calhoun et al., 2012). Whether different cognitive or academic tasks evoke different explanatory mechanism is unclear. The field is emerging and explanation of the link between cognition and sleep for children is an ongoing focus of research (Astill et al., 2012).
2.3.2 Children’s Sleep and Behavioural Difficulties

Overwhelmingly, studies identify children’s behavioural difficulties as associated with increased sleep related problems (Bates et al., 2002; Goodlin-Jones, Tang, Liu, & Anders, 2009; Gregory, Eley, O’Connor, & Plomin, 2004; Gregory & O’Connor, 2002) and reduced sleep duration (Komada et al., 2012; Lavigne et al., 1999; Paavonen et al., 2010). More specifically, these studies suggest that children’s sleep may be particularly important in regards to reports of externalising behaviours (Goodnight, Bates, Staples, Pettit, & Dodge, 2007; Komada et al., 2012; Lavigne et al., 1999). However associations with internalising behaviours have also been reported (Shang, Gau, & Soong, 2006).

Methodological differences are important to note in studies examining the link between sleep and behaviour, particularly in relation to the focus samples. A number of sampling approaches have been used. These examine five distinct samples: (i) children presenting with sleep problems (e.g. P. Lam, Hiscock, & Wake, 2003; Owens-Stively et al., 1997), (ii) children presenting with behavioural problems (e.g. Lavigne et al., 1999), (iii) children presenting with diagnosed psychiatric disorders (e.g. Sadeh et al., 1995), (iv) children presenting with evidencing developmental delays or neurocognitive functioning difficulties (e.g. Goodlin-Jones et al., 2009) and, finally, (v) general non-clinical, population of children (Paavonen et al., 2009). In addition, due to the correlational design of most studies in this area, the direction of such associations between sleep and behaviour is not clear (Bates et al., 2002). Whether sleep problems precede or are a result of behavioural difficulties, or a marker of underlying neurological difficulties that may lead to both, remains debated.

A number of studies have examined the association between sleep and behaviour in non-clinical preschool samples of children among preschool aged
children (Bates et al., 2002; Goodlin-Jones et al., 2009; Gregory et al., 2004; Gregory & O'Connor, 2002; Komada et al., 2012; Lavigne et al., 1999; Paavonen et al., 2009; Paavonen et al., 2010). Most of these studies have relied on cross-sectional, correlational designs in which sleep and behaviour was reported at a single time point. However, a small number of prospective studies examining the relationship between sleep problems in early childhood and later behavioural difficulties have emerged (Goodnight et al., 2007; Gregory et al., 2004; Gregory & O'Connor, 2002).

Gregory, Eley, O’Connor and Plomin (2004), for example, demonstrated that sleep problems at age 3 years were a significant predictor of behavioural difficulties at age 7, whilst controlling for stability in sleep related difficulties across time. Gregory and O'Connor (2002) also showed a significant association between sleep difficulties at age 4 and behavioural difficulties in early adolescence.

To date, only two studies have examined the association between napping behaviours and behavioural outcomes in preschool children (J. C. Lam et al., 2011; Yokomaku et al., 2008). Contrary to reports regarding night-time sleep (Komada et al., 2012; Lavigne et al., 1999; Paavonen et al., 2010), Yokomaku et al. (2008) in a sample of 135 children aged 4-6 years reported that longer nap duration was associated with greater levels of behavioural difficulty including social withdrawal and thought problems. More recently, J. C. Lam, et al. (2011) in a study of 59 children aged 3 to 5 years, found no significant association between napping in childcare and parent reports of behavioural problems. Studies of the relationship between napping and behaviour are only emerging, but suggest the need to consider the context in which sleep occurs.
2.3.3 Children’s Sleep and Obesity

There is growing evidence that disruptions in sleep in childhood may have a considerable effect on an individual life-long physical health (Amin et al., 2002; de la Eva, Baur, Donaghue, & Waters, 2002; Flint et al., 2007; Gozal & Kheirandish-Gozal, 2008). One particular focus of interest is the association between sleep patterns and body mass index (Patel & Hu, 2008). Currently one in four Australian children aged 5 to 17 years are classified as overweight or obese (Australian Bureau of Statistics, 2009). These rates reflect global trends over the last two to three decades that have seen a dramatic rise in the prevalence of childhood obesity across both developed and developing nations (World Health Organization, 2011). The potential lifelong health implications of such trends are alarming (Dietz, 1998; Lobstein, Baur, & Uauy, 2004; J J Reilly et al., 2003). Recognition of the significant public health cost of childhood obesity and the related health sequelae on future generations have led to a strong push to identifying effective targets for intervention (Doak, Visscher, Renders, & Seidell, 2006; Hesketh & Campbell, 2010). Sleep is considered as one such candidate (Marshall, Glozier, & Grunstein, 2008).

To date, studies using both cross-sectional and prospective designs have reported a relatively consistent finding in which short sleep duration in childhood is associated with higher body mass index (BMI; for systematic review and meta-analyses see Cappuccio et al., 2008; Chen, Beydoun, & Wang, 2008; Patel & Hu, 2008). Although these findings have been have been reported for studies of adolescent and adult populations (for review see Cappuccio et al., 2008; Patel & Hu, 2008), they are most consistent in childhood where short sleep duration has been found to be independently associated with increased BMI and increased risk of overweight and obesity both during childhood (Agras, Hammer, McNicholas, &
There has also been some evidence to suggest that the relationship between sleep duration and BMI may be particularly important during the preschool period. Snell et al. (2007) examined the association between sleep duration and timing (bedtime and wake-time) and follow-up BMI for a cohort of 1,441 children aged 3-12 years. The authors report that increased sleep time, earlier bed-time and later wake-time was associated with lower BMI for children at follow-up (5 to 6 years later), and that this finding was more pronounced for younger than for older children. A similar pattern has also been reported by Bell and Zimmerman (2010). Their study examined the effects of night-time sleep duration on later BMI for a cohort of 1,930 children aged 0-13 years. The authors report that for younger children (aged 0 to 59 months at baseline), short night-time sleep duration significantly increased the odds of being overweight and obese at follow-up (5 years later), even after controlling for confounding variables in analyses. This association was not found, however, for older children who experienced short sleep duration beyond age 5. There has also been mixed findings for studies that have specifically examined the association between BMI and short-sleep duration during early infancy (prior to the second year) and the preschool period (from 2 to 5 years). Touchette, et al. (2008) in a study that tracked 1492 children from 5 months to 6 years found that children who experienced consistently short sleep durations between 2 and 5 years had an increased risk of being overweight or obese at age 6. Interesting in this study, children who exhibited early short sleep duration, but had improved sleep after age 2.5 did not have a
significantly increased risk of being overweight or obese, once controlling for confounding variables. Taken together, these findings have led to the suggestion that there may be a ‘critical period’, possibly between ages 2 and 5 years, in which the association between short sleep duration and body composition is most pronounced.

Not all studies have supported the association between sleep duration and BMI. Hiscock, Scalzo, Canterford and Wake (2011) for example found no significant short-term association between sleep duration and obesity for children age 0-1, 2-3 or 4-5 years in a large Australian cohort (N=9070). However they report an association between sleep and obesity at age 6-7. Interesting this study used total sleep (a combination of day and night sleep combined) to define sleep duration. While some researchers have suggested that reduction in day-time sleep best accounts for the association between short-sleep duration and overweight status in the early childhood period (Agras et al., 2004), other studies do not report such an association (Jiang et al., 2009; Touchette et al., 2008). Jiang, et al. (2009) report no independent association between day-time nap duration and BMI for 3- to 4-year old children (N=1311) Similarly, Touchette, et al. (2008) found that the odds of being overweight or obese were not associated with children’s napping patterns in children aged 2.5 years. Both these studies did, however, find significant associations between night-time sleep and weight-related outcomes. Whether the lack of significant findings reported by Hiscock et al. (2011) are due to confounding effects of the inclusion of day-time sleep in analysis is unclear. Given the association between night sleep and obesity rates in young children, sleep practices may therefor have a genuine role both the promotion and intervention of obesity in young children.
2.4 SUMMARY AND IMPLICATIONS

In summary, the current evidence from sleep science identifies children’s sleep as a significant predictor of development. Research from studies within the preschool period identify night-time sleep as having a critical role in child functioning, with demonstrated relationship with key indices of child health and development; including neurocognitive functioning, behavioural difficulties and weight-status. In addition, evidence of the antecedents of children’s night-time sleep suggests an important role of environmental factors in the establishment of early sleep patterns. Such environmental factors are potentially even more important for daytime sleep patterns; where new data from behavioural genetics studies suggest a potentially greater influence of shared environmental effects on this component of sleep. The study of the contribution of daytime sleep to development is emergent. While daytime sleep represents a normal component of a child’s early sleep patterns, research evidence regarding this component of sleep is limited.

In Chapter 1, the potential of ECEC environments to affect sleep patterns was outlined. The universal attendance of preschool aged children in ECEC programs and the potential role of ECEC in affecting daytime sleep, identify the value of the current study. This study presents the first conducted within ECEC to observe and measure sleep, the ECEC environment and their interaction. The findings present the potential to have wide reaching implications for children learning, development and health.
This chapter provides an overview of the research program design (section 3.1); including details of the *E4Kids study* (section 3.2) and *Sleep Observation Study* (section 3.3) within which papers 2-4 of this thesis were undertaken. Additional details of individual measures and approached to each study are provided within the methods section of each of the papers.

### 3.1 RESEARCH PROGRAM DESIGN

The research program undertaken by the PhD candidate included data collection across three key studies: the E4Kids study, the Sleep in Early Childhood Study and the Sleep in Childcare study. An overview of each of the studies and their relationship is shown in Figure 3, and further details of the E4Kids and Sleep Observation studies are included below. Data analysed within papers 2, 3 and 4 of this thesis manuscript primarily derive from that collected as part of the Sleep Observation Study, embedded within the E4Kids study. The included papers within this manuscript do not include data collected as part of the Sleep in Childcare Study, however detail of the methods used for this study, which was conducted during the period of the students candidature is provided in Appendix C, and a published abstract deriving from analysis conducted for this study is shown in Appendix A (Staton et al. 2013).
Figure 3.1. Overview of PhD research program studies.

**E4Kids Study**
- **Full Title:** Assessing the effectiveness of early childhood education and care programs in Australian communities
- **Sample:**
  - N ≈ 250 ECCE programs in Queensland and Victoria
  - N ≈ 2000 preschool aged children attending these programs in the year prior to school
- **Design:** Longitudinal study with children tracked from year prior to school until third grade
- **Methods:**
  - Direct observation of process and structural quality in ECCE,
  - Direct cognitive, social and anthropometric measurement of study children
  - Parent, teacher and director report of child, family and service characteristics
- **Funding:** Australian Research Council Linkage Projects Scheme, the Victorian Government Department of Education and Early Childhood Development, and the Queensland Government Department of Education and Training.

**Sleep Observation Study**
- **Full Title:** Sleep in early childhood study
- **Sample:**
  - N= 130 long day care and kindergarten rooms in Queensland participating in the E4Kids study
  - N= 2114 preschool aged children attending these programs
  - N = 239 focus children participating in the E4Kids study
- **Design:** Naturalistic observation study of sleep practice and children’s sleep patterns
- **Methods:**
  - Teacher report of sleep policy and changes in practice across the week/year
  - Observation of sleep practice, including emotional quality, teacher strategies, classroom management
  - Observation of child response, including counts of children asleep, awake, doing activities, disruptive/distressed
- **Funding:** Institute of Health and Biomedical Innovation, Queensland University of Technology.

**Sleep in Childcare Study**
- **Full Title:** Optimising sleep health for Australian children: Understanding the effects of daytime sleep periods in childcare services
- **Sample:**
  - N= 6 long day care rooms in Brisbane, Queensland drawn from the 130 rooms observed as part of the Sleep Observation Study
  - N= 62 preschool aged children attending these rooms
- **Design:** 2 (room policy: mandatory of flexible sleep) x 2 (napping status: habitual or non-habitual napper) design
- **Methods:**
  - 2-week recording of sleep/wake using actigraphy
  - Diurnal sampling of cortisol Observation of childcare practice and child response to practice
  - Parent report of night-time sleep patterns and sleep related difficulties
- **Funding:** Foundation for Children
3.2 THE E4KIDS STUDY

This thesis was embedded within the Australian Research Council Linkage project (ARC LP0990200) ‘Assessing the effectiveness of early childhood education and care programs in Australian communities’ (E4Kids) for which the candidate was funded as an Australian Postgraduate Award (Industry) Scholar. E4Kids is a 5-year longitudinal study examining the effectiveness of ECEC programs, by tracking their impact on education, health and equity outcomes in a large cohort of over 2000 3- to 4-year-olds living in four Australian communities (see http://www.e4kids.org.au). The E4Kids study commenced in 2010 and used a stratified random sampling framework to recruited a representative sample of ECEC services, stratified by services socio-economic status (SEIFA); service location (metropolitan, rural, remote) and service type (e.g. long day care, kindergarten) (Tayler, Ishimine, Cloney, Cleveland, & Thorpe, 2013). Recruitment occurred across four study sites; two in the state of Queensland, Brisbane (metropolitan) and Mt Isa (remote), and two in the state of Victoria, Melbourne (metropolitan) and Shepparton (rural). Within each study site all children within study rooms were invited to participate, with the aim of providing a representative sample of children attending ECEC services in Australia.

The E4Kids study included four primary aims, as shown in Figure 3.2. The current thesis aligned with Aim 1 of the E4Kids study; to assess the quality of ECEC within the Australia context. The original conceptualisation of quality in ECEC within the E4Kids study did not include a specific focus on sleep times and indeed the examination of sleep practice or policy or child sleep behaviours did not fall under the original mandate for this study. Accordingly the key focus of this thesis - sleep practices within ECEC – aligned well with, but was independent of the broader E4Kids study focus.
Figure 3.2. E4Kids study aims and alignment of current thesis program.
An overview of the measurement approaches used by the E4Kids study is provided in Appendix D. Existing measurement for the E4Kids included direct observation of both structural (ECERS-R; Harms, Clifford, & Cryer, 2003) and process (CLASS; Pianta, La Paro, & Hamre, 2008) quality of ECEC settings. The original protocol for these observations did not provide detailed measurement of sleep time, with the CLASS observations explicitly ceasing during sleep periods. The broader E4Kids methodology also included direct and parent report measurement of child development, behaviour and health. Despite the wide mandate of the E4Kids study, prior to commencement of this thesis the E4Kids study did not include measurement of children’s sleep patterns or behaviours (either in ECEC or at home). In response to the need identified in Chapters 1 and 2 to examine sleep practices within ECEC and their implications for children’s sleep more broadly, additional measurement was developed and implemented by the candidate for the purpose of this thesis.

3.2.1 Parent and ECEC Educator Reported Sleep Measures

To measure children’s sleep behaviours and ECEC sleep policies, a number of survey items were also developed for inclusion within the existing parent (Appendix E) and ECEC educator (Appendix F) surveys of the E4Kids study. Items included within the teacher and director surveys were designed by the candidate and based on prior screening data collected from observations in ECEC settings (see below) as well as theoretical questions regarding sleep practices as described in Chapter 1.

Parent survey sleep items were brief to conform with limitations set out by the E4Kids executive and were modelled off those previously utilized by large longitudinal cohort studies, including the Longitudinal Study of Australian Children (LSAC) (Hiscock et al., 2007). The selection of items used across these studies also
ensured consistency and comparability of measurement across studies. Alongside standard measures of sleep patterns, items were also developed by the candidate to specifically measure napping behaviors and parents preferences and beliefs regarding sleep within ECEC settings. Although not directly reported within the papers of this thesis, these additional items formed the basis of sub-studies undertaken by masters students co-supervised by the candidate during the period of their candidature (see Appendix A).

### 3.3 SLEEP OBSERVATION STUDY

Observation of sleep practices in ECEC settings were completed as part of the Sleep Observation Study outlined in Figure 3.1. The sleep observation study was conducted alongside the E4Kids study and included direct observation of sleep policies, practices and children’s sleep patterns across all rooms participating in the E4Kids study in Brisbane and Mt Isa, Queensland, during 2011. At this time, which corresponded with the second year of the E4Kids study, 239 children who were participating in E4Kids were attending centre-based ECEC (kindergarten and long-day care) settings in Queensland. Observations were conducted across all ECEC rooms attended by these children, providing a total of 130 ECEC rooms for observation. Measurement of sleep periods in ECEC settings were not originally included as part of the primary E4Kids project. Therefore, in order for direct observation of sleep policies and practices across all ECEC services to be undertaken, spate additional funding was required. With the assistance of the PhD candidates supervisory team an application for an internal competitive university Strategic Seeding Grant was submitted and awarded by the Institute of Health and Biomedical Innovation at Queensland University of Technology to conduct these observations. This grant formed the basis of the Sleep Observation Study.
3.3.1 The Sleep Observation Measure for ECEC

The sleep observation study is the first study to conduct standard observations of sleep practices across a large number of ECEC settings. In order to document sleep practices and policies in ECEC, alongside children’s responses to these practices, the candidate undertook the development of a detailed standard observation protocol, The Sleep Observation Measure for ECEC (SOME). The development of the SOME occurred in 3 key stages as outlined in Figure 3.3.

Figure 3.3. Steps in the development and implementation of the Sleep Observation Measure for Early Childhood Education and Care (SOME).

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<tr>
<th>1. Development of Brief Screening Protocol</th>
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<td>• Development of a brief screening protocol</td>
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<td>• Screening of sleep practices (N=108 rooms)</td>
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<td>• Preliminary analysis of screening data</td>
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<th>2. Full Sleep Observation Protocol</th>
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<td>• Development of full observation protocol</td>
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<td>• Piloting of full observation protocol</td>
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<td>• Revision and modification</td>
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<th>3. Implementation</th>
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<td>• Training of field researchers</td>
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<td>• Implementation of full protocol</td>
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<td>• Inter-rater reliability</td>
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3.3.1.1 Brief Sleep Policy and Practice Screening Tool

To provide an initial overview of the variability in sleep practice across services and establish the viability of measurement within this context, a brief sleep policy and practice screening tool was initially developed (see Appendix G) and implemented. The brief observation tool was designed to allow for minimal cost screening of sleep practices across E4Kids services during the first wave of observation conducted in 2011. At this time additional funding for full sleep observations had not yet been secured and the data from this screening provided an indication of the likely costs of undertaking this work. The brief, single-page screening tool was developed based on a key questions of interest identified via literature review, prior informal observations regarding sleep practices in ECEC settings, and included the use of published parent report measures of sleep settling strategies adapted for use within this settings (Morrell & Cortina-Borja, 2002). This tool was designed to provide an initial indication of the range of sleep policies and practices employed in ECEC settings and to assist in the development of full observation protocols.

Permission to conduct initial screening was granted from the Human Research Ethics Committee at QUT (UHREC Approval Number: 1000000172) and the E4Kids executive. Restrictions to this measure included the requirement that all data was collected within the existing E4Kids observation period and did not add additional costs to existing data collection. Accordingly the brief (1-page) tool was designed to be completed alongside existing E4Kids observation protocols via either direct observation or through consultation with staff. Screening of sleep practices were completed via direct observation only when the timing of existing E4Kids measures (CLASS, ECERS-R) overlapped with scheduled sleep periods; in the remaining rooms measurement was completed via a brief interview with conducted
with ECEC staff. Screening occurred in a total of 108 ECEC rooms between July and August 2011. As observations were being conducted in both ECEC and Prep (first year of formal schooling) settings at this time, data was collected for both room types.

3.3.1.2 Development of the Full Sleep Observation Measure for ECEC

Data collected via the initial brief screening protocol outlined in Section 3.3.1.1 and shown in Appendix G was subsequently used to develop an initial extended observation protocol for piloting. The measure was designed to capture variations in sleep practice and children’s sleep response via direct observation of entire scheduled sleep/rest periods in ECEC rooms. As this study represents the first observation of sleep practices in ECEC across a large number of ECEC environments, items were developed in order to provide a comprehensive record of the range of practice and sleep behaviors during sleep times, including those both directly relevant to and beyond the focus of the current thesis.

The measure included a brief report survey to be completed in consultation with staff (front sheet), alongside direct observation of (1) sleep/rest times conducted in 30 minute continuous observation blocks (observation sheets) and (2) child response to sleep times collected at 10 minute intervals. The eight key components of the measure are outlined in Table 3.1. In order to measure children’s sleep response a modified version of the protocol described by Ward et al. (2008) was used. Children’s sleep responses were coded at 10-minute intervals into six categories. This approach to measurement of sleep and wake within ECEC settings has been found, both in previous studies (Ward et al, 2008) and within our own work (Staton et al, 2014), to have excellent reliability against ambulatory measurement of sleep patterns using actigraphy (ICC=>.94).
Table 3.1. Key components of the Full Sleep Observation Measure.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <strong>Timing and duration</strong></td>
<td>Scheduled and actual</td>
</tr>
<tr>
<td>2. <strong>Level of choice</strong></td>
<td>What were the children allowed to do (e.g. lie on bed, do activities on bed, do activities away from bed)</td>
</tr>
<tr>
<td>3. <strong>Quality of teacher-child interactions</strong></td>
<td>Classroom Assessment Scoring System (CLASS; Pianta et al., 2008). Emotional Domain and behavioural management subscales.</td>
</tr>
<tr>
<td>4. <strong>Child Nap Behaviours</strong></td>
<td>Count of children’s responses to sleep time at 10 min intervals (e.g. awake, asleep, disruptive/distressed, doing activity on bed, away from bed) adapted from Ward et al., 2008.</td>
</tr>
<tr>
<td>5. <strong>Teacher settling strategies</strong></td>
<td>Adapted from the Parent Interaction Bedtime Behavioural Scale (Morrell &amp; Cortina-Borja, 2002). E.g. music tape, reading a story, lights off, patting.</td>
</tr>
<tr>
<td>6. <strong>Disruptions</strong></td>
<td>Number and type of disruptive incidents during observations.</td>
</tr>
<tr>
<td>7. <strong>Deliberate waking</strong></td>
<td>The number of children who were deliberately woken.</td>
</tr>
<tr>
<td>8. <strong>Typical napping behaviour</strong></td>
<td>Teacher report of typical sleep and rest behaviour (E4Kids focus children only).</td>
</tr>
</tbody>
</table>
Piloting of the full observation measure was conducted to test the feasibility of the protocol and to identify any areas for clarification/modification in descriptors or response sets. In order to conduct piloting, 3 services not participating in the E4Kids study were recruited. Piloting was conducted in 3 rooms by 7 trained researchers. All researchers had received initial training in the use of the measure and completed full observations of sleep rest periods in at least one service. This stage of development included the piloting of the use of the CLASS measure in the context of sleep time and the details of the refinement of measurement definitions based on this process are outlined in Paper 3 (Chapter 6). Following observation a consultation process was undertaken to identify any issues or concerns regarding the use of the measure and to modify definitions or coding responses. Modifications were undertaken and the final version of the protocol and instructions for the Sleep Observation Measure for ECEC (SOME) is shown in Appendix H. During this process the need for the development of a brief protocol for use in rooms identified as not having scheduled sleep periods was also identified, with this form of the measure provided in Appendix I.

3.3.1.3 Training and Inter-rater Reliability

All research staff conducting observations in Queensland as part of the E4Kids study were subsequently trained by the PhD candidate in the use of the full SOME measure. To establish reliability, inter-rater reliability was conducted in eight of study rooms via concurrent observations by two independent researchers. Inter-rater reliability analyses were undertaken using within-groups, random-effects intraclass correlations with absolute agreement. In all cases excellent reliability was found with ICC ranging from 0.995 to 1.0. Reliability for the CLASS measure followed the
standard protocol for this measure (Pianta et al., 2008). Full details of the reliability process for CLASS measure during sleep time are provided in Paper 3 (Chapter 6).

3.4 ETHICAL AND HEALTH AND SAFETY APPROVALS

This study involved the active participation of children, educators, parents and centre directors in the completion of survey, direct testing and observational measures and in all cases complied with the requirements of the *National Statement on Research involving Human Participation*. Ethical clearance for the E4Kids project was granted by the QUT University Human Research Ethics Committee (UHREC), **Approval Number: 1000000172**. The thesis program also included the use of measures specifically designed to assess sleep practices and children’s responses to these practices within ECEC services and collected sleep related information from parents. These measures were incorporated alongside the existing suite of measures used in the E4Kids study. Health and safety guidelines for this project were developed with the consultation of the Faculty of Health H&S Officer.
Chapter 4: Paper 1 - Napping, development and health from 0-5 years

4.1 PUBLICATION STATUS AND CO-AUTHOR CONTRIBUTION

4.1.1 Publication Status and Target Journal

This paper is currently In Press for Archives of Disease in Childhood (IF=2.91). This journal, part of the BMJ group, is a highly respected international peer-reviewed Paediatrics journal that focuses on providing up to date information on health and disease in children from conception to adolescence. It has a wide readership including medical and health professions and regularly published systematic reviews of new and emerging areas relevant to child health and disease. The following paper has been formatted in accordance with the requirements of the Archives of Disease in Childhood.

4.1.2 Statement of Contribution

Professor Thorpe conceptualized and designed the study (as principle supervisor), supervised database searches and screening, analysed and interpreted the data, and drafted the final manuscript; Ms Staton conceptualized and designed the study, developed the review protocol, undertook database searches and screening, contributed to interpretation of data, contributed to drafting of the manuscript and critically reviewed the manuscript; Ms Sawyer undertook database searches and screening, assisted in the analysis and interpretation of the data and critically reviewed the manuscript. Ms Pattinson conceptualized and designed the study, contributed to interpretation of the data and critically reviewed the manuscript. Ms Haden assisted in the development of search protocols, undertook database searches and contributed to drafting of the manuscript. Dr Smith conceptualized and designed the study (as associate supervisor), supervised data collection, contributed to interpretation of data and critically reviewed the manuscript. All authors approved the final manuscript as submitted.

Principal Supervisor Confirmation

I have sighted email or other correspondence from all Co-authors verifying their authorship.

Professor Karen Thorpe

Name

Signature

Date

22/10/2014
Title: Napping, development and health from 0-5 years: A systematic review

Authors: Karen Thorpe¹, Sally Staton¹, Emily Sawyer², Cassandra Pattinson¹, Catherine Haden³, Simon Smith⁴

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Address correspondence to: Professor Karen Thorpe, School of Psychology and Counselling, Level 5, O Block, B Wing, Queensland University of Technology, Victoria Park Rd, Kelvin Grove, Queensland, Australia, 4051, k.thorpe@qut.edu.au, Ph:(07) 3138 4707.

Key Words: Sleep, Children, Infants, Body Mass Index, Cognition

Word Count: 2492
ABSTRACT

**Background**  Duration and quality of sleep affects child development and health.

Encouragement of napping in preschool children has been suggested as a health-promoting strategy.

**Objectives**  To assess evidence regarding the effects of napping on measures of child development and health

**Design**  A systematic review of published, original research articles of any design.

**Subjects**  Children aged 0 to 5 years

**Method**  Electronic data base search following PRISMA guidelines and assessment of research quality following a GRADE protocol.

**Results**  Twenty-six articles met inclusion criteria. These were of heterogeneous quality; all had observational designs (GRADE-low). The studies reported on 6 outcomes: salivary cortisol, night-sleep, cognition, behaviour, obesity and accidents. The findings regarding cognition, behaviour and health impacts were inconsistent, probably due to variation in age and habitual napping status of the samples. The most consistent finding was an association between napping and later onset, shorter duration and poorer quality of night sleep, with evidence strongest beyond age 3.

**Limitations**  Studies were not randomised. Most did not obtain data on the children’s habitual napping status or the context of napping. Many were reliant on parent report rather than direct observation or physiological measurement of sleep behaviour.

**Conclusions**  The evidence indicates that beyond age 2 napping is associated with later night sleep onset and both reduced sleep quality and duration. The evidence regarding behaviour, health and cognition is less certain. There is a need for more systematic studies that employ stronger designs. In children presenting with sleep problems beyond age 2 clinicians should investigate napping patterns.
INTRODUCTION

The duration and quality of sleep has immediate, ongoing and long-term consequences for child development and health.[1,2] During early childhood, sleep patterns not only impact upon the individual child but can also have a profound effect on family functioning and parent well-being.[3] There is continuing emotive debate about what is optimal parenting practice with regard to sleep during early childhood.[4] While this controversy is not new, recent evidence on the significance of sleep for long-term child health has intensified this debate. Evidence linking sleep duration to health outcomes derives predominantly from studies of night sleep or total sleep in a 24-hour period. The findings have been extrapolated to infer the value of promoting napping, both in home and childcare contexts.[5] We sought to understand how well this assumption was founded. The purpose of the current review was to examine the state of evidence and current findings regarding the independent effects of napping on children’s night sleep, behaviour, cognitive functioning and physical health from birth to 5 years.

Early childhood is a particularly important period in sleep development. From birth to 5 years is a time of normative transition in sleep patterns during which sleep gradually consolidates into the nighttime hours and daytime naps cease.[6] This is also a sensitive period in which children’s sleep patterns are increasingly responsive to environmental modification.[7] Alongside, some researchers have argued that encouragement of napping might act to compensate for insufficient night sleep.[5] While such a proposal is both logical and ostensibly feasible the sleep science literature would suggest this strategy is overly simplistic. Napping is distinct from night sleep in three key ways: circadian timing,[8] polysomnographic architecture,[9,10] and developmental salience[11]. All give cause to question the assumption of parity of day and night sleep.
Understanding the independent contribution of napping within the range of sleep factors influencing child development and health is significant to inform parents, non-parental carers and health professionals about optimal sleep practices. The current systematic review was therefore undertaken to assess the evidence regarding costs and benefits of napping for the development and health of children aged 0-5 years.

METHODS

A review protocol was developed by the authors using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Guidelines.[12]

Search strategy

An extensive search for relevant studies was carried out on the 8th of January 2014 using the following electronic databases; Medline (via Ebscohost), PsycINFO (via Ebscohost), CINAHL (via Ebscohost), Web of Science, Scopus and ERIC (via Ebscohost). Searches were conducted to identify papers that contained the following key words: ("daytime sleep" OR nap* OR "day?sleep" OR "sleep consolidation") AND (cognition OR behaviour OR "physical Health" OR "night sleep") AND (child* OR infant OR bab*). The search strategies were developed in consultation with a Health Liaison Librarian.

The exact search terms and limiters used for each database are listed in the online supplementary material Table S1. Reference lists from papers identified by searches were also examined to identify potential papers for inclusion.

Inclusion criteria

All published, original research articles that examined the independent effects of napping on night sleep, behaviour, cognition, and physical health, in children aged 0-5 years were included for review. Napping was defined as periods of sleep, measured using observational, parent/carer or self-report, or physiological measurement that occurs during daytime hours. Studies that included napping as part of total or 24-hour sleep measurement were included
only if the effects of the napping component could be reasonably differentiated from the effects of night-time sleep, or if napping was indicated by a ratio of day-to-night-time sleep (an index of sleep consolidation).

**Selection of studies**

A three-step approach to the selection of studies was undertaken. First, two review authors (ES and SSt) independently examined the title and abstract of all records identified via searches to determine if they met the inclusion criteria. Second, full-text versions of relevant studies were obtained and the same review authors independently examined the details of each to determine if they meet the pre-determined criteria. The rationale for inclusion or exclusion of a study was documented by each review author. Finally, decisions for inclusion and exclusion of full-text articles were discussed with additional members of the research team (KT, SSm, CP) and a consensus method used to resolve any disagreements.

**Grading of study quality**

To assess the quality of each article we employed a GRADE system,[13,14] GRADE first assigns a quality score for study design. Randomised control trials are scored as high quality, and observational studies, including longitudinal, quasi-experimental and correlational designs, are scored as low quality. In the study of napping, experimental designs that manipulate napping and longitudinal studies that provide detail of the sequencing of effect of night and day sleep are significant in showing direction of effect. For this reason we increased GRADE score by 1 point for design when studies were experimental or longitudinal. Additionally, GRADE deducts or adds points if aspects of the methodology increase or decrease the certainty of the result. In assessing the quality of research for this study, we reduced scores if key methodological features decreased certainty of the findings regarding sleep in early childhood (low objectivity of the sleep measure, low quality data on habitual napping). We also reduced scores if there were general methodological features that
reduced certainty (reporting bias, poor control of confounders, low levels of observation). GRADE also makes provision for increasing scores if high effect size is found, however, as the outcomes and their measurement were diverse, comparison and grading would be arbitrary and was not undertaken and precluded meta-analyses. Instead, for this review we were dependent on consistency of direction of result only. The GRADE criteria for this review are documented in online supplementary material Table S2. Using these criteria two authors (KT, ES) each graded the studies. The authorship team undertook a final review to ensure consensus.

RESULTS

Database search and data extraction

Figure 1 presents the data extraction records for each stage of the search. Of the initial 781 papers identified after exclusion of duplicates, 26 met the criteria for inclusion. Most papers reported on a single outcome, but 2 report on more than one outcome. An overview of the key details of the 26 papers arranged by outcome measure is presented in Table 1.

Designs and Methodologies

There were no randomised control trials within the corpus of studies. There was a heterogeneous group of studies observational that included experimental \((n=5)\), quasi-experimental \((n=6)\), longitudinal \((n=6)\), and cross-sectional designs \((n=9)\). The description of each study and their findings are summarised in Table 1 and summary of quality and GRADE score in Table 2.
<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Country</th>
<th>Design</th>
<th>Sample N</th>
<th>Age (months)</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NIGHT SLEEP</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fukuda[15]</td>
<td>2002</td>
<td>Japan</td>
<td>Quasi-experimental</td>
<td>441</td>
<td>42-72</td>
<td>Later night sleep onset time occurs following a day nap. Napping does not occur as a response to loss of night sleep</td>
</tr>
<tr>
<td>Ward[16]</td>
<td>2008</td>
<td>USA</td>
<td>Cross-sectional</td>
<td>52</td>
<td>36-60</td>
<td>Napping was associated with, more night awakenings and reduced night sleep duration but not reduced total sleep</td>
</tr>
<tr>
<td>Yokomaku*[17]</td>
<td>2008</td>
<td>Japan</td>
<td>Quasi-experimental</td>
<td>135</td>
<td>48--72</td>
<td>Children in families with late evening schedules had longer nap duration and less night sleep</td>
</tr>
<tr>
<td>Komada[18]</td>
<td>2012</td>
<td>Japan</td>
<td>Longitudinal</td>
<td>967</td>
<td>0-60</td>
<td>Duration of napping and later end of nap time was associated with later bedtime on the corresponding night and</td>
</tr>
<tr>
<td>Iwata[19]</td>
<td>2011</td>
<td>Japan</td>
<td>Cross-sectional</td>
<td>48</td>
<td>60</td>
<td>Nappers had later sleep onset, longer sleep latency, later sleep end time and more parent reported sleep problems</td>
</tr>
<tr>
<td>Lam*[20]</td>
<td>2011</td>
<td>USA</td>
<td>Cross-sectional</td>
<td>59</td>
<td>36-60</td>
<td>Increased nap duration associated with decreased night sleep duration</td>
</tr>
<tr>
<td>El-Sheikh[21]</td>
<td>2013</td>
<td>USA</td>
<td>Cross-sectional</td>
<td>63</td>
<td>36-60</td>
<td>Poor quality of sleep in the day associated with poor quality night sleep. Quality defined by number of wake minutes, sleep efficiency and sleep activity. No association between duration of day and night sleep</td>
</tr>
<tr>
<td>Jones[5]</td>
<td>2013</td>
<td>UK</td>
<td>Cross-sectional</td>
<td>84</td>
<td>36</td>
<td>Greater napping duration associated with decreased night sleep but not total sleep duration.</td>
</tr>
<tr>
<td>Cairns[22]</td>
<td>2014</td>
<td>USA</td>
<td>Longitudinal</td>
<td>34</td>
<td>60</td>
<td>Reduced napping was associated an increase in night time sleep and a reduction in total weekday sleep.</td>
</tr>
<tr>
<td><strong>BEHAVIOUR</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spruyt[23]</td>
<td>2008</td>
<td>Australia</td>
<td>Longitudinal</td>
<td>20</td>
<td>0-12</td>
<td>At 12 months decreased daytime sleep associated with higher scores for emotional regulation</td>
</tr>
</tbody>
</table>

Chapter 4: Paper 1 - Napping, development and health from 0-5 years
<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>Country</th>
<th>Study Design</th>
<th>N</th>
<th>Duration</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yokomaku*</td>
<td>2008</td>
<td>Japan</td>
<td>Quasi-experimental</td>
<td>135</td>
<td>48-72</td>
<td>Longer nap duration was associated with higher scores on the withdrawn, anxious/depressed and thought problems subscales of the CBCL</td>
</tr>
<tr>
<td>Lam*</td>
<td>2011</td>
<td>USA</td>
<td>Cross-sectional</td>
<td>59</td>
<td>36-60</td>
<td>Napping not associated with behavior BASC-II</td>
</tr>
<tr>
<td>Berger</td>
<td>2012</td>
<td>USA</td>
<td>Experimental</td>
<td>10</td>
<td>30-36</td>
<td>Nap restriction affects emotional response—children more negative and confused in face of negative stimuli, and less able to respond positively to positive stimuli</td>
</tr>
<tr>
<td>Hall</td>
<td>2012</td>
<td>Canada</td>
<td>Cross-sectional</td>
<td>58</td>
<td>12-36</td>
<td>Reported problems with napping at home and daycare associated with increased emotional problems and poorer adaptation to preschool</td>
</tr>
<tr>
<td><strong>COGNITION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Gómez</td>
<td>2006</td>
<td>USA</td>
<td>Quasi-experimental</td>
<td>48</td>
<td>15</td>
<td>Napping after a language learning task improved language abstraction</td>
</tr>
<tr>
<td>Hupbach</td>
<td>2009</td>
<td>USA</td>
<td>Quasi-experimental</td>
<td>24</td>
<td>15</td>
<td>Infants who napped had better performance on language abstraction 24 hours later</td>
</tr>
<tr>
<td>Dionne</td>
<td>2011</td>
<td>Canada</td>
<td>Longitudinal</td>
<td>1029</td>
<td>6-60</td>
<td>Poor sleep consolidation associated with poorer language development</td>
</tr>
<tr>
<td>Lam*</td>
<td>2011</td>
<td>USA</td>
<td>Cross-sectional</td>
<td>59</td>
<td>36-60</td>
<td>Napping negatively associated with cognitive function</td>
</tr>
<tr>
<td>Kurdziel</td>
<td>2013</td>
<td>USA</td>
<td>Quasi-Experimental</td>
<td>40</td>
<td>36-66</td>
<td>Naps support memory among habitual nappers only—polysomnography suggests a role of sleep spindles in memory</td>
</tr>
<tr>
<td>Lukowski</td>
<td>2013</td>
<td>USA</td>
<td>Quasi-experimental</td>
<td>21</td>
<td>10</td>
<td>Nap related to encoding and generalisation at 2 hours but not delayed recall</td>
</tr>
<tr>
<td>Werchan</td>
<td>2014</td>
<td>USA</td>
<td>Experimental</td>
<td>27</td>
<td>24-60</td>
<td>Non-nappers perform better on word generalisation</td>
</tr>
<tr>
<td><strong>HEALTH</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Valent</td>
<td>2001</td>
<td>Italy</td>
<td>Cross-sectional</td>
<td>113</td>
<td>0-60</td>
<td>In males accidents associated with less sleep including nap. Independent effect of nap not certain</td>
</tr>
<tr>
<td>Touchette</td>
<td>2008</td>
<td>Canada</td>
<td>Longitudinal</td>
<td>2223</td>
<td>6-72</td>
<td>Nap duration at 2.5 years was not significantly associated with odds of being overweight/obesity at 6 years.</td>
</tr>
<tr>
<td>Author</td>
<td>Year</td>
<td>Country</td>
<td>Study Design</td>
<td>N (participants)</td>
<td>Age</td>
<td>Remark</td>
</tr>
<tr>
<td>---------</td>
<td>------</td>
<td>---------</td>
<td>--------------</td>
<td>------------------</td>
<td>-----</td>
<td>--------</td>
</tr>
<tr>
<td>Bell[34]</td>
<td>2010</td>
<td>USA</td>
<td>Longitudinal</td>
<td>882</td>
<td>0-60</td>
<td>Napping was not associated with BMI.</td>
</tr>
<tr>
<td>Boto[35]</td>
<td>2012</td>
<td>Portugal</td>
<td>Quasi-experimental</td>
<td>413</td>
<td>12-60</td>
<td>Children who nap had significantly less risk of accidents</td>
</tr>
<tr>
<td>Larson[36]</td>
<td>1991</td>
<td>USA</td>
<td>Quasi-experimental</td>
<td>24</td>
<td>8-11</td>
<td>Naps temporarily reduced cortisol levels but rose to pre-nap level after 45 minutes</td>
</tr>
<tr>
<td>Watamura[37]</td>
<td>2002</td>
<td>USA</td>
<td>Cross-sectional</td>
<td>35</td>
<td>34-51</td>
<td>No napping variables related to cortisol rise/no diff between home and ECEC</td>
</tr>
<tr>
<td>Gribbin[38]</td>
<td>2011</td>
<td>USA</td>
<td>Experimental</td>
<td>7</td>
<td>30-48</td>
<td>Cortisol Awakening Response occurred after morning and afternoon napping, but was diminished following an evening nap</td>
</tr>
</tbody>
</table>

*Cpapers appear multiple times in table.*
## Table 2: Quality of papers

<table>
<thead>
<tr>
<th>Author</th>
<th>Nap Measurement</th>
<th>Certainty of habitual/non-habitual napping status</th>
<th>Certainty of finding</th>
<th>Other comments on quality</th>
<th>GRADE Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fukuda[15]</td>
<td>Standard report measure</td>
<td>Yes</td>
<td>Other concern</td>
<td>&lt;7 days sleep data</td>
<td>0</td>
</tr>
<tr>
<td>Ward[16]</td>
<td>Objective, Standard report measure</td>
<td>Probable</td>
<td>Other concern</td>
<td>&lt;7 days sleep data</td>
<td>0</td>
</tr>
<tr>
<td>Yokomaku[17]</td>
<td>Standard report measure</td>
<td>Probable</td>
<td>No concern</td>
<td>Group comparison but with check for group confounders</td>
<td>0</td>
</tr>
<tr>
<td>Komada[18]</td>
<td>Standard report measure</td>
<td>Yes</td>
<td>No concern</td>
<td>Detailed analysis of day/night correspondence, large sample looks across ages 1-5 years</td>
<td>1</td>
</tr>
<tr>
<td>Iwata[19]</td>
<td>Objective, Standard report measure</td>
<td>Yes</td>
<td>No concern</td>
<td>Provides data on non-routine and late-onset naps</td>
<td>2</td>
</tr>
<tr>
<td>Lam[20]</td>
<td>Objective, Standard report measure</td>
<td>Yes</td>
<td>No concern</td>
<td>Take account of weekend variation. Detailed measurement</td>
<td>2</td>
</tr>
<tr>
<td>El-Sheikh[21]</td>
<td>Objective, Standard report measure</td>
<td>Probable</td>
<td>Other concern</td>
<td>&lt;7 days sleep data</td>
<td>0</td>
</tr>
<tr>
<td>Jones[5]</td>
<td>Standard report measure</td>
<td>Probable</td>
<td>Other concern</td>
<td>&lt;7 days sleep data</td>
<td>0</td>
</tr>
<tr>
<td>Cairns[22]</td>
<td>Objective, Standard report measure</td>
<td>Yes</td>
<td>No concern</td>
<td>Detailed longitudinal tracking across the transition from kindergarten to school</td>
<td>3</td>
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<td>Spruyt[23]</td>
<td>Objective, Standard report measure</td>
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<td>Sleep assessed 3 consecutive days every month for 12 consecutive months</td>
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<td>Berger[24]</td>
<td>Objective, Standard report measure</td>
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<td>Well controlled study</td>
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<tr>
<td>Hall[25]</td>
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<td>No information on family background variables</td>
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<td>Source</td>
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<td>Nap (yes/no)</td>
<td>Probability of reporting bias</td>
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<td>Hupbach[27]</td>
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<td>Dionne[28]</td>
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<td>No concern</td>
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<td>Werchan[30]</td>
<td>Nap (yes/no)</td>
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<td>No concern</td>
<td>No concern</td>
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<td>Valent[31]</td>
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<td>Probability of reporting bias</td>
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<td>Touchette[32]</td>
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<td>Other concern</td>
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<td>Jiang[33]</td>
<td>Standard report measure</td>
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<td>No concern</td>
<td>No concern</td>
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<td>Bell[34]</td>
<td>Standard report measure</td>
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<td>Boto[35]</td>
<td>Standard report measure</td>
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<td>No concern</td>
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</tbody>
</table>
Outcomes

The consistency of benefit or cost to the child was examined with reference to study quality. Three studies examining the association of napping with changes in salivary cortisol were not included in this process because the meaning of the outcomes could not be interpreted in terms of benefit or cost to the child. A summary of the direction of findings for all other outcomes are presented in Figure 2.

The most consistent finding was an association between napping and night sleep. Table 3 provides a summary of the magnitude of findings and documents a moderate association of napping with night sleep patterns including later sleep onset,[15, 18, 19] reduced duration, [16, 17, 20, 5] and quality indices of nighttime sleep. [16, 19, 21] Notably, eight of the studies of nighttime sleep were of children beyond the age of 3 years, a point at which there is a significant decline in habitual napping.[6] Three studies examine differences in total 24-hour total sleep duration and report no difference between those who do and do not nap, indicating that daytime napping changes the distribution, rather than the duration, of sleep in a 24 hour period. However, Cairns and Harsh[22] in a study of transition to school, report reduction in total sleep duration which they attribute to loss of naps. Three papers provide evidence of direction of association. Komada et al[18] presents evidence of the direction of the relationship through a detailed study of nine consecutive 24-hour periods in a sample of 967 children aged 0-5 years. The study reports that there were not significant differences in night sleep associated with duration of napping in children younger than 2. Beyond 2, however, decreased sleep duration and later bedtime occurred on nights following napping. Fukuda and Sakashita[15] report that among children attending Kindergarten, where napping is optional, the onset of night sleep was later on evenings following a nap compared with onset on days in which
the same children had not napped. Napping was not found to be a response to shorter sleep duration on the night preceding a nap. Iwata et al.[39] presents data on children who are non-habitual nappers attending nursery during weekdays, where naptime is compulsory, and compares their weekday and weekend sleep. During weekends most children did not nap and had earlier sleep onset, and shorter sleep latency. A subgroup of children, however, had late unplanned naps that increased the onset and decreased the quality of their nighttime sleep. Together the evidence suggests that, beyond age 2, napping can influence night sleep patterning. The meaning of these affects, however, remains uncertain.
### Table 3. Summary of the magnitude of findings across studies of napping and nighttime sleep

<table>
<thead>
<tr>
<th>Author</th>
<th>Outcome and analysis</th>
<th>Outcome magnitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fukuda[15]</td>
<td><strong>Sleep onset time</strong>&lt;br&gt;Within subject comparison – napping and non-napping days.</td>
<td>Mean 28 min later sleep onset following daytime nap.</td>
</tr>
<tr>
<td>Ward[16]</td>
<td><strong>Duration of night sleep and Number of night awakenings</strong>&lt;br&gt;Group comparison nappers and non-nappers.</td>
<td>Mean 48 min less duration and 0.8 more night awakenings for napping children.</td>
</tr>
<tr>
<td>Yokomaku[17]</td>
<td><strong>Duration of night sleep</strong>&lt;br&gt;Group comparison late versus early family schedule.</td>
<td>Children with late family schedule had mean of: 24 min more nap duration, 80 min less night sleep and 57 min less total sleep per day.</td>
</tr>
<tr>
<td>Komada[18]</td>
<td><strong>Bedtime on corresponding night</strong>&lt;br&gt;Group comparisons across 4 napping duration groups (no nap, &lt;1 hr, &lt;2 hrs, ≥ 2 hrs) and group differences in relationship to nap start and end time.</td>
<td>Across groups, between 10 and 40 minutes later bedtime on night following a nap. For 3 and 4 year olds significantly later bedtime when nap has later end-time – figures not given.</td>
</tr>
<tr>
<td>Iwata[19]</td>
<td><strong>Night sleep latency, onset time, end time and parent reported sleep problems</strong>&lt;br&gt;Correlation with incidence of napping.</td>
<td>Incidence of napping associated with increased night sleep latency: r = .47 (moderate effect). Trend towards later night sleep onset time, end time and increased parent reported sleep problems – (figures not given).</td>
</tr>
<tr>
<td>Lam[20]</td>
<td><strong>Duration of night sleep</strong>&lt;br&gt;Correlation with duration of napping</td>
<td>r= -.51 (moderate effect).</td>
</tr>
<tr>
<td>El-Sheikh[21]</td>
<td><em><em>Quality</em> of night sleep</em>*&lt;br&gt;Partial correlation with quality of day sleep - controlling for age gender, ethnicity and BMI.</td>
<td>Poor sleep quality during the day associated with poor sleep quality at night – significant correlations ranging from r=.30 to r=.60 (moderate effect).</td>
</tr>
<tr>
<td>Jones[5]</td>
<td><strong>Duration of night sleep</strong>&lt;br&gt;Correlation with duration of napping</td>
<td>r=-.25 (small effect).</td>
</tr>
<tr>
<td>Cairns[22]</td>
<td><strong>Duration of night and total weekday sleep</strong>&lt;br&gt;Group comparison (preschool or not) by time (before/after school entry )</td>
<td>Reduced reduction in total weekday sleep. Attributed by authors to loss of napping (figures not provided).</td>
</tr>
</tbody>
</table>

*Quality defined as number of wake minutes, sleep efficiency and sleep activity*
Behavioural outcomes were examined by four studies. Berger et al.[24] report an experimental study of sleep restriction among children, age 30-36 months, trained to a nap schedule. Under these conditions a reduction in positive facial emotional responses and increase in negative facial emotional responses to visual stimuli and problem solving were found. Three studies are non-experimental. Spruyt et al.[23] in a detailed 12 month longitudinal study reports that children with easier temperament napped more readily but, at 12 months decreased daytime sleep was associated with better emotional regulation as measured by the Bayley Developmental Scales. Two studies report association with internalising behavioural problems using the parent-form of the Child Behaviour Check List.[17,25] Yokomaku et al.[17] found longer nap duration among 4- to 6-year-olds was associated with greater anxiety/depression, withdrawal and thought problems, while Hall et al.[25] found that among 1- to 3-year-olds difficulty settling for naps at home was associated with anxiety, depression, withdrawal and internalising behaviour. Additionally, Hall et al.[25] obtained teacher report using the Preschool Adjustment Questionnaire and Preschool Behaviour Questionnaire. There were inconsistent outcomes; higher daily frequency of napping was associated with less prosocial behaviour and reduced ability to deal with challenges, while difficulty settling for naps was associated with poorer behaviour and poorer adjustment at preschool. The difference between the experimental study and non-experimental studies are most likely explained by two processes. First, while the experimental study focuses on disruption of habitual napping,[24] the non-experimental studies focus on normally occurring nap behaviours.[17,23,25] Second, two of the non-experimental studies were of children who attended preschool settings.[17,25] The preschool setting may be a factor explaining the association of problems settling for naps and behavioural difficulties because these contexts often
mandate naptime and may not be environmentally conducive to napping.[40] Both the stage in developmental sleep transition and the environmental context of napping are significant factors in interpretation of results.

Studies of cognitive outcomes also present a mixed picture. Three studies report that language learning is improved following a nap,[10,26,27] while another reports being awake rather than napping improves language generalisation.[30]. While the age of children and the task used to assess learning may be implicated there is currently insufficient evidence to speculate on cause of this inconsistency. An important factor in interpretation of effect, however, is the habitual napping status of the children. Kurdziel, Duclos and Spencer[10] report a positive effect of napping on learning and memory consolidation in preschool aged children, but with benefit only for habitual nappers. Two further studies suggest that sleep consolidation (ratio of night to day sleep) is a key marker of cognitive maturity.[20,28] Dionne et al.[28] using a longitudinal twin design, mapped the association of sleep consolidation from 6 to 30 months on language development at 60 months. They report that later sleep consolidation is a risk factor for language delay while more rapid sleep consolidation positively predicts language learning.[28] Similarly, Lam et al.[20] report that daytime napping was associated with poorer neurocognitive function in children aged 3-5 years and suggest cessation of napping may be a marker of brain maturation. The corpus of cognition studies directs attention to both the benefits of napping for learning and memory, especially among younger children,[26,27] but also the changing value of napping across time.[20] Sleep consolidation may be a global marker of neurological maturity.

Evidence on the implications of napping for physical health was poor. Two studies report that, among preschoolers, napping serves to protect against accidental
injury.[31,35] Both studies, however, have the serious limitation of dependence on retrospective recall at the time of attending accident and emergency departments.[31,35] The only other published studies pertaining to napping and health were three reporting on the association with childhood obesity.[32–34] All reported shorter sleep duration as a predictor of excessive weight or obesity, but no independent effect for napping. These findings suggest that the function of napping with regard to weight status is potentially different from that of night sleep. Considerably more research is required before there can be any certainty about the effects of napping on children’s physical health.

In summary, there is currently a low volume of evidence regarding the impacts of napping on children’s development and health. Extant literature covers a range of outcomes with few using standard, comparable measures. The quality of studies reflects the relatively new focus of research on the independent effects of napping. Future studies should address the dual complexities of sleep transition across early childhood and the impacts of environmental manipulations at home and in the non-parental care context.

CONCLUSION

There is consistent, though weak, evidence that night sleep onset, duration and quality are influenced by napping, particularly as sleep consolidates into the nighttime. The relationship between napping and other child development and health outcomes are less clear. Greater certainty about the nature and direction of effect would be provided by stronger study designs. These should include collection of data about habitual napping status and the stability of napping across home and childcare context and employ independent physiological measurement of sleep. The impact of night sleep on children’s development and health is increasingly documented, but to
date there is not sufficient evidence to indicate the value of increasing napping to ameliorate the effect of reduced nighttime sleep, whether at home or in childcare contexts. For clinicians treating sleep problems, particularly among children older than 2 years, the investigation of napping patterns is indicated.
What is already known on this topic?

- Early childhood is an important period in sleep development in which sleep consolidates into the nighttime and napping ceases.
- The total duration and quality of sleep in a 24-hour period is a predictor of child health and development.
- In early childhood, children’s sleep patterns can disrupt family functioning and parent well-being.

What this study adds?

- Our review identifies consistent reports that between 0-5 years napping is increasingly associated with delayed night sleep onset and reduced night sleep.
- Our review identifies the need for more extensive and higher quality studies of the independent effects of napping on learning, behavior and health.
- Extant evidence does not support the practice of prolonging napping behavior once sleep consolidates into the nighttime.

Funding: none to declare
Chapter 4: Paper 1 - Napping, development and health from 0-5 years

References


Chapter 4: Paper 1 - Napping, development and health from 0-5 years


29 Lukowski AF, Milojevich HM. Sleeping like a baby: Examining relations between habitual infant sleep, recall memory, and generalization across cues at 10 months. Infant Behav Dev 2013;36:369–76. doi:http://dx.doi.org/10.1016/j.infbeh.2013.02.001


FIGURES

Figure 4.1. Systematic review search flow diagram based on Prisma[10]
Figure 4.2. Number of articles reporting potential health and development benefits or costs of napping.
Table S1. Search terms and limiters used

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<th>Platform</th>
<th>Search statement (Fields and search string and limiters)</th>
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<td>EBSCOHOST</td>
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<td>EBSCOHOST</td>
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(SCI-EXPANDED) injury OR accident OR “physical activity”) AND (child* OR infant OR bab*)
Chapter 4: Paper 1 - Napping, development and health from 0-5 years

"daytime sleep" OR nap* OR "day?sleep" OR "sleep consolidation") AND (cognition OR behavior OR "physical health" OR "night sleep" OR "body mass" OR injury OR accident OR "physical activity")

Limiters - Educational Level: Early Childhood Education, Kindergarten, Preschool Education
## Table S2. GRADE criteria

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</table>

\(^1\) Polysomnography, actigraphy, direct observation  
\(^2\) Standard questionnaire measure \(^*\) or structured diary  
\(^3\) Number of observations of sleep <7 days, napping is a secondary focus with limited detail, context of napping not considered
Chapter 5: Paper 2 - Mandatory naptimes and group napping trajectories in childcare

5.1 PUBLICATION STATUS AND CO-AUTHOR CONTRIBUTION

5.1.1 Publication Status and Target Journal

This paper is currently submitted and under review with *Behavioural Sleep Medicine* (IF= 1.562). Behavioural Sleep Medicine is an international peer-reviewed journal with broad and multidisciplinary focus on aspects of behavioural sleep medicine, including normal sleep experience and paediatric. Please note that the following paper has been formatted in accordance with the requirements of *Behavioural Sleep Medicine*.

5.1.2 Statement of Contribution

Ms Stanton conceptualized and designed the study, supervised and performed data collection, contributed to the analysis and interpreted the data, and drafted the manuscript; Dr Smith conceptualized and designed the study (as associate supervisor), contributed to interpretation of data and critically reviewed the manuscript; Dr Hurst analysed and interpreted the data and critically reviewed the manuscript; Ms Pattinson performed data collection, contributed to interpretation of data and critically reviewed the manuscript; Dr Thorpe conceptualized and designed the study (as principle supervisor), supervised data collection, contributed to interpretation of data and critically reviewed the manuscript. All authors approved the final manuscript as submitted.

Principal Supervisor Confirmation

I have sighted email or other correspondence from all Co-authors verifying their authorship.

Professor Karen Thorpe

Name

Signature

Date

22/10/2014
Mandatory Naptimes and Group Napping Trajectories in Childcare:

An Observational Study

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\textsuperscript{2}Centre for Accident Research & Road Safety – Queensland, Institute for Health and Biomedical Innovation, Queensland University of Technology, Victoria Park Rd, Kelvin Grove, Queensland, Australia, 4059

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Abstract

This study examined the association between duration of mandatory naptimes and children’s napping patterns in childcare settings. Observations were undertaken in a community sample of 113 preschool rooms (N=2114 children, age 3-6 years). Our results showed that 83.5% of childcare settings implemented a mandatory naptime (range=15-145 minutes). Overall 31% of children slept during naptimes. Compared to rooms with ≤30 minutes of mandatory naptime, rooms with 31-60 minutes and >60 minutes of mandatory naptime had a two- and four-fold increase, respectively, in the proportion of children napping. Latency to sleep onset did not significantly differ across rooms. Our findings suggest that exposure to mandatory naptimes may increase rates of napping among preschool aged children in childcare.
Mandatory Naptimes and Group Napping Trajectories in Childcare:

An Observational Study

Across developed nations more than three-quarters (77%) of children aged 3-6 years attend child care services (The Organisation for Economic Co-operation and Development, 2014). Provision for daytime napping is typical in these settings, but there is variability in the practices employed (El-Sheikh, Arsiwalla, Staton, Dyer, & Vaughn, 2012; Siren-Tiusanen & Robinson, 2001; Ward, Gay, Alkon, Anders, & Lee, 2008; Watamura, Sebanc, & Gunnar, 2002). One practice that might modify children’s early sleep patterns is the allocation of a period of mandatory naptime (Cairns & Harsh, 2013; Fukuda & Asaoka, 2004); a period during which all children are required to lie on their beds without alternate activity permitted, regardless of whether they nap. To date there has been no studies of the prevalence or duration of mandatory naptimes in childcare settings, nor of the impacts of such practices on napping patterns within these settings.

Scheduling of mandatory naptimes in childcare presents a potential modification of naturally occurring sleep patterns in preschool aged children. Across early childhood, sleep patterns are characterised by a dramatic decrease in the prevalence and duration of day-time napping and concurrent consolidation of sleep into the night (Iglowstein, Jenni, Molinari, & Largo, 2003; Price et al., 2014). By age 4 years, international studies suggest that most children have ceased regular napping (Blair et al., 2012; Carter, Taylor, Williams, & Taylor, 2011; Galland, Taylor, Elder, & Herbison, 2012; Iglowstein et al., 2003; Ikeda, Kaneita, Kondo, Itani, & Ohida, 2012; Komada et al., 2012; Ottaviano, Giannotti, Cortesi, Bruni, & Ottaviano, 1996; Snell, Adam, & Duncan, 2007; Thorleifsdottir, Björnsson, Benediktsdottir, Gislason, & Kristbjarnarson, 2002). While age presents an important predictor of napping cessation, variations in napping prevalence across demographic and cultural groups are also evident and suggest environmental modification (Blair et al., 2012; Crosby, LeBourgeois, &
Recent behavioural genetic studies indicate an increasing environmental influence on napping with age (Dionne et al., 2011; Fisher, van Jaarsveld, Llewellyn, & Wardle, 2012; Touchette et al., 2013), in which shared environmental factors account for almost 80% of the variance in napping duration by age 4 (Touchette et al., 2013). These findings direct attention to environmental factors, such as parental or childcare practices, that may influence children’s napping patterns.

Evidence from the home environment indicates the potential for modification of napping behaviour, through napping promotion, which may well be mirrored in non-parental care settings. For example, Jones and Ball (2013) found that positive parent attitude to napping was associated with increased napping duration among preschool-aged children (Jones & Ball, 2013). Extant evidence for the impact of childcare environments on napping behavior is indirect. First, though there are no prevalence data, the promotion of napping through scheduling of mandatory naptimes is documented in a range of studies (Cairns & Harsh, 2013; El-Sheikh et al., 2012; Fukuda & Sakashita, 2002; Ward, Gay, Alkon, et al., 2008; Watamura et al., 2002). Second, within childcare settings that schedule mandatory naptime the reported rates of napping are higher than expected when compared with population norms (Ikeda et al., 2012; Ward, Gay, Anders, Alkon, & Lee, 2008). Finally, two Japanese studies provide comparison of sleep behavior for children attending nursery schools in which legislation mandates a naptime of 1.5-2 hours and those attending kindergarten where naptimes are optional (Fukuda & Asaoka, 2004; Fukuda & Sakashita, 2002). Though neither study observes or measures napping behavior in each childcare setting, these studies report decreases in night sleep for nursery school children, both concurrently (Fukuda & Sakashita, 2002) and up to four years after attendance (Fukuda & Asaoka, 2004). Both studies suggest that differences in night time sleep are explained by increased napping due to mandatory naptimes in nursery schools. To date this evidence remains circumstantial.
Accordingly, this study aimed to document for the first time; (1) the prevalence of mandatory naptimes and their related characteristics (duration, timing) across a large, representative sample of childcare settings, and (2) the relationship between variations in duration of mandatory naptimes and napping behaviours within these settings. As sleep onset latency is seen as a marker of sleep drive (Jenni & LeBourgeois, 2006), in the current study we examine napping trajectories that account for both the prevalence of napping within childcare rooms and timing of nap onset.

Method

Participants

Observations were conducted in 130 centre-based ECEC rooms catering for preschool aged children (3- to 6-years). All study rooms were participating in the Effective Early Educational Experiences for Children (E4Kids) study (Tayler, Ishimine, Cloney, Cleveland, & Thorpe, 2013). E4Kids is a large longitudinal study observing current practices in ECEC rooms and does not include any intervention or manipulation phase. Initial recruitment for the E4Kids study occurred in 2010 and applied a stratified sampling frame of socio-economic status and geographical location of service and license type, to provide a representative sample of ECEC service provision in Australia. Observations of naptime practices were conducted in Queensland, Australia, across all participating childcare settings during the second year of the E4Kids study (2011). In Queensland, the study sites were located across two geographical locations; Brisbane (metropolitan region) and Mt Isa (remote region). In Queensland, Australia, almost all children attend group-based childcare services in the year prior to school (Australian Bureau of Statistics, 2013). Although current legislation requires that childcare services provide opportunities for sleep (Australian Children’s Education & Care Quality Authority, 2013) there is limited government directive regarding the
implementation of naptimes, with decisions regarding nap times made at the individual room, service or provider level.

Rooms were excluded from the current study if they: (1) did not include children in the year prior to school (4.5 years; \(n=5\) rooms); (2) did not have a scheduled nap time (\(n=11, 8.8\%\)); or (3) observation could not be completed on the day of testing (\(n=1\)). The final sample included 113 rooms; 69 Long Day Care (61.1%; equivalent to USA childcare) and 44 Kindergarten (38.9%; equivalent to USA preschool). The number of children in each room ranged from 9 to 26 children (\(M=18.71, SD=3.0\)) with a total of \(N=2114\) children observed. The age of the children ranged from 36 (\(M=48.1, SD=4.2\)) to 57 (\(M=62.9, SD=2.6\)) months across study rooms.

**Measures and Procedure**

Full ethical approval was received from the Human Research Ethics Committee of the author’s affiliated institution and informed written consent was received from parents, childcare directors and staff. Observations of nap times were conducted in each of the study rooms on one day during the second half of the education year (Sep-Nov, 2011). Observations were conducted by trained researchers, in 30-minute continuous coding intervals using the Nap Observation Protocol (described below). Observations commenced when the first child was on their bed and ended when the last child left their bed. **Scheduled nap time** was the total time (minutes) scheduled for napping based on the daily schedule for each centre. **Nap start time** was based on direct observation and was the time at which the first child was recorded on their bed by the researcher. **Observed nap time** was the total time (in minutes) in which at least one child was observed as being on their bed during the observation period. **Mandatory nap time** was defined as the length of time (in minutes) in which all children were required to lie without any alternate activity permitted (e.g. no reading or quiet activities allowed). Mandatory nap times were classified by duration, into
three groups; ≤30, 31-60, >60. The rationale for the selection of groups was based on theoretical consideration of evidence regarding the typical sleep latency of children aged 3-6 years (Galland et al., 2012).

During each 30-minute observation block the quality of interactions between staff and children were measured using the emotional support subscale of the Classroom Assessment Scoring System (CLASS Pre-K; Pianta, La Paro, & Hamre, 2008). The CLASS (Pre-K) is a widely used and validated observational tool designed to measure interaction quality in ECEC settings. The emotional support subscale includes four domains; positive climate, negative climate, teacher sensitivity and regard for student perspective. The procedure for the use of the emotional subscale of the CLASS within the context of naptime in ECEC settings has been previously published and shown to have good consistency with the interaction quality within early childhood settings during non-nap periods (Pattinson, Staton, Smith, Sinclair, & Thorpe, in press). Scores across each observation block were averaged to provide a single emotional support score (1-2=low, 3-5=mid, 6-7=high).

Children’s responses to naptimes were measured using a modified version of the Nap Observation Protocol as described by Ward et al. (2008). This method of observation has been found to have good reliability against ambulatory assessment of sleep/wake patterns using actigraphy (Staton, Smith, Pattinson, & Thorpe, 2013; Ward, Gay, Anders, et al., 2008). Counts of children’s responses to naptimes were conducted at 10 minutes intervals and coded into five categories: (1) asleep (lying still with eyes closed), (2) potentially asleep (lying still but eyes could not be observed), awake (moving and/or eyes open), (3) away from bed or (4) disruptive/distressed (crying or acting out). In the current study, to be conservative with estimates, only children coded as asleep (lying still with eyes closed) were included in the final counts of the number of children napping at each time point. To assess the inter-rater reliability of all nap observation measures, two independent researcher completed concurrent
observations across eight study rooms. Intra-class correlations were examined and showed excellent inter-rater reliability across all sleep observation measures ($ICC=0.995$ to 1.0).

Age data were available on the youngest and oldest child in each room and was collected from centre staff. The socio-economic status (SES) of the location for each of the services was determined via linking of area postcodes with the Socio-Economic Indices for Areas (SEIFA; Australian Bureau of Statistics, 2011). SEIFA scores are derived from census data and are used to rank geographical areas in regards to relative social advantage and disadvantage. Service socio-economic status is presented as deciles, with areas ranked from the lowest 10% (scores 1) through to the highest 10% (scored 10) of rankings for areas based on Australian population norms (Australian Bureau of Statistics, 2011).

**Statistical analyses**

Descriptive statistics of scheduled, observed, mandatory and nap start times were first examined. Analyses of differences in sample characteristics across mandatory naptime groups were examined using chi-square analyses and one-way ANOVAs with Tukey’s HSD post-hoc tests.

To examine group differences in napping trajectories analyses were conducted to simultaneously account for both napping prevalence (the number of children who napped) and nap onset latency (the time to sleep onset) within study rooms. A Poisson mixed-effect regression model was employed, with the room identifier representing the random effect. For these analyses the number of children napping at any given time represented a count variable, and successive 10-minute observations were taken for each room. The nap incidence rate ratio represented the measure of association between the outcome and predictors. The study effect was mandated naptime duration ($\leq$30 min, 31-60 min, $>$60 min), and other covariates included were room age range, nap start time, emotional climate, service SES and service type. For the purpose of these analyses, counts across the first 60 minutes of observed
naptimes were used. This cut-off was deemed sufficient to ensure comparability across study rooms, whist accounting for typical sleep onset latency, which has been shown to be on average between 16-19 minutes in children of this age group (Galland et al., 2012), as well as potential attenuation in latency due to the environmental constraints within the childcare context. A total of 10 (9%) study rooms ceased observed naptime prior to the 60-minute cut-off. In addition, due to overlap with other observation measures being completed by researchers at the time of testing, counts of the number of children asleep were delayed at the commencement of sleep observation in seven (6%) of the study rooms. Three approaches were considered in terms of dealing with missing data; (1) complete case analysis (only rooms with complete trajectory data included), (2) available case analysis (all observation points in which there was a value recorded included), and (3) imputation using Next-Observation-Carried-Back. We ran our final models applying each of the three approaches and found minimal difference in the results. In line with current recommendations for dealing with missing data in mixed models (Twisk, de Boer, de Vente, & Heymans, 2013) results for the available case analysis are presented.

To examine whether mandated naptimes modified the napping trajectories within rooms the mandated naptime duration and time (linear) interaction was included in all models. Both the random intercept and random coefficient mixed effect models were fit to the data and as the relationship between the log incidence of napping and time is likely to have a non-linear component, a 3rd order polynomial model (in time) was considered. Interaction effects with covariates were only included within the final model if significant. The combination of the above model properties resulted in six models being fit to the data, linear, quadratic and cubic Possion random intercept models, and the three corresponding random coefficient analogs. The best model was one that represented a significant improvement on the previous lower order model (linear → quadratic→ cubic), and had the
lowest Akaike's Information Criteria (AIC). Analyses were conducted using SPSS Version 21 (IBM Corp, 2012) and the R statistics package (R Core Team, 2014), and the mixed effect models were fit using the R library lme4 (Bates, Maechler, Bolker, & Walker, 2014).

Naptime Practices and Childcare Characteristics

Table 5.1 presents the means, standard deviations and ranges for scheduled, observed and mandatory naptimes and nap start times across study rooms. As seen in the table, there was considerable variation in naptime practice across childcare settings. While the range of scheduled and observed naptimes was reasonably consistent, on average observed naptimes were found to be significantly longer in duration than those nominated within the daily schedule, paired samples t(112)=4.68, p=<.001. More than three-quarters of the study rooms (85.8%) had at least some period of mandatory naptime, with mandatory naptimes ranging from between 15 to 145 minutes.

Childcare Characteristics by Mandatory Naptimes Groups

Childcare characteristics across the study rooms are presented in Table 5.2. As seen in the table, less than a third (31%) of the preschool aged children in childcare settings were observed napping during observations. Although a higher number of children were observed to nap in rooms with longer duration of mandatory naptime, even in rooms with >60 minutes of mandatory naptime, on average less than half of the children were observed napping. Compared to rooms with ≤30 minutes of mandatory naptime, rooms with >60 minute of mandatory naptime had were located in significantly lower SES areas, were more likely to be long day care services, had lower scores for emotional support quality, include children across a greater age range, and have earlier nap start times.

Napping Trajectories across Mandatory Naptimes Groups

The crude and adjusted incident rate ratios associated with the quadratic, random coefficient, Poisson mixed effect regression analysis are shown in Table 5.3. At the crude
level all predictors, except service SES, were significantly associated with the nap incident rate. When the effects were mutually adjusted, however, only the time and mandated naptime effects remain significant. Examination of the adjusted time effect showed that the incidence of napping was 1.13 times higher for every successive (10 minute) observation. There was also a significant association between mandated naptime duration and nap incidence rate ($\chi^2_{LRT} = 26.263, df = 2, p < 0.001$). Relative to the ≤30 group, the incidence rate of napping was two and a half times higher in the 31-60 group ($IRR=2.63; 95\%\ CI: 1.63, 4.26; p<0.0001$) and four time higher in the >60 group ($IRR=4.07; 95\%\ CI: 2.28, 7.24; p=0<0.0001$). Figure 5.1 shows the pattern of napping trajectories across each of the mandatory naptime groups. As demonstrated in the figure, the absolute differences between the curves remained relatively constant, with no evidence that the shape of the napping trajectories differed between the three different mandated naptime groups.

Discussion

Mandatory naptimes in childcare present a potential modification of naturally occurring sleep patterns in preschool aged children. This study aimed to document, for the first time, the prevalence of the practice of mandatory naptimes across a large sample of childcare settings, and examine the relationship between variations in observed duration of mandatory naptimes and group napping patterns within these settings.

Our data showed that over 90% of childcare settings allocated a scheduled naptime for children in the preschool years (3- to 6-years). Among these settings, more than two-thirds (85.8%) employ mandatory naptime practices in which all children were required to lie down on their beds without alternative activity permitted. These periods ranged from as little as 15 minutes to ~2.5 hours. Despite the prevalence of mandatory naptimes, the mean rates of napping were surprisingly low. Overall less than a third (31%) of children were observed napping. To date the prevalence rates for napping amongst Australian children has not been
documented; however, the rates of napping reported in the current study are comparable to those of international studies, which suggest that, beyond age three, fewer than half of children typically nap (Acebo et al., 2005; Blair et al., 2012; Iglowstein et al., 2003).

While overall prevalence of napping was low, there was evidence that the duration of mandated naptimes within childcare rooms significantly modified napping rates. Compared to those with ≤30 minutes of mandatory naptime, there was a two-fold increase in the proportion of children napping within rooms with 31-60 minutes of mandatory naptime and a four-fold increase for those in rooms with >60 minutes mandatory naptime. These findings are consistent with prior studies that describe higher than expected rates of napping, compared to population norms, in childcare settings where mandatory naptimes occur (Ikeda et al., 2012; Ward, Gay, Anders, et al., 2008). Taken together, these findings raise important questions regarding the potential implications of increased daytime napping in preschool aged children. While it is has been argued that encouraging napping in young children may have positive benefit by increasing total sleep duration (Jones & Ball, 2013; Touchette et al., 2013), increased napping in preschool-aged children is associated with later sleep onset time and shorter duration of nighttime sleep (Cairns & Harsh, 2013; El-Sheikh et al., 2012; Iwata, Iwata, Iemura, Iwasaki, & Matsuishi, 2011; Komada et al., 2012; Ward, Gay, Anders, et al., 2008). In addition Lam et al. (2011) reported that children aged 3-5 years who napped under conditions of mandatory naptime in childcare had both decreased night-time sleep duration and poorer neurocognitive performance. Future research examining the effects of mandatory naptimes in childcare on children’s immediate and on-going development and health are warranted.

Although a higher proportion of children slept in rooms with longer duration of mandatory naptime, we found no evidence of difference in the pattern of nap onset latency across mandatory naptime groups. One explanation for this finding may relate to ongoing
experience of mandatory naptime. Observations were undertaken in the second semester of the education year when the majority of children would have been attending childcare for a minimum of seven months. Further, given that the children were in the year prior to school, most would have a history of up to 5 years of childcare attendance. Any effects of mandatory naptime on nap onset latency, therefore, are likely to have proceeded the observation period.

A number of studies suggest that children who attend childcare settings with mandatory naptimes have disrupted night-time sleep (Fukuda & Asaoka, 2004; Fukuda & Sakashita, 2002; Ikeda et al., 2012). This suggests that the lack of difference in nap onset latency may be due to a reciprocal effect in which extended mandatory naptimes decreases duration of nighttime sleep with a consequent increase in sleep drive across the day. Future studies should consider the effects of lifetime exposure to mandatory naptimes, particularly in relation to age of cessation of napping.

This study had some limitations that should be considered in interpretation of results. First, because measures were collected at the group level we did not have detailed information regarding child and family characteristics of all children within the study rooms. For this reason there may be individual child and family differences across groups not examined in the current study that may have accounted for the increased rates of napping across rooms. Second, this study focused on mandatory naptimes, a practice that constitutes a potential modification of children’s early sleep patterns. Future studies should examine other sleep related practices and environmental constraints that may act to promote or inhibit sleep within the childcare context.
References


Twisk, J., de Boer, M., de Vente, W., & Heymans, M. (2013). Multipe imputations of missing values was not necissary before performing a longitudinal mixed-model analysis. *Journal of Clinical Epidemiology, 66*, 1022-1028.


Table 5.1 Sleep practices (means, standard deviations and ranges) across study rooms

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scheduled sleep time (min)</td>
<td>83.5</td>
<td>35.8</td>
<td>30</td>
<td>180</td>
</tr>
<tr>
<td>Observed sleep time (min)</td>
<td>92.6</td>
<td>34.6</td>
<td>25</td>
<td>165</td>
</tr>
<tr>
<td>Mandatory sleep time (min)</td>
<td>57.7</td>
<td>37.0</td>
<td>0</td>
<td>145</td>
</tr>
<tr>
<td>Nap start time (hh:mm)</td>
<td>12:36pm</td>
<td>39.31</td>
<td>11:15am</td>
<td>1:48pm</td>
</tr>
</tbody>
</table>
Table 5.2 Sample characteristics for rooms associated with different mandated naptime groups

<table>
<thead>
<tr>
<th>Measure</th>
<th>≤30 minutes</th>
<th>31-60 minutes</th>
<th>&gt;60 minutes</th>
<th>All rooms</th>
<th>Test</th>
<th>Post-hoc tests (Tukey’s HSD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N rooms</td>
<td>24 (21.24%)</td>
<td>41 (36.28%)</td>
<td>48 (42.48%)</td>
<td>113</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max number asleep</td>
<td>1.96 (1.99)</td>
<td>4.46 (2.67)</td>
<td>8.08 (4.22)</td>
<td>5.47 (4.1)</td>
<td>F = 30.17*** a&lt;b, a&lt;c, b&lt;c</td>
<td></td>
</tr>
<tr>
<td>Max proportion asleep(^{†})</td>
<td>0.11 (0.11)</td>
<td>0.26 (0.16)</td>
<td>0.45 (0.22)</td>
<td>0.31 (0.23)</td>
<td>F = 31.38*** a&lt;b, a&lt;c, b&lt;c</td>
<td></td>
</tr>
<tr>
<td>Age range (months)</td>
<td>13.25 (4.09)</td>
<td>14.17 (4.35)</td>
<td>16.0 (5.01)</td>
<td>14.75 (4.69)</td>
<td>F = 3.38* a&lt;c</td>
<td></td>
</tr>
<tr>
<td>SES (deciles)</td>
<td>8.58 (1.64)</td>
<td>7.34 (2.7)</td>
<td>6.54 (2.82)</td>
<td>7.27 (2.66)</td>
<td>F = 5.07** a&gt;c</td>
<td></td>
</tr>
<tr>
<td>Start time (hh:mm)</td>
<td>1:08pm (23.77)</td>
<td>12:52pm (33.56)</td>
<td>12:05pm (27.36)</td>
<td>12:36pm (39.31)</td>
<td>F = 47.12*** a&gt;c, b&gt;c</td>
<td></td>
</tr>
<tr>
<td>Emotional support</td>
<td>Medium</td>
<td>High</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>9 (37.5%)</td>
<td>24 (58.54%)</td>
<td>38 (79.16%)</td>
<td>71 (62.83%)</td>
<td>(\chi^2 = 12.40**)</td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>15 (62.5%)</td>
<td>17 (41.46%)</td>
<td>10 (20.84%)</td>
<td>42 (37.17%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Service type</td>
<td>Long Day Care</td>
<td>Kindergarten</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long Day Care</td>
<td>7 (30.43%)</td>
<td>16 (69.57%)</td>
<td>45 (93.75%)</td>
<td>69 (61.61%)</td>
<td>(\chi^2 = 37.48***)</td>
<td></td>
</tr>
<tr>
<td>Kindergarten</td>
<td>17 (41.46%)</td>
<td>24 (58.54%)</td>
<td>3 (6.25%)</td>
<td>43 (38.39%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Values shown are Mean (SD) or n (%). a = ≤30 minutes; b = 31-60 minutes; c = >60 minutes. \(^{†}\)Max number asleep/total number of children within a room. SES= socio-economic status. **p<0.001, *p<0.05.
<table>
<thead>
<tr>
<th>Effects</th>
<th>IRR&lt;sub&gt;crude&lt;/sub&gt;</th>
<th>IRR&lt;sub&gt;adj&lt;/sub&gt;</th>
<th>L95</th>
<th>U95</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minutes</td>
<td>1.13***</td>
<td>1.13***</td>
<td>1.12</td>
<td>1.15</td>
</tr>
<tr>
<td>I(minutes^2)</td>
<td>0.99***</td>
<td>1.00***</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td><strong>Mandated Naptime</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mandated Naptime</td>
<td>( \chi^2 = 36.138*** ) ( \chi^2 = 26.263*** ) ( \dagger )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31-60 minutes</td>
<td>3.35***</td>
<td>2.63***</td>
<td>1.63</td>
<td>4.26</td>
</tr>
<tr>
<td>&gt;60 minutes</td>
<td>5.85***</td>
<td>4.07***</td>
<td>2.28</td>
<td>7.24</td>
</tr>
<tr>
<td>Emotional climate: High</td>
<td>0.53**</td>
<td>1.03</td>
<td>0.73</td>
<td>1.45</td>
</tr>
<tr>
<td>Age range</td>
<td>1.05*</td>
<td>1.02</td>
<td>0.98</td>
<td>1.10</td>
</tr>
<tr>
<td>SES</td>
<td>0.97</td>
<td>1.04</td>
<td>0.98</td>
<td>1.10</td>
</tr>
<tr>
<td>Nap start time</td>
<td>0.54*</td>
<td>0.83</td>
<td>0.59</td>
<td>1.17</td>
</tr>
<tr>
<td>Service type: Kindergarten</td>
<td>0.40***</td>
<td>0.86</td>
<td>0.56</td>
<td>1.32</td>
</tr>
<tr>
<td><strong>Time x Mandated Naptime</strong></td>
<td>NA</td>
<td>( \chi^2 = 2.742 )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minutes:31-60 minutes</td>
<td>NA</td>
<td>1.0</td>
<td>0.98</td>
<td>1.02</td>
</tr>
<tr>
<td>Minutes:&gt;60 minutes</td>
<td>NA</td>
<td>1.01</td>
<td>0.99</td>
<td>1.03</td>
</tr>
</tbody>
</table>

***p<0.001, **p<0.01, *p<0.05. \( \dagger \) Likelihood ratio test based on main effects model.

Note. All main effect coefficients are estimated from the main effects model, coefficients for the interaction terms are only provided to demonstrate no evidence for an interaction effect.
Figures

Figure 5.1. Pattern of napping trajectories across mandatory naptime groups.
Chapter 6: Paper 3 - Emotional Climate and Behavioural Management during Sleep Time in Early Childhood Education Settings

6.1 PUBLICATION STATUS AND CO-AUTHOR CONTRIBUTION

6.1.1 Publication Status and Target Journal

This paper is published: Pattinson, C., Staton, S., Smith, S., Sinclair, & D., Thorpe, K. (2014). Emotional Climate and Behavioural Management during Sleep Time in Early Childhood Education Settings. Early Childhood Research Quarterly. Vol 29, Issue 4, p660-668. (IF=2.06). Early Childhood Research Quarterly is in the top quartile of journal rankings each of the following discipline areas - Education, Developmental Psychology and Social Science. Please note that the following paper has been formatted in accordance with the requirements of the journal.

6.1.2 Statement of Contribution

Ms Pattinson contributed to the conceptualisation and design of the study, performed data collection; analysed and interpreted the data, and drafted the manuscript; Ms Staton conceptualized and designed the study, developed study measures, supervised and performed data collection, contributed to the analysis and interpretation of the data, and contributed to the drafting of the manuscript; Dr Smith conceptualized and designed the study (as associate supervisor), contributed to interpretation of data and critically reviewed the manuscript; Dr Thorpe conceptualized and designed the study (as principle supervisor), supervised data collection, contributed to interpretation of data and contributed to the drafting of the manuscript. All authors approved the final manuscript as submitted.

Principal Supervisor Confirmation

I have sighted email or other correspondence from all Co-authors verifying their authorship.

Professor Karen Thorpe 22/10/2014

Name Signature Date
Emotional Climate and Behavioral Management during Sleep Time in Early Childhood Education Settings.

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E4Kids is a project of the Melbourne Graduate School of Education at The University of Melbourne and is conducted in partnership with Queensland University of Technology. E4Kids is funded by the Australian Research Council Linkage Projects Scheme (LP0990200), the Victorian Government Department of Education and Early Childhood Development, and the Queensland Government Department of Education and Training. E4Kids is conducted in academic collaboration with the University of Toronto Scarborough, the Institute of Education at the University of London and the Royal Children’s Hospital in Melbourne. The E4Kids team would like to sincerely thank the ECEC services, directors, teachers/staff, children and their families for their ongoing participation in this study.
Abstract

The majority of children cease napping between 3 and 5 years of age yet, internationally, the allocation of a sleep time during the day for children of this age remains a practice in many early childhood education (ECE) settings. These dual circumstances present a disjuncture between children’s sleep needs and center practices, that may cause conflict for staff, increase stress for children and escalate negative emotional climate in the room. Testing this hypothesis requires observation of both the emotional climate and behavioral management used in ECE rooms that extends into the sleep time. This study was the first to apply the Classroom Assessment and Scoring System (CLASS) Pre-K (Pianta, La Paro, & Hamre, 2008) to observe the emotional climate and behavioral management during sleep time. Pilot results indicated that the CLASS Pre-K functioned reliably to measure emotional climate and behavioral management in sleep time. However, new sleep-specific examples of the dimensions used were developed, to help orient fieldworkers to the CLASS Pre-K rating system in the sleep time context. The CLASS was then used to assess emotional climate and behavior management between the non-sleep and sleep time sessions, in 113 ECE rooms in Queensland, Australia. In these rooms 2,114 children were observed. Of these children, 71% did not sleep at any point during the allotted sleep times. There was a significant drop in emotional climate and behavioral management between the non-sleep and sleep-time sessions. Furthermore, the duration of mandated sleep time (a period of time where no activities are provided to non-sleeping children) accounted for significant independent variance in the observed emotional climate during sleep-time. The CLASS Pre-K presents a valuable tool to assess the emotional climate and behavior management during sleep-time and draws attention to the need for further studies of sleep time in ECE settings.
Emotional Climate and Behavioral Management during Sleep Time in Early Childhood Education Settings.

The quality and duration of sleep affects how individuals think, feel and behave. It is therefore not surprising that disruption to normal sleep patterns has been found to have numerous adverse social and health consequences (Carskadon & Dement, 1994; Vassalli & Dijk, 2009). A growing body of evidence attests to the importance of sleep in childhood, with a multitude of adverse social, cognitive, and health outcomes being linked to sleep loss or disruption. Specifically, sleep loss/disruption has been associated with an increased risk of childhood obesity (Bell & Zimmerman, 2010; Jiang et al., 2009) and poorer neurocognitive functioning and academic performance in children and adolescents (Sadeh, 2007; Touchette et al., 2007). Much of this evidence derives from studies of sleep at night; the role of daytime sleep is not well understood. During the first three years of life, daytime sleep is a typical behavior that has a clear developmental function (Acebo et al., 2005; Iglowstein, Jenni, Molinari, & Largo, 2003; Weissbluth, 1995). Beyond these years, daytime sleep may only be beneficial in circumstances of deprivation or restriction of night-time sleep (Batejat & Lagarde, 1999; Crosby, LeBourgeois, & Harsh, 2005; Fallone, Acebo, Arnedt, Seifer, & Carskadon, 2001). The body of extant findings directs attention to practices in early childhood education (ECE) environments, across a range of international settings, where mandating sleep periods for all children occurs well beyond the age at which daytime sleep may be a biological necessity (El-Sheikh, Arsiwalla, Staton, Dyer, & Vaughn, 2013; Fukuda & Sakashita, 2002; Ward, Gay, Alkon, Anders, & Lee, 2008; Watamura, Sebanc, & Gunnar, 2002). Potential implications of such practices include: increasing conflict between children who do not sleep and their supervising care staff, raising stress for
the children who no longer need/want to sleep, and non-sleeping children disrupting children who require day-sleep. The current study was conducted to address these possibilities. The interactions within a range of Australian ECE rooms were observed during the non-sleep and sleep time sessions, on one day, using the Classroom Assessment and Scoring System (CLASS) Pre-K (Pianta, La Paro, & Hamre, 2008). The CLASS Pre-K ratings assessed the impact of variation in duration of mandated sleep time and the level of continuity of emotional climate and behavioral management across non-sleep and sleep time sessions. In the current study, the term sleep time is used in reference to naptime, rest time, or day-time sleep as this is common usage in the Australian ECE context.

The need to assess emotional climate and behavioral management during sleep time

Across the first 4 years of life, human sleep-wake cycles evidence a rapid developmental transition from polyphasic sleep-wake patterns in infancy (where a child sleeps multiple times throughout the day and night), to predominantly biphasic patterns (nap only once during the day) in toddlerhood through to mature monophasic (where sleep is consolidated into the night period) sleep-wake cycles (Acebo et al., 2005; Iglowstein et al., 2003; Weissbluth, 1995). By age 4, most children have achieved monophasic sleep patterns (Acebo et al., 2005; Blair et al., 2012; Iglowstein et al., 2003), yet the scheduling of sleep time for children of this age is a feature of many ECE settings.

Currently, data from Australia indicates that daily programming in ECE settings includes scheduling for sleep time which exceeds two hours, with these periods often mandated for all children until school entry at age 6 (Staton, Smith, Pattinson, & Thorpe, 2013). Internationally, information on daytime sleep practices
in ECE settings is not well documented. However, there is evidence that mandated sleep time occurs in the United States of America (USA) with research methodologies and outcomes documenting extended periods in which children are required to lie without alternative activities (Kurdziel, Duclos, & Spencer, 2013; Ward, Gay, Alkon, et al., 2008; Ward, Gay, Anders, Alkon, & Lee, 2008; Watamura et al., 2002). For example, Ward, Gay, Anders et al. (2008) documented a mandated sleep period of two and a half hours for all children aged between 2.5 and 4.9 years in two university affiliated full-day child care centers. Additionally, Watamura and colleagues (2002) observed children aged between 2.8 and 4.3 years in a university-based full day childcare centre in the Midwest. They documented that rest time consisted of two parts, an initial 50-minute period during which all children were required to lie on their cots only, followed by an optional rest period during which those children not sleeping, were provided activities in another room. Thus, a maximum total sleep period of 2.5 hours was documented. More recently, Kurdziel et al., (2013) observed 77 children (aged between 3 and 5.5 years) in six preschool classrooms with a scheduled classroom nap time of approximately 2 hours. Although these studies are limited to small and selected samples, they suggest that practices of sleep scheduling in ECE are not unique to Australian contexts. Furthermore, studies from Japan indicate that there is a national mandated sleep time of 1.5 hours for all children attending nursery schools aged between 2 and 5 years (Fukuda & Sakashita, 2002; Komada et al., 2012).

The scheduling of sleep time for all children, when for most sleep is no longer biologically required (Acebo et al., 2005; Iglowstein et al., 2003), raises the possibility of two disruptive and potentially detrimental mechanisms. First, for children who sleep during the ECE day, there may be a reduction in the homeostatic
sleep drive such that night-time sleep is affected (Fukuda & Asaoka, 2004; Fukuda & Sakashita, 2002). The net benefit of a sleep time may only pertain for children who have insufficient night sleep at home (Kelly & El-Sheikh, 2011), or who have not yet ceased to require additional sleep during the day in accordance with individual difference in normative patterns of sleep development (Acebo et al., 2005). Second, for those children who cannot sleep, the experience may be stressful, particularly in circumstances where alternative activities are not permitted (Ward, Gay, Alkon, et al., 2008). In the absence of alternative activities, children unable to sleep may transgress behavioral expectations, be viewed as behaviorally difficult by staff and therefore be reprimanded, or experience stress. Mandating sleep time for children who do not sleep may also present an issue of behavioral management. Difficulties arise when the rights of those to have an appropriately quiet environment for those who sleep, is pitched against the management of children who do not require sleep. To test both the biological (homeostatic drive) and behavioral hypotheses requires observation of the emotional quality of the environment in the ECE classroom alongside the behavioral management strategies used during sleep time.

Although the implications of mandating a sleep time in ECE services on children’s sleep patterns are currently unknown, emerging evidence suggests that napping in pre-school classrooms may have disruptive effects on night-time sleep that endure beyond napping cessation. Fukuda and Sakashita (2002) compared the sleep patterns of children attending kindergarten programs, where napping was optional, with those of children attending nursery programs, where all children were required to nap for 1.5 hours daily. The authors reported that children attending nursery programs, with mandated sleep periods, had significantly later bed-times, delayed sleep onset, shorter night-time sleep and more unwillingness to attend the
program, than those children for whom sleep was optional. A follow-up study found that the sleep difficulties experienced by children attending nursery programs continued into their elementary school years, long after their afternoon nap routine had ceased (Fukuda & Asaoka, 2004). Two further studies of preschool children (Acebo et al., 2005; Ward, Gay, Anders, et al., 2008), found that napping was associated with poorer night time sleep and more night awakenings. Furthermore, Lam, Mahone, Mason, and Scharf (2011) found that daytime napping in preschoolers was negatively correlated with performance on neurocognitive testing. The designs of these studies do not allow the direction of effect between disruption of night sleep and day-time napping to be fully understood. To date, only the studies of Fukuda and colleagues (Fukuda & Asaoka, 2004; Fukuda & Sakashita, 2002) present any data on direction of association, suggesting that napping under the mandated conditions of the ECE setting precedes long-term sleep disruption. The possibility that a third factor explains the associations must also be considered. For example, poor health or stressful life circumstances may drive both sleep disruption and poor cognitive functioning. The available studies indicate the need for more knowledge of such underlying mechanisms.

Sleep time in ECE rooms for 3- to 5-year-olds has the potential to present emotional and behavioral challenges both for children and their supervising teachers. Currently, there are no studies that have examined this hypothesis; however, two studies have provided indirect evidence for increased stress. Ward, Gay, Alkon et al, (2008) provided preliminary evidence for this hypothesis, with 50% of children (n = 38) observed during sleep time at childcare classified as ‘problem nappers’ (children exhibited disruptive behavior or difficulty settling, requiring teacher assistance). Compared to non-problem nappers, problem nappers had significantly higher levels
of cortisol directly following the sleep period. This finding may indicate raised stress associated with an unwanted experience. Additionally, evidence from children’s accounts of childcare suggests that naptime is a disliked and unwanted experience for many 4-year-olds. In a study of children’s accounts of their experiences in childcare, naptime was named among the top three unwanted experiences alongside “mean children” and” long circle times” (Wiltz & Klein, 2001). To assess whether such responses relate to the experience of sleep time requires not only an assessment of those who sleep, but also of the experiences of those who remain awake. In particular, documentation of the emotional quality of interactions between children and supervising care staff, and the behavioral management strategies used during the sleep period, is necessary. Further, using measures that allow assessment of the degree of continuity or discontinuity from the emotional climate and behavioral management experienced during all activities throughout the day allows assessment of the independent impact of these factors during sleep time. To this end, identification of a measure suitable for assessment of emotional climate and behavior management within sleep time and during the non-sleep time sessions is required.

Questionnaires and interviews have been used extensively to report on children’s sleep behavior (Crosby et al., 2005; Hale, Berger, LeBourgeois, & Brooks-Gunn, 2011). However, such measures, while functioning well to report on behavioral aspects of sleep and/or sleep time, are not designed for assessment of emotional climate. Moreover, these measures do not provide opportunity for comparison with general classroom interactions and emotional climate. For this task, an independent measure of classroom environment using standardized codes provides the best option. Among the most comprehensive measures of emotional climate in pre-kindergarten class environments is the Classroom Assessment and
Scoring System (CLASS) Pre-K (Pianta et al., 2008). The CLASS is used extensively to rate ECE teacher-child interaction quality and has been used as a measure of Head Start program quality (Howes et al., 2008; La Paro, Pianta, & Stuhlman, 2004; LoCasale-Crouch et al., 2007; Merritt, Wanless, Rimm-Kaufman, Cameron, & Peugh, 2012; Raver et al., 2008). Within the standard CLASS protocol observations are not made in sleep time, but rather cease at the transition to the scheduled sleep period. However, the coding framework presents categories that do not preclude application during sleep time. As the focus of this study was to examine the trajectories of emotional climate and behavioral management throughout sleep and non-sleep sessions, these subscales of the CLASS Pre-K were identified as a focus. The first aim of this study was to report on the efficacy of the CLASS Pre-K scales as an observational assessment of sleep time.

**Assessing the impact of sleep practices in ECE settings on emotional climate and behavioral management in the Australian Context**

In the current study, two types of ECE services were observed in Queensland, Australia. These were Long-day care and Kindergarten programs. Long-day care is equivalent to ‘child care’ centers in the USA, providing centre-based care for children from birth until school entry (5- to 6-years old). These services are run by not-for-profit and for-profit organizations that operate at least 48 weeks per year, open for approximately 10-hours per day and provide full-time or part-time care with children grouped in rooms according to developmental stage or age (Queensland Department of Education and Training, 2013). For example, a Long-day care centre may have 4 rooms based on age groups: “Infants”: 0- to 15-months, “Toddlers”: 15-months to 2-years, “Kindy” 2- to 3-years and “Preschool”: 3- to 5-years. Kindergartens are akin to USA ‘preschool’ programs. Queensland Kindergarten
programs provide care to children in the year before school entry with the majority of the children in these programs being aged between 3- and 5-years. Children typically attend for 15 hours per week and programs are commonly scheduled as a 5-day fortnight: 2 days one week, then 3 days the following week, with programs running for approximately 40 weeks of the year (C&K Pre-schooling Professionals, 2013). Recently, Tayler, Ishimine, Cloney, Cleveland, and Thorpe (2013) completed a comparison of Kindergarten programs in Australia and preschool programs in the USA using the CLASS Pre-K (Pianta et al., 2008). Ratings of emotional climate were reported to be equivalent between Australian Kindergarten programs and USA preschool programs (Tayler et al., 2013).

Currently, over one million (60%) Australian children attend licensed care services (Australian Bureau of Statistics, 2012; Karvelas, 2013). In Australia, national quality standards (Australian Children’s Education & Care Quality Authority, 2011) and curriculum documents (Council of Australian Governments, 2009a) direct ECE services to adopt child-centered approaches to learning and social-constructivist approaches in interactions. However, data emerging from a large Australian study (Effective Early Educational Experiences for Children; E4Kids) indicates that more than three-quarters of ECE services have compulsory sleep periods, in which all children are required to lie quietly without alternative activities even if they do not or cannot sleep (Staton, Smith et al., 2013). This suggests that, for those children who have achieved mature monophasic sleep patterns, the experience of scheduled sleep time may not be developmentally appropriate. Within the remaining quarter of ECE services, there were varying degrees of flexibility in practices during sleep time, for example, allowing sleep time to be optional or permitting children choice of a quiet activity. To date, there are no studies that report
on the effect of these practices. Furthermore, there are currently no national guidelines regarding sleep practices and policies for ECE providers. Factors such as provisions for staff planning, cleaning, breaks, and beliefs about child sleep needs may influence the scheduling of sleep within these services (Inglis, Staton, Smith, Pattinson, & Thorpe, 2013). This staff/centre based scheduling of sleep ostensibly runs contrary to recent research of effective ECE environments that indicates that when teachers co-create and negotiate activities with children there is an associated increase in child engagement, behavior, and overall positive emotional climate (Council of Australian Governments, 2009b; Hicks & Holden, 2007; Mashburn & Pianta, 2006).

Existing evidence documents that the majority of children in Australian preschool rooms will not sleep during the allotted sleep period (Staton, Smith et al., 2013). Accordingly, two hypotheses, regarding the impact of sleep time on the emotional climate and behavioral management within ECE rooms are proposed. First, a disjuncture between scheduling of sleep and a child’s ability to sleep is likely to have implications for emotional climate and behavioral management through increased violation of behavioral expectations and escalation of negative emotional climate (e.g. yelling and threats to establish control). This hypothesis would predict that ratings of emotional climate and behavioral management would decline between the non-sleep and sleep time sessions. The second hypothesis is that there would be significant declines in emotional climate and behavioral management associated with increased duration of mandated sleep time, defined as the duration of time in which all children were required to lie on their beds without any activities (e.g. quiet reading) permitted for non-sleeping children.
In response to the hypothesized need for assessment of emotional climate and behavior management during sleep time in ECE classrooms, we assessed the use of the CLASS Pre-K observation measure in this context. We initially piloted the CLASS Pre-K for use during sleep time. We then employed the CLASS Pre-K to examine the effect of sleep time on emotional climate and behavior management, by comparing mean CLASS scores during non-sleep and sleep time sessions. Finally, we examined the effect of the duration of mandated sleep on ratings of emotional climate and behavioral management during sleep time whilst controlling for the ratings of emotional climate and behavioral management in the non-sleep context and the proportion of children that were asleep during the sleep-time session.

**Method**

**Pilot Study**

**Participants.** Pilot testing was undertaken to assess the effectiveness of the CLASS Pre-K (Pianta et al., 2008) to measure emotional climate and behavioral management in the context of sleep time. This pilot testing was conducted in three rooms located within three ECE services independent of any centers involved in the subsequent sleep observation study reported in this paper. Children attending the three pilot rooms were aged between 3- and 6-years.

**Procedure.** Seven CLASS certified researchers undertook observations. All had undertaken three days of training by certified CLASS Pre-K instructors and achieved over 80% agreement, within 1 scale point, of the master coders across five video-assessments administered by Teachstone (http://www.teachstone.com/about-the-class/). Each researcher was asked to evaluate the efficacy of the CLASS Pre-K protocol in capturing the interactions occurring within the context of sleep time and to report back any possible modifications needed.
The protocol established for the piloting process is similar to the standard CLASS Pre-K protocol, with observations being conducted in 30-minute cycles. However, the sleep observation protocol incorporated a timed cycle of 25 minutes of observation and 5 minutes of coding. This adjustment to timing of the observation cycles ensured that variations in sleep practices and durations across all rooms were captured. Furthermore, due to the use of a shortened version of the CLASS Pre-K coding system, a shortened, 5-minute coding period was used. Thus, for a sleep time of 30-minute duration, observers completed one, 30-minute observation cycle and for a 2-hour sleep time, observers completed four, 30-minute observation cycles. Sleep observations commenced when the first child got onto their bed and were completed once the last child had left their bed. Five dimensions of the CLASS Pre-K (Pianta et al., 2008) were used to measure the observed teacher-child interactions that impact on the emotional and behavioral aspects of the sleep period. Four dimensions comprising the Emotional Climate domain and one dimension of the Organizational Support domain were measured. The Emotional Climate dimensions were: Positive Climate (assesses emotional connectedness and the level of respect and enjoyment shown between students and teachers as well as within peer interactions), Negative Climate (assess the degree of negativity expressed by teachers and/or children), Teacher Sensitivity (responsiveness of teachers to children’s academic and emotional development), and Regard for Student Perspectives (the degree to which classroom activities reflect students’ interests and ideas). One dimension of the Organizational Support domain Behavioral Management (the effectiveness of teacher strategies to prevent and redirect misbehavior) was measured.

Initial feedback from the seven experienced researchers identified a difficulty with the application of CLASS Pre-K to the context of sleep time. Even though all
researchers had extensive experience using the CLASS Pre-K measure in its standard form, there was a tendency to modify their point of references when coding the CLASS in the context of sleep time. During the sleep observations, researchers made adjustments to the CLASS definitions to account for their belief that sleep time necessitated a more structured part of children’s ECE experiences. That is, there was a level of personal bias and subjectivity not previously seen when administering the CLASS in the standard non-sleep observations. In response to this feedback, and consistent with the original CLASS measure, sleep time specific examples were developed. These examples, presented in Appendix J (Tables A through E - Online Supplementary Material), were not used as definitive examples to base coding, but were developed to orient observers to the published CLASS definitions. After piloting the measurement, all fieldworkers were subsequently trained in the sleep time observation protocol, using the additional sleep time specific examples to ensure integrity of the CLASS categories was maintained.

**Primary study**

**Participating Centers.** The centers recruited for this study were those ECE services with children participating in the second year (2011) of the Effective Early Educational Experiences for Children (E4Kids) study in Queensland, Australia (Tayler et al., 2013). In 2010, the E4Kids study applied a stratified random sampling frame to recruit licensed ECE services in two metropolitan, a regional, and a remote location across Queensland and Victoria. In Queensland, the metropolitan site of Brisbane, and the remote location of Mt Isa were the recruitment sites for the study; in Victoria, the recruitment sites were Melbourne (metropolitan) and Shepparton (regional). The study aimed to represent the diversity of licensed ECE provisions in Australia (Tayler et al., 2013). In Queensland, while the majority of children
participating in the E4Kids study commenced school in 2011, approximately 22% (n = 245) remained engaged in ECE services. A total of 111 (97%) ECE services were recruited, this included, 72 Long-day care services and 39 Kindergarten services. Within these services there were 130 ECE rooms that were attended by children participating in the E4Kids study in 2011.

**Participating Rooms.** To account for developmental changes in sleep and ensure age comparability, only rooms that had children in attendance, aged 4.5 years (the year prior to school) at the time of observation, were included in the current study. As a consequence, five rooms were excluded. The excluded rooms included two rooms with all children aged less than 4.5 years at the time of observation (i.e. two years prior to school entry), one multi-age room that included children younger than 20 months, and two rooms that, due to observations being conducted during school holiday care periods, included school-aged children. A further 12 (9.6%) rooms were excluded because they did not have a scheduled sleep period. Thus, a final sample of 113 rooms was observed during both the non-sleep and sleep time sessions. These rooms were nested within 98 ECE services (n = 66 Long-day care services and n = 32 Kindergarten services). Ten centers (10%) had more than one room in the analysis. To examine the similarity of sleep practices, emotional climate (during both sleep and non-sleep session) and behavioral management between individual rooms within a single centre, a series of intra-class correlations were conducted. In all cases the intra-class correlation coefficients were low to moderate (from 0.02 for non-sleep behavioral management ratings to 0.36 for duration of mandated sleep time).

Scheduled sleep time across all rooms ranged from 30 minutes to 180 minutes (3 hours), with a mean of 83.54 minutes. The modal scheduled sleep time

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(34 rooms; 30.1%) was 120 minutes (2 hours). Scheduled sleep times varied with 26.5% of rooms scheduling less than 1 hour for sleep time, 37.2% scheduled between 1 hour and less than 2 hours, and 36.3% had a standard scheduled sleep time of 2 or more hours.

**Participating Children and Staff.** Within the 113 rooms observed, the number of children present on the day of observations ranged from 9 to 26 ($M = 18.71$, $Mode = 21$). A total of 2,114 children were observed across the day and during sleep time. The average age of the youngest child across these rooms was 48 months (4 years; $SD = 4.2$ months) and the average oldest child was 62 months (5.16 years; $SD = 2.6$ months). Across all rooms, the age range observed was 3.0 to 6.4 years. Quality standard regulations in the State of Queensland in 2011 required a staff to child ratio of 1:12. Therefore, most rooms required 2 adult carers, with at least one carer being present at all times during the observations.

**Measures**

*The CLASS Pre-K (Pianta et al., 2008).* Embedded in the theory of effective teaching as an educational science, this measure observes classroom experiences in three distinct domains: Emotional Climate, Classroom Organization, and Instructional Support (Hamre, Pianta, Mashburn, & Downer, 2007). For this study, a subset of five dimensions (four dimensions of the Emotional Climate domain and the Behavioral Management dimension) of the CLASS Pre-K (Pianta et al., 2008) was used. Each dimension is rated on a seven-point Likert scale with ranges of Low (1, 2), Mid (3, 4, 5) and High (6, 7). In all rooms, the CLASS Pre-K (Pianta et al., 2008) was used to observe the teacher-child interactions, across all activities throughout the day. Activities observed included, meals and snacks, transitions between activities, free-play and the sleep time session. During the sleep period, researchers were also
provided the sleep-specific examples (Appendix J - Tables A through E, Online Supplementary Material) to help orient them to the CLASS Pre-K coding system in the context of sleep.

**Sleep Observation Protocol.** The *mandated sleep time* was defined as the observed time (minutes) within the scheduled sleep time that all children were required to lie on beds only, without any alternative activities permitted. Mandated sleep time ranged from 0 minutes (no time during the scheduled sleep time was spent without alternative activities being provided) to 140 minutes, during which, non-sleeping children were not permitted any alternative activities ($M = 57.80$ minutes, $SD = 36.96$ minutes). A count of the number of children in the room who were *awake* (eyes open and/or moving), *asleep* (eyes closed and lying still) and *potentially asleep* (lying still but unable to see child’s eyes), was also conducted using a modified version of the Nap Observation Protocol employed by Ward, Gay, Alkon, et al., (Ward, Gay, Anders, et al., 2008). This method of observation has been found to have good reliability against objective ambulatory assessment of sleep/wake patterns using actigraphy devices (ICC >.94) (Staton, Pattinson, Smith, & Thorpe, 2013; Ward, Gay, Alkon, et al., 2008). To provide a singular and conservative estimate of the children asleep for analysis, the maximum number of children coded as *asleep* and *potentially asleep* in each room were combined and expressed as a proportion (%) of the number of children within a room.

**Procedure**

Permission to conduct this research was obtained through the University Human Ethics Research Committee and written consent was provided by the service director and teachers to undertake observations within the participating classrooms. The CLASS Pre-K (Pianta et al., 2008) observation was undertaken throughout one
day in each centre. The commencement of observations was arranged with reference to the daily schedule and in consultation with supervising care staff. All observations were conducted by trained researchers who were certified as reliable in using the CLASS Pre-K measure. The majority of observations commenced between 8:30am and 9:00am and finished at the end of sleep time. A minimum of four and maximum of six observation cycles of the CLASS Pre-K were completed in the non-sleep sessions. Consistent with instructions of the CLASS manual, observation cycles during non-sleep sessions, comprised of 15 to 20 minute observations of the classroom interactions and up to 10 minutes of coding (Pianta et al., 2008). Observations of sleep time (using the observation protocol outlined in the Pilot Study, p. 12) commenced once the first child was on their bed and ended when the last child left their bed. In addition, the Sleep Observation Protocol was conducted every 10 minutes. Inter-rater reliability testing was also undertaken. This was conducted in eight rooms. Eight coders each rated one room, during the scheduled sleep period, alongside the gold standard coder. Inter-rater reliabilities were calculated for each individual using the standard CLASS criteria. Following published CLASS protocol, certified reliability was expressed as being within one rating of the Gold Standard Coder, with at least 80% agreement across all observations. Inter-rater reliability with eight fieldworkers yielded high levels of reliability against the gold standard coder (M = 98.8%, range: 83.3% - 100%).

Results

Children’s Observed Sleep Behaviors

Of the 2,114 children observed, 1,496 (71%) did not sleep at any point during the scheduled sleep period. The maximum proportion of children observed sleeping within a room ranged from 0 to 90% with a mean of 30.84%.
Ratings of Emotional Climate and Behavioral Management between Sessions

A significant decline in ratings of emotional climate between the non-sleep and sleep-time sessions, was found, using a paired-samples t test, \( t (112) = 15.93, p < .001, 95\% CI [.86, 1.11], d = 1.50 \). A significant decline in ratings of behavioral management between the non-sleep and sleep-time sessions, was found using a paired-samples t test, \( t (112) = 6.68, p < .001, 95\% CI [.38, .70], d = 0.63 \). Declines in emotional climate and behavioral management across sessions are illustrated in Figure 1.

Figure 6.1. Ratings of mean emotional climate and behavior management between non-sleep and sleep-time sessions

Correlations between emotional climate, behavioral management and mandated sleep time

Correlations between the key variables are presented in Table 6.1. Emotional climate ratings of the sleep-time sessions were moderately associated with emotional climate ratings during non-sleep sessions, maximum proportion of children asleep, and duration of mandated sleep time. Behavior management ratings of the sleep time sessions were moderately associated with the behavior management ratings during
non-sleep sessions and duration of mandated sleep time. However, behavior management during sleep-time was not significantly associated with the maximum proportion of children asleep.

**Mandated Sleep Time on Ratings of Emotional Climate and Behavioral Management**

To address the hypothesis that duration of mandated sleep time would be negatively associated with emotional climate of sleep time, a hierarchical multiple regression analysis was conducted. Only variables identified as having a significant bivariate association with the DV were included in the analysis. At Step 1 (see Table 6.2), the emotional climate ratings of the non-sleep session and the proportion of children who were asleep was entered. At Step 2, duration of mandated sleep time (in minutes) was entered. Assumptions of the multiple regression analysis were examined and no breaches were identified.

As shown in Table 6.2, in Step 1, 39% of the variance in the emotional climate of the sleep time session was accounted for by the emotional climate of the non-sleep session and the proportion of children asleep, \((F(2,110) = 35.08, p < .001)\). The addition of duration of mandated sleep time, entered at Step 2, accounted for an additional and significant, 4.9% of the variance in the emotional climate of sleep time \((F(3,109) = 28.36, p < .001)\). Both emotional climate of the non-sleep session and the amount of mandated sleep time were significantly associated with the emotional climate of sleep time. There was no association between the number of children asleep in this period and emotional climate observed during sleep time at both steps of this model. The total model accounted for 42.3% of the variance in the emotional climate observed during sleep time.
Table 6.1 Descriptive Statistics and Correlations between Key Variables and Duration of Mandated Sleep (DMS) and with Proportion of Children Asleep during Sleep-time (%asleep)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Session</th>
<th>M (SD)</th>
<th>r (with DMS)</th>
<th>r %asleep</th>
<th>t</th>
<th>r</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive Climate</td>
<td>Non-sleep</td>
<td>5.47 (0.82)</td>
<td>-.413***</td>
<td>11.13***</td>
<td>.600***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sleep time</td>
<td>4.60 (1.00)</td>
<td>-.335***</td>
<td>-.19*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative Climate</td>
<td>Non-sleep</td>
<td>6.66 (0.61)</td>
<td>-.391***</td>
<td>4.65***</td>
<td>.702***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sleep time</td>
<td>6.41 (0.79)</td>
<td>-.459***</td>
<td>-.18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher Sensitivity</td>
<td>Non-sleep</td>
<td>5.27 (1.07)</td>
<td>-.353***</td>
<td>8.42***</td>
<td>.721***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sleep time</td>
<td>4.55 (1.29)</td>
<td>-.284**</td>
<td>-.15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regard for Student Perspec</td>
<td>Non-sleep</td>
<td>5.16 (0.78)</td>
<td>-.240*</td>
<td>19.41***</td>
<td>.158†</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sleep time</td>
<td>3.04 (0.99)</td>
<td>-.429***</td>
<td>-.32**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotional Climate</td>
<td>Non-sleep</td>
<td>5.64 (0.70)</td>
<td>-.408***</td>
<td>15.93***</td>
<td>.693***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sleep time</td>
<td>4.66 (0.78)</td>
<td>-.467***</td>
<td>-.26*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Behavioral Management</td>
<td>Non-sleep</td>
<td>5.42 (.97)</td>
<td>-.235*</td>
<td>6.68***</td>
<td>.615***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sleep time</td>
<td>4.88 (1.17)</td>
<td>-.267**</td>
<td>-.01</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05. ** p < .01. *** p < .001. † p < .10.

*aNegative climate is reverse coded so that higher scores indicate lower levels of negative climate.
Table 6.2 Predictors of Emotional Climate and Behavioral Management Ratings during Sleep Time using Hierarchical Regression (N = 113 rooms)

(a) Emotional Climate\textsuperscript{a} During Sleep Time

<table>
<thead>
<tr>
<th>Predictors</th>
<th>$\Delta R^2$</th>
<th>$b$ ($SE$)</th>
<th>$\beta$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>.39***</td>
<td>.69 (.08)</td>
<td>.62***</td>
</tr>
<tr>
<td>Emotional climate during the non-sleep session\textsuperscript{a}</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum proportion of children asleep</td>
<td>-.35 (.24)</td>
<td>-.11</td>
<td></td>
</tr>
<tr>
<td>Step 2</td>
<td>.05**</td>
<td>.57 (.09)</td>
<td>.51***</td>
</tr>
<tr>
<td>Emotional climate during the non-sleep session\textsuperscript{a}</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum proportion of children asleep</td>
<td>.28 (.31)</td>
<td>.09</td>
<td></td>
</tr>
<tr>
<td>Duration of mandated sleep time</td>
<td>-.01 (.00)</td>
<td>-.26**</td>
<td></td>
</tr>
</tbody>
</table>

(b) Behavioral Management During Sleep Time

<table>
<thead>
<tr>
<th>Predictors</th>
<th>$\Delta R^2$</th>
<th>$b$ ($SE$)</th>
<th>$\beta$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>.48***</td>
<td>.83 (.08)</td>
<td>.69***</td>
</tr>
<tr>
<td>Behavioral management during the non-sleep session</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 2</td>
<td>.01</td>
<td>.80 (.08)</td>
<td>.67***</td>
</tr>
<tr>
<td>Behavioral management during the non-sleep session</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duration of mandated sleep time</td>
<td>-.00 (.00)</td>
<td>-.11</td>
<td></td>
</tr>
</tbody>
</table>

\*p<.05, **p < .01, ***p < .001.
\textsuperscript{a}Negative climate is reverse coded so that higher scores indicate lower levels of negative climate.
To address the hypothesis that the duration of mandated sleep time would be negatively associated with behavioral management in sleep time, a hierarchical multiple regression analysis was conducted. As there was no significant bivariate association between the proportion of children asleep and behavior management ratings during sleep time analyses were conducted with and without this variable. As there were minimal differences in the results, the subsequent analysis does not include the proportion of children asleep. In Step 1 (see Table 6.2), the behavioral management rating of the non-sleep session was entered. At Step 2, duration of mandated sleep time (in minutes) was entered. All of the assumptions of the multiple regression analysis were met.

As shown in Table 6.2, in Step 1, 48% of the variance of behavioral management ratings during sleep time was accounted for by the behavioral management ratings of non-sleep sessions ($F (2,110) = 102.36, p < .001$). The addition of duration of mandated sleep time at Step 2, accounted for an additional 1.2% of the variance in the behavior management of sleep time, representing a non-significant change. Table 6.2 shows that in Step 2, only the behavioral management ratings of the non-sleep session were significantly associated with the observed behavioral management of sleep time. The total model accounted for 49.1% of the variance in the behavioral management observed during sleep time.

Finally, to ensure that we did not over-estimate the observed emotional climate and behavioral management by including multiple rooms from a single center, analyses were also conducted with only one room randomly selected from each center included. No substantial differences in results were found. Accordingly, the results presented, included all rooms in the analysis.
Discussion

Biological studies indicate that between 3- and 5-years, a majority of children enter a monophasic sleep pattern and cease to require a daytime nap (Acebo et al., 2005; Iglowstein et al., 2003). However, internationally, ECE settings continue to schedule sleep for children of this age (Fukuda & Sakashita, 2002; Staton, Smith, et al., 2013; Ward, Gay, Alkon, et al., 2008). This circumstance presents the potential for daily difficulties with behavioral management and attendant reduction in the classroom’s emotional climate. The current study proposed that sleep time may be disruptive for children and their supervising care staff. As this was the first study to use the CLASS Pre-K (Pianta et al., 2008) in the context of sleep time, a pilot study was conducted. The pilot study trialed the use of a subset of the CLASS Pre-K observation protocol during the sleep period. The measure was then employed to assess changes in emotional climate and behavioral management between sleep and non-sleep sessions throughout one day in 113 ECE services in Queensland, Australia.

The pilot study indicated that the CLASS Pre-K functioned reliably to assess emotional climate and behavioral management during sleep time, though the measure had not been specifically designed for this purpose and no previous study had reported the use of CLASS in this context. The provision of specific examples for sleep time that remained true to the integrity of the original CLASS dimensions assisted researchers to maintain category integrity.

Consistent with biological research suggesting children beyond three years of age enter monophasic sleep patterns (Acebo et al., 2005; Iglowstein et al., 2003; Staton, Smith, et al., 2013), over two thirds of the children observed, did not sleep during the scheduled sleep time. Our data suggests that there was a decline in both emotional climate and behavioral management across all rooms between the non-
sleep and sleep-time sessions supporting our first prediction that the scheduling of sleep time may have adverse effects on emotional climate and behavioral management. Declines were evident across all four emotional climate dimensions with significant increases in negative climate observed alongside significant declines in positive climate, teacher sensitivity and regard for student perspectives. Notably, these findings do not suggest a decline in emotional climate associated with a single dimension (e.g. regard for student perspectives) but show a decline across all measures of emotional climate. The result indicates that sleep time in ECE presents emotional challenges in which there is a mismatch between teacher goals and child behavior. The decline in behavioral management at sleep time may suggest that, during non-sleep sessions, teachers employ more proactive strategies, and are more accepting of child behavior than they are during the scheduled sleep time. Alongside, children may be more likely to transgress behavioral expectations during sleep time. The overall declines shown in our data may be indicative of increased stress for both staff and children. Recent research indicates that teacher stress is associated with the emotional climate of the classroom (Friedman-Krauss, Raver, Morris, & Jones, 2014). Furthermore, Ward, Gay, Alkon et al., (2008) showed that regardless of whether children napped or not, ‘problematic nappers’ who demonstrated disruptive behaviors and difficulty settling, had higher afternoon cortisol levels, which may be indicative of sleep time being a physiologic stressor.

There was partial support for the second hypothesis that predicted that both emotional climate and behavioral management ratings would decrease with increased duration of mandated sleep time. Duration of mandated sleep time uniquely and negatively predicted ratings of emotional climate during sleep time, even after controlling for the emotional climate ratings during the non-sleep session and the
proportion of children asleep. This result indicates that classrooms that had longer mandated sleep time had lower ratings of emotional climate. The regression analysis also indicated that the proportion of children who were asleep did not significantly contribute additional variance to the prediction of the emotional climate observed during the sleep time session. Finally, although there was a significant decline overall in ratings of behavioral management between the non-sleep and sleep time sessions, this effect was not associated with the duration of mandated sleep time. A likely explanation for this finding is that increased behavioral difficulties and attendant teacher management strategies occur throughout the sleep session regardless of the duration of the sleep time and are consequently reflected in low variance between mean scores.

**Limitations and Future Directions**

The current study is the first application of the CLASS Pre-K measure in the context of sleep time and presents promising results from a substantial number of observations of rooms and children. However, there are a number of limitations that must be considered in application of the findings. These relate to the limitations of the sample and limitations of measurement. First, the findings are currently limited to the context of Australian ECE centres. Replication in other national and cultural contexts is needed to ascertain generalizability of the findings. Extension of investigation to new contexts is important, as the practice of mandating a sleep period for children aged between 3- and 5-years has been reported in a range of international contexts (Fukuda & Sakashita, 2002; Kurdziel et al., 2013; Ward, Gay, Alkon, et al., 2008; Watamura et al., 2002). Second, the study was only able to employ room-level demographic data and did not have access to individualized child-level data on age or family social economic status. As younger children are
biologically more likely to require a daytime sleep, age variability may affect the number of children observed sleeping (Acebo et al., 2005; Iglowstein et al., 2003). However, as the number of non-sleeping children was high (71%) during the allocated sleep time, there is a low likelihood that our results simply reflect individual variability. As there is some evidence in the extant literature of an association between lower SES and increased difficulties obtaining sufficient night-time sleep (Kelly & El-Sheikh, 2011; Mezick et al., 2008; Moore, Adler, Williams, & Jackson, 2002) the need to account for individual social circumstances is evident. Future studies should obtain data on individual age and family social status variability within ECE rooms alongside children’s responses to sleep time.

On the basis of the current findings, there are a number of suggested directions for extending the exploration of the effects of sleep practices in childcare. These relate to assessment of child outcomes and extension of the use of CLASS to assess sleep time. While this study provides evidence of an association between sleep policies during sleep time, emotional climate, and behavior management, child outcomes were not directly measured. Examination of children’s behavioral and physiological responses to sleep time, through observation and physiological measurement (e.g. cortisol testing), would strengthen the findings of this study and aid in informing sleep practices and policies in ECE settings more generally. In particular, exploration of the differential effects of sleep time on those children who do and do not sleep is indicated, and should consider the effects of observed emotional climate and behavioral management. Finally, the study focused on a subset of the CLASS dimensions for the observations during sleep time to accommodate the specific focus of our research. Given that we found so many children did not sleep in
the rooms observed, future research might consider the use of the entire CLASS Pre-K observation during both the non-sleep and sleep time sessions.

Implications

The findings of the current study raise serious questions pertaining to the sleep policies and practices employed in ECE environments. However, they do not suggest that sleep periods be completely abolished. Our data indicates that a significant minority of children (~30%) did sleep during the allotted sleep time session. Furthermore, it is recognized that sleep scheduling may result from economic pressures within ECE centers and be provided to allow staff breaks, cleaning, time for planning lessons, and professional development (Inglis et al., 2013). Nevertheless, our results indicate that sleep time presents an issue for both emotional climate and behavior management within classrooms. Emotional climate and behavioral management have been shown to predict both classroom engagement and learning (Emmer & Stough, 2001; NICHD ECCRN, 2002; Pianta, Paro, Payne, Cox, & Bradley, 2002). The detected association between activities during non-sleep and sleep time sessions, underlines the significance of the sleep period and highlights the imperative for reflection and open discussion about sleep policies and practices to support teachers and children within this challenging period. For example, ECE services may consider a reduction in the duration of mandated sleep time by providing quiet activities for non-sleeping children. A key message of this study is that research is needed to guide ECE staff in decision-making concerning sleep policy and practices.
Conclusion

This study provides evidence of the value of using the CLASS Pre-K observation protocol in the study of sleep in ECE settings. The CLASS Pre-K tool functioned as an effective and sensitive measure of the emotional climate and behavior management observed in sleep time. The results indicate that sleep time presents measurable, emotional and behavioral challenges for both children and teachers. Furthermore, the disjunction of duration of mandated sleep time and emotional climate in the later years of ECE, calls into question the responsiveness of sleep practices to the developmental transition and behavioral variation in children’s sleep patterns at this time. This study highlights the need for further exploration of the antecedents and consequences of sleep policies and practices in ECE settings.
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doi:10.1097/PSY.0b013e31816fdf21


doi:http://dx.doi.org/10.1016/j.ecresq.2007.09.001


Chapter 7: Paper 4 – Mandatory Naptimes in Childcare and Children’s Nighttime Sleep

7.1 PUBLICATION STATUS AND CO-AUTHOR CONTRIBUTION

7.1.1 Publication Status and Target Journal

This paper is currently submitted and under review with the *Journal of Developmental and Behavioral Pediatrics* (*IF* = 2.118). The *Journal of Developmental and Behavioral Pediatrics* is an international peer-reviewed journal with a broad audience of clinicians, researchers and teachers interested in critical issues for paediatric healthcare. Please note that the following paper has been formatted in accordance with the requirements of *Journal of Developmental and Behavioral Pediatrics*.

7.1.2 Statement of Contribution

Ms Staton conceptualized and designed the study, supervised and performed data collection, analysed and interpreted the data, and drafted the manuscript; Dr Smith conceptualized and designed the study (as associate supervisor), contributed to analysis and interpretation of data and critically reviewed the manuscript; Ms Pattinson performed data collection, contributed to analysis and interpretation and critically reviewed the manuscript; Dr Thorpe conceptualized and designed the study (as primary supervisor), supervised data collection, contributed to analysis and interpretation of data and reviewed and revised the manuscript. All authors approved the final manuscript as submitted.

Principal Supervisor Confirmation

I have sighted email or other correspondence from all Co-authors verifying their authorship.

Professor Karen Thorpe  
K Thorpe  
22/10/2014

Name  Signature  Date
Mandatory Naptimes in Childcare and Children’s Nighttime Sleep

Running Head: Naptime in Childcare and Children’s Nighttime Sleep

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ABSTRACT

Objectives: To examine the effects of mandatory naptimes in childcare on nighttime sleep duration, both concurrently and 12 months later once in school.

Methods: A sample of 168 children (50-72 months; 55% males) attending licensed childcare centres were observed across their morning and throughout their scheduled naptime. Mandatory naptime was determined as the period in which children were not permitted any alternative activity except lying on their bed. Teachers reported each child’s napping in childcare. Nighttime and total sleep duration was reported by parents at two time points, in childcare and in the second semester of their first school year. General linear models were used to examine group differences in sleep duration between children experiencing 0-60 minutes and >60 minutes of mandatory naptime, adjusting for key confounders. Path analysis was conducted to test a mediation model in which mandatory naptime is associated with nighttime sleep duration through increased napping in childcare.

Results: Children who experienced >60 minutes of mandatory naptime in childcare had significantly less nighttime sleep than those with 0-60 minutes of mandatory naptime. This effect persisted at 12-month follow-up, once children were in school. Napping in childcare mediated the relationship between mandatory naptime and duration of nighttime sleep.

Conclusions: Exposure to mandatory naptimes of >60 minutes in childcare is associated with decreased duration of nighttime sleep that endures beyond childcare attendance. Given the large number of children who attend childcare, sleep practices within these settings present an important focus for child health.

Key Words: nap, sleep, childcare, preschool, children
Insufficient nighttime sleep in young children significantly increases the risk of adverse health and developmental outcomes, most notably increased behavioural difficulties, \(^1\) poorer cognitive functioning, \(^2\) increased injury, \(^3\) and increased paediatric obesity. \(^4\) Napping has been proposed as a potentially modifiable component of children’s sleep, and one that may ameliorate the effects of reduced nighttime sleep. \(^5,6\) Studies of the effects of napping in early childhood do not consistently report positive effects, \(^7-9\) however, and raise questions about the value of napping promotion. Restricting the napping of children who would normally nap has been shown to have adverse effects on their emotional regulation \(^10\) and cognitive performance. \(^11,12\) In contrast, Lam et al. in a study conducted in childcare settings where naptime is a part of the daily routine, report napping to be associated with poorer cognitive functioning. \(^8\) A key feature distinguishing these conflicting findings is the age and biological sleep drive of the children studied. While napping restriction studies have sampled younger children (<3 years) because they habitually nap, \(^10-12\) Lam et al. focused on preschoolers (3-5 years) who were required to nap when many no longer have had the biological drive to do so. \(^8\) The conflicting findings direct attention to the changing developmental value of napping as children transition from infancy through to the preschool years.

Among preschoolers, napping is consistently associated with shorter duration of nighttime sleep \(^6,13-17\) and likely reflects normative developmental changes in sleep drive. \(^18\) Normative studies indicate that by age 3 approximately half of all children will have ceased regular napping, with the proportion napping dropping to less than a quarter by age 4. \(^19-21\) Despite the normative pattern of consolidation of sleep into the night period, a common practice in childcare programs internationally is the scheduling of a mandatory naptime throughout the childcare years, during which time all children are required to lie on their bed and are not permitted to engage in alternative activity. \(^16,22\) The impact of such environmental
exposures are likely meaningful. Environmental, and not biogenetic factors, account for almost 80% of the variance in napping duration by age 4-years.\textsuperscript{5,7,23} Such environmental influence has already been demonstrated in the association of parent’s attitudes toward napping and duration of napping in preschool aged children.\textsuperscript{6} Whether such effects are also seen in the context of childcare, where napping is actively promoted, has not been determined.

Across developed nations more than two-thirds (77%) of children aged 3-5 years attend childcare services,\textsuperscript{24} yet there remains little understanding of the impacts of attendance on children’s sleep patterns. Current evidence derives from two Japanese studies that compared two forms of childcare provision, one in which napping is optional and the other in which a mandatory naptime of 1.5 hours is legislated.\textsuperscript{14,15} Both studies report exposure to legislated mandatory naptimes to be associated with reduced nighttime sleep duration and increased sleep problems; an effect found at the time of attendance\textsuperscript{15} and up to 4 years later when the children had entered school and exposure to childcare had ceased.\textsuperscript{14} While these studies suggest mandatory naptimes may disrupt nighttime sleep, their design was limited to simple comparison of program type. They did not include direct observation of naptime practices and could not exclude other childcare, child or family characteristics that may have explained this finding. In the current study we address these limitations. On the basis of the prior citations we hypothesise that children in childcare settings with longer mandatory naptimes would have reduced duration of nighttime sleep, and that this effect would continue, at 12 month follow-up, once children were in school. Further, we hypothesised that how regularly a child napped in childcare would mediate the relationship between mandatory naptime and the duration of their nighttime sleep.
METHODS

Study Design and Participants

Data were collected as part of the Effective Early Education Experiences (E4Kids) study. The E4Kids study includes children across a representative sample of early childhood service provision in Australia. Observations of sleep practices were conducted in Brisbane (metropolitan) and Mt Isa (rural), Queensland, Australia during 2011. At this time, at total of 239 of the E4Kids cohort were attending centre-based childcare services (N=130), including long day care (equivalent to USA child care) and kindergarten (equivalent to USA preschool) programs. The analyses presented are based on data collected from direct observations within all participating childcare services, teacher reports of children’s napping at childcare and parent report of children’s sleep at two time point; concurrently (T1) and at 12-month follow-up (T2). Of the initial 239 children, 70 (29%) did not have parent report data available at T1, and were subsequently excluded from analyses. As the primary interest was preschool aged children, one child outside the preschool age range (>6 years) at T1 was excluded. The final sample included 168 children at T1 and 130 children at T2.

Measures

Mandatory naptime. Mandatory naptime in each child’s childcare setting was measured by trained researchers via direct observation. Researchers used a standard protocol to record the time in which different activities were permitted during designated sleep periods. Duration of mandatory naptime was defined as the length of time (minutes) within a childcare room in which all children were required to lie on beds, without any alternate activity permitted (e.g. drawing or reading). Inter-rater reliability was determined via independent observation by two researchers across eight study rooms and was deemed excellent (ICC=.996).
Napping at childcare. How regularly each child napped at childcare was reported by teachers via a single-item “Does this child usually sleep during sleep/rest time?” with a 5-point Likert scale (0=never, 1=rarely, 2=sometimes, 3=mostly, 4=always). Teacher reports of how regularly children napped was validated against direct observation of napping duration in childcare settings on a single day ($r=0.6, p<.001$) using a modified version of the nap observation protocol described by Ward et al.$^{17}$ This method of sleep observation codes child behaviours at 10-minute intervals to determine sleep duration and has been found to have good reliability against ambulatory assessment of sleep/wake patterns using actigraphy.$^{17}$

Nighttime and total sleep duration. Each child’s nighttime and total sleep duration was reported by parents at T1 and T2 via the following items: 1) “on a typical night, when does the study child go to bed?”; 2) “on a typical morning, when does the study child wake up?”; 3) “does the study child ever nap (sleep during the day)?”, (4) “in a typical week, on how many does the study child usually nap?” and (5) “on days when the study child naps, how long do they usually nap for?”. Bed-times and wake-times were indicated in 30 minute increments. The difference between typical bed-time and wake-time was used to calculate nighttime sleep duration. Typical duration of napping was calculated as per the method used by Miller et al.,$^{25}$ whereby the reported nap duration is multiplied by the number of days a child napped and dividing by 7. Where parents identified children as not napping, a score of 0 was applied. Total sleep duration was calculated by summing a child’s typical napping duration with their nighttime sleep.

Child and family characteristics. Child gender, age and temperament, parental education, and total family income and were reported by the primary care-giver via structured survey. Child temperament was measured using the Short Temperament Scale for Children (STSC).$^{26}$ In the current study, scores across 12 items encompassing three domains (sociability, persistence and inflexibility) of the STSC were averaged to provide a single
Easy-Difficult Temperament Score, in which higher scores reflect a more easy temperament style (scale 0-5; Cronbach's $\alpha = .76$). Parental education was derived in response to two items (1) “what is the highest level of education you have completed” and (2) “what is the highest level of education your partner has completed?” Responses were scored on an 8 point-scale (0=no schooling or did not complete primary school; 1=primary school or equivalent; 2=year 10 or equivalent; 3=year 12 or equivalent; 4=tertiary certificate or equivalent; 5=Diploma or equivalent; 6=University bachelor degree or equivalent; 7=postgraduate university degree). The average across both items was subsequently used to calculate a mean parental education score. Total family income was reported in response to the following item “Before tax is taken out what was your family’s total income for last year?” Total family income was indicated on a 13-point scale from 0=$0-24,999 thru to 12=$300,000+ (AUD).

**Childcare characteristics.** Each childcare environment was defined by measures of childcare quality, child’s days of attendance, and service type. Childcare quality was measured using a standard observation measure; The Classroom Assessment Scoring System (CLASS Pre-K).\textsuperscript{27} CLASS codes the quality of teacher-child interactions via multiple intensive observations of emotional, organisational and instructional quality with score ranging from 1 (low) through 7 (high). In the current study, the average total score for the CLASS Pre-K was used. Days of attendance in centre-based childcare was reported by parents and measured via two items (1) “In 2011, on how many days in a typical week did the study child attend a child-care centre” and (2) “In, 2011, on how many days in a typical week did the study child attend a stand-alone kindergarten”. Service type (long day care or kindergarten) was derived from licensing details collected from childcare centre directors.

**Procedures**

Full ethical approval was received from the Human Research Ethics Committee of the author’s affiliated institution. Informed consent was received from parents and childcare...
staff. Trained researchers conducted standard observations on a single day in the second semester of the education year (Aug-Nov) at each childcare service. Data regarding napping were collected on the same day. In line with the standard procedures for the CLASS Pre-K, observations of classroom activities were conducted in 15-20 minute blocks with 10 minutes of coding time. A minimum of 4 and a maximum of 6 observations were conducted in each room. Full reliability procedures have been previously published. Observations of naptime began once the first child was on their bed and ceased once the last child was up off their bed.

Statistical Analysis

Data were analysed using SPSS Version 21\textsuperscript{28} and AMOS 21\textsuperscript{29} software. Missing data (<5\% of study values; Little’s MCAR test, $p>.05$) were estimated and replaced using the expectation-maximisation (EM) method. Parametric and non-parametric analyses (independent samples t, Mann-Whitney U and Chi-squared tests) were conducted to examine group differences in child, family, childcare and napping characteristics across mandatory naptime groups; and between children with and without parent report data at T1 and T2. Primary analyses focused on group differences in night and total sleep duration whilst in childcare and, 12-months later, once children were in school in relation to mandatory naptimes at childcare. For the purpose of these analyses, mandatory naptime was divided into two groups based on central distribution; 0-60 minutes and >60 minutes. Analyses of variance tests were conducted using general linear models to examine differences in nighttime and total sleep duration at T1 and T2 across mandatory naptime groups. Analyses were conducted both unadjusted and adjusted for potential confounding variables of age, gender, child temperament, family income, parental education, days/week in childcare, childcare quality and service type. In all cases significance and direction of findings remained for both adjusted and unadjusted models and as such adjusted models are presented throughout. Follow-up analyses were conducted to examine if napping in childcare mediates
the relationship between mandatory naptime and duration of nighttime sleep. In these analyses mandatory naptime was treated as a continuous variable. Path analysis was conducted using AMOS to examine a mediation model in which mandatory naptime is related to duration of nighttime sleep, through napping in childcare. Baron and Kenny’s\textsuperscript{30} four step approach was used to assess the presence of a mediation pathway. The significance of the indirect effect was determined using bootstrapping techniques with effects generated after resampling from the observed cases 2000 times; bias corrected 95% confidence intervals (CI) are reported in text.

**RESULTS**

**Missing Data Analysis**

No significant differences in age, gender, mandatory naptime duration, napping in childcare and childcare quality were found between children with and without parent report data at T1. More children attending kindergarten services participated in the study at both T1 ($p=.02$) and T2 ($p=.002$). Additionally, children remaining in the sample at T2 had experienced significantly less mandatory naptime at T1 ($p=.005$). No other significant differences between children with and without T2 data were found.

**Sample Characteristics**

Characteristics of the study samples are shown in Table 7.1. At T1 the average age of the children in the study was 59.06 months ($SD=3.87$) with a range of 50-72 months, 55% males. All children were attending licensed long day care (57%) or kindergarten (43%) services, with an average attendance rate of three days per week ($M=3.19$, $SD=0.97$). Mandatory naptimes experienced by the children within their childcare setting ranged from 0 to 145 minutes ($M=56.24$, $SD=39.96$). At T2 approximately 97% of the study children were attending school. The children ($n=5$) who remained in childcare in T2 were excluded from analyses at this time point.
Mandatory Naptime and Napping

At T1, children exposed to >60 minutes of mandatory naptime napped more often in childcare ($U=4972.5$, $p<.001$, $r=.37$) and had longer parent reported napping duration ($U=4973.5$, $p<.001$, $r=.39$) than children exposed to 0-60 minutes of mandatory naptime (Table 7.1). Only a small number of children continued to nap at T2 ($N=19$; 15%), with all children napping 2 days per week or less. Whilst no significant difference in presence of napping across groups at T2 was observed, children exposed to >60 minutes of mandatory naptime continued to have significantly longer typical napping duration once in school, $U=2114.5$, $p=.03$, $r=.44$.

Mandatory Naptime and Duration of Nighttime Sleep in Childcare (T1)

Group differences in nighttime sleep and total sleep duration are shown in Figure 6.1. Results showed that children exposed to more than >60 minutes of mandatory naptime had significantly less nighttime sleep whilst in childcare than children exposed to 0-60 minutes of mandatory naptime, $F(1,158) = 12.482$, $p<.001$, $\eta_p^2=.073$. There was no significant difference in total sleep duration between groups at T1 ($p>.05$).

Mandatory Naptime and Duration of Nighttime Sleep in School (T2)

At T2, at 12-month follow-up during the second semester of their first year of school, children who had previously been exposed to >60 minutes of mandatory naptime whilst in childcare continued to have significantly less nighttime sleep than children exposed to 0-60 minute of mandatory naptime, $F(1,115) = 8.244$, $p=.005$, $\eta_p^2=.067$ (Figure 7.1). Additionally, once in school, children exposed to >60 minutes of mandatory naptime in childcare were also found to have significantly less total sleep than children exposed to 0-60 minutes of mandatory naptime, $F(1,115) = 6.349$, $p=.01$, $\eta_p^2=.052$. To examine if these effects were explained by increased napping within the >60 minutes group, analyses were also conducted excluding all children ($n=19$) who were reported as still napping at this time. Results showed
that amongst children who had ceased napping there remained a significant difference in the duration of nighttime sleep across groups, \(F(1,96) = 10.165, p = .002, \eta^2_p = .096\), with children in the >60 minute group reporting significantly less nighttime sleep.

Napping as a Mediator between Mandatory Naptime and Nighttime Sleep

Figure 7.2 depicts the relationship between mandatory naptime, napping in childcare and children’s nighttime sleep at Time 1. As seen in the figure, the standard criteria for mediation were met; (1) mandatory naptime was significantly associated with duration of nighttime sleep (95% CI: -.31, -.001), (2) mandatory naptime was significantly associated with napping in childcare (95% CI: .08, .44), (3) napping in childcare was significantly associated with duration of nighttime sleep (95% CI: -.45, -.15) and (4) mandatory naptime was no longer significantly associated with duration of nighttime sleep once adjusted for napping in childcare (95% CI: -.23, .11). The indirect effect between mandatory naptime and duration of nighttime sleep was significant (95% CI: -.18 to -.02).

**DISCUSSION**

This study is the first to examine the relationship between duration of mandatory naptime in childcare and children’s nighttime sleep. Children who experienced >60 minutes of mandatory naptime within their childcare setting had shorter nighttime sleep than those in rooms with 0-60 minutes of mandatory naptime, with this effect likely due to increased ratio of day-to-night time sleep amongst this group. Critically the effects on nighttime sleep were still present at 12-month follow-up, when children were in school and napping had virtually ceased. Our findings are consistent with two previous sets of studies that show (1) a decline in night sleep duration associated with increased duration of napping among preschool children\(^{10,17-22}\) and (2) differences in disruption of nighttime sleep associated with childcare service types\(^{14,15}\). Our findings advance understanding by showing a connection between observed variations in duration of mandatory naptime and children’s nighttime sleep.
Importantly this study demonstrates the potential of napping practices in childcare settings to modify sleep patterns that endure beyond the time of childcare attendance. Our results raise questions about the immediate and on-going implications on sleep patterns of extended mandatory naptimes for children, beyond the age at which monophasic sleep patterns would typically emerge.

Our study has a number of strengths including the use of detailed observations of sleep practices in childcare settings, multiple data sources (observation, parent and teacher) and nighttime sleep data measured beyond the time of attendance at childcare. Opposing these strengths was a number of limitations. It is important to note that our findings relate specifically to children aged 3-6 years and cannot be generalised beyond this age group. Additionally, while we have controlled for a comprehensive range of potentially confounding variables, causality cannot be inferred. Nevertheless our longitudinal design that shows decreased sleep duration beyond the childcare context is consistent with an enduring modification of sleep pattern.

In conclusion, this study for the first time shows a relationship between observed naptime practices in childcare settings and children’s nighttime sleep. Given the number of young children who attend childcare and the relationship of nighttime sleep with multiple health outcomes, childcare sleep practices represent a potentially important focus for child health.
References


Chapter 4: Paper 4 – Mandatory Naptimes in Childcare and Children’s Nighttime Sleep


Acknowledgements

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The contents of this article are solely the responsibility of the authors and do not necessarily represent the official views of the E4Kids affiliated collaborating groups or funding bodies.

<table>
<thead>
<tr>
<th>Measures</th>
<th>Total Sample (N=168)</th>
<th>0-60 Minutes Mandatory Naptime (n = 91)</th>
<th>&gt;60 Min Mandatory Naptime (n = 77)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Child, Family and Childcare Characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age, months</td>
<td>58.89 ± 3.88</td>
<td>59.80 ± 3.31</td>
<td>57.81 ± 4.23*</td>
<td>.001b</td>
</tr>
<tr>
<td>Gender (female)</td>
<td>78 (46)</td>
<td>44 (48)</td>
<td>34 (44)</td>
<td>.59c</td>
</tr>
<tr>
<td>Easy-difficult temperament, score</td>
<td>3.14 ± 0.70</td>
<td>3.25 ± 0.63</td>
<td>3.01 ± 0.75*</td>
<td>.03b</td>
</tr>
<tr>
<td>Family total income</td>
<td>5.06 ± 3.00</td>
<td>5.45 ± 3.20</td>
<td>4.60 ± 2.69</td>
<td>.10d</td>
</tr>
<tr>
<td>Parental education level</td>
<td>5.20 ± 1.27</td>
<td>5.44 ± 1.21</td>
<td>4.90 ± 1.30*</td>
<td>.004d</td>
</tr>
<tr>
<td>Childcare attendance, days/wk.</td>
<td>3.20 ± 0.95</td>
<td>3.10 ± 0.87</td>
<td>3.34 ± 1.03</td>
<td>.07d</td>
</tr>
<tr>
<td>Childcare quality, score</td>
<td>4.50 ± 0.56</td>
<td>4.75 ± 0.57</td>
<td>4.20 ± 0.40*</td>
<td>&gt;.001b</td>
</tr>
<tr>
<td>Service type (kindergarten)</td>
<td>69 (41)</td>
<td>63 (69)</td>
<td>6 (8)*</td>
<td>&gt;.001c</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daytime Napping</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T1 napping at childcare, freq.</td>
<td>1.62 ± 1.31</td>
<td>1.17 ± 1.10</td>
<td>2.16 ± 1.35*</td>
<td>&gt;.001d</td>
</tr>
<tr>
<td>T1 typical napping duration, min*days/7</td>
<td>0.25 ± 0.38</td>
<td>0.12 ± 0.23</td>
<td>0.40 ± 0.45*</td>
<td>&gt;.001d</td>
</tr>
<tr>
<td>T2 napping (yes)a</td>
<td>19 (15)</td>
<td>10 (14)</td>
<td>9 (17)</td>
<td>.58c</td>
</tr>
<tr>
<td>T2 typical napping duration, min*days/7a</td>
<td>0.03 ± 0.09</td>
<td>0.01 ± 0.04</td>
<td>0.05 ± 0.13*</td>
<td>.03d</td>
</tr>
</tbody>
</table>

Values shown are mean ± SD or n (%). *Significant at p<.05.

a: n=125 with complete T2 data (0-60 minutes, n=73; >60 minutes, n=52); b: Independent groups t-test; c: Chi-squared test (χ²); d: Mann-Whitney U test.
Figure 7.1. Mean nighttime and total sleep duration at T1 and T2 by mandatory naptime group. Error bars show 95% Confidence Intervals (CI). Models adjusted for age, gender, temperament, family income, parental education, days/week in childcare, childcare quality and service type. *Significant at p <.05.
Figure 7.2. Napping in childcare mediates the relationship between mandatory naptime and nighttime sleep duration. Model adjusted for age, gender, temperament, family income, parental education, days/week childcare, childcare quality and service type. Values are standardised regression weights [β(SE)]. a Unadjusted; b Adjusted for mandatory naptime; c Unadjusted; d Adjusted for napping in childcare. *<.05 **<.01.
Chapter 8: Paper 5 - The role of sleep science in informing sleep practices in Early Childhood Education and Care settings

8.1 PUBLICATION STATUS AND CO-AUTHOR CONTRIBUTION

8.1.1 Publication Status and Target Journal

This paper is accepted for publication for the Journal of Translational Issues in Psychological Science, Special Issue: Sleep Science (First Edition). This journal, published by the American Psychological Association publishing group, provides a platform for the translation of critical issues within the field of psychological science, with each issue centred on a new, emerging or potentially controversial theme. The paper was by invitation to the candidate following presentation at the Society for Research in Child Development, Seattle, 2013 and the American Association of Sleep Medicine, Minneapolis, 2014. The following paper is formatted in accordance with the requirements of the Translational Issues in Psychological Science.

8.1.2 Statement of Contribution

Ms Staton conceptualized the paper, undertook review of relevant research and drafted the manuscript; Dr Smith contributed to the conceptualisation and design of the paper (as associate supervisor) and critically reviewed the manuscript. Professor Thorpe conceptualized the paper (as primary supervisor) and contributed to the drafting of the manuscript.

Principal Supervisor Confirmation

I have sighted email or other correspondence from all Co-authors verifying their authorship.

Professor Karen Thorpe

Name

Signature

Date

22/10/2014
“Do I Really Need a Nap?”: The Role of Sleep Science in Informing Sleep Practices in Early Childhood Education and Care Settings

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Abstract

A compelling body of studies identifies the importance of sleep for children’s learning, behavioural regulation and health. These studies have primarily focused on nighttime sleep or upon total sleep duration. The independent contribution of daytime sleep, or napping, in childhood is an emerging research focus. Daytime sleep is particularly pertinent to the context of early childhood education and care (ECEC) where, internationally, allocation of time for naps is commonplace through to the time of school entry. The biological value of napping varies with neurological maturity and with individual circumstance. Beyond the age of three years, when monophasic sleep patterns become typical, there is an increasing disjuncture between children’s normative sleep requirements and ECEC practice. At this time, research evidence consistently identifies an association between napping and decreased quality and duration of night sleep. We assess the implications of this evidence for educational practice and health policy. We identify the need to distinguish the functions of napping from those of rest, and assert the need for evidence-based guidelines on sleep-rest practices in ECEC settings to accommodate individual variation in sleep needs. Given both the evidence on the impact of children’s nighttime sleep on long-term trajectories of health and well-being and the high rates of child attendance in ECEC programs, we conclude that policy and practice regarding naptime have significant implications for child welfare and on-going public health.

Keywords: Napping, Sleep, Early Childhood Education and Care, Policy, Practice
“Do I Really Need a Nap?”: The Role of Sleep Science in Informing Sleep Practices in Early Childhood Education and Care Settings

A growing international body of data indicates that many children do not normally have a daily nap after the age of approximately three years (Blair et al., 2012; Carter, Taylor, Williams, & Taylor, 2011; Galland, Taylor, Elder, & Herbison, 2012; Iglowstein, Jenni, Molinari, & Largo, 2003; Komada et al., 2012; Ottaviano, Giannotti, Cortesi, Bruni, & Ottaviano, 1996; Snell, Adam, & Duncan, 2007; Thorleifsdottir, Björnsson, Benediktsdottir, Gislason, & Kristbjarnarson, 2002). In early childhood education and care (ECEC) settings, however, scheduling of a daily nap time and concurrent sleep promotion are commonplace right through until the time children enter school, around age six (El-Sheikh, Arsiwalla, Staton, Dyer, & Vaughn, 2012; Fukuda & Sakashita, 2002; Staton, Smith, Pattinson, & Thorpe, 2014; Ward, Gay, Alkon, Anders, & Lee, 2008). In many centres these naptimes are mandatory and of significant duration. We review the extant literature regarding napping within the early childhood period, identify a disjuncture between scientific evidence on children’s sleep needs and current practice in ECEC settings, and outline a research agenda to inform policy. We ask whether, for whom and under what conditions napping in ECEC is important, and in what ways sleep practices in these settings are likely to confer benefit or risk to children, families, and ongoing public health.

In developed economies, a high proportion of parents participate in the workforce, and by the end of the early childhood period most children will have spent some time in a non-parental ECEC setting (OECD, 2014). For example, by four years a majority of children attend ECEC in the USA (57.5%), UK (97.3%), Australia (52.6%) and Japan (95.7%) and attendance rates increase such that by five
years the figures for these countries are 73.3%, 98.8%, 99.8% and 98.2% respectively. The extent to which sleep time is a component of the ECEC day across different nations is not systematically documented, however, there is evidence from USA, Japan, Finland and Australia that indicate that scheduled nap times can last up to, and in excess of, two hours (El-Sheikh et al., 2012; Fukuda & Sakashita, 2002; Staton, Smith, Pattinson, & Thorpe, 2013; Ward, Gay, Alkon, et al., 2008; Watamura, Sebanc, & Gunnar, 2002), which has been defined as a ‘substantial proportion’ of the ECEC day (Harms, Clifford, & Cryer, 2003). Current understanding of the effects of these practices is limited. Studies of nighttime sleep documents a largely positive association between children’s sleep quality and duration and their developmental outcomes (e.g. Alfano & Gamble, 2009; Bates, Viken, Alexander, Beyers, & Stockton, 2002; Bell & Zimmerman, 2010; Carter et al., 2011; Gomez, Newman-Smith, Breslin, & Bootzin, 2011; Jiang et al., 2009; Paavonen, Porkka-Heiskanen, & Lahikainen, 2009; Sadeh, Gruber, & Raviv, 2002; Touchette et al., 2007). Though it is tempting to extrapolate from these findings to infer a universal benefit for daytime sleep, studies of napping in early childhood suggest this inference may be overly simplistic (e.g. Dionne et al., 2011; Fukuda & Asaoka, 2004; Lam, Mahone, Mason, & Scharf, 2011). The extant evidence raises questions about the value of routine scheduling of extended sleep periods for all children in ECEC settings. There is a need to apply the existing evidence from developmental and sleep science to guide appropriate policy and practice in ECEC settings, and a need for further research to refine such guidance. Specifically, there is a growing imperative for evidence to direct an accommodation of individual differences in sleep need that result both from variation in timing of neurobiological
maturation and the diversity of social and health circumstance experienced by the population of children who attend ECEC settings.

**The Importance of Sleep in Early Childhood**

Sleep has a significant impact on how individuals think, feel and behave throughout the life span (Carskadon & Dement, 1994; Vassalli & Dijk, 2009). In regards to early childhood (0-5 years), a large body of data attests to the significance of sleep in promoting a developmental outcomes (Alfano & Gamble, 2009; Bates et al., 2002; Bell & Zimmerman, 2010; Bernier, Beauchamp, Bouvette-Turcot, Carlson, & Carrier, 2013; Cappuccio et al., 2008; Carter et al., 2011; Gomez et al., 2011; Paavonen et al., 2009; Touchette et al., 2007). These studies converge to identify that both the quantity and quality of sleep are positively associated with children’s concurrent and longer term learning, behaviour and health. For example, shorter sleep duration has been associated with paediatric obesity that has attendant lifetime effects on health and social well-being (Bell & Zimmerman, 2010; Carter et al., 2011; Snell et al., 2007).

The early childhood period is a particularly critical time, during which there is rapid biological transition toward adult patterns of sleep (Touchette, Petit, Tremblay, & Montplaisir, 2009) and, commensurate with this transition, an increasing sensitivity to environmental influence (Dionne et al., 2011; Fisher, van Jaarsveld, Llewellyn, & Wardle, 2012; Touchette et al., 2013). Emerging evidence from studies using animal models suggest that sleep early in life is critical for normal brain development, and that perturbation of sleep within these critical sensitive periods may influence significant later adult behaviour (Kayser, Yue, & Sehgal, 2014). While models such as those by Keyser use drosophila (fruit fly), such models can provide powerful new insights into the mechanisms of sleep’s role in normal
development (Sehgal & Mignot, 2011) as they have for other developmental phenomenon (Fernando & Robbins, 2011). Their findings provide support for a critical developmental window in which sleep may determine life-long trajectories, and in which appropriate sleep is necessary.

Normative developmental sleep trajectories during the early childhood period map a process of consolidation of sleep into the nighttime period and a commensurate reduction in daytime sleep (Blair et al., 2012; Dionne et al., 2011; Iglowstein et al., 2003). Over a very short period of approximately four years there is a transition from the polyphasic sleep-wake pattern seen in early infancy, where children sleep at multiple times during the day, to a biphasic sleep/wake pattern where children nap only once and finally a monophasic pattern of a single night sleep, typical of that seen in adults (Figure 1). This transition can be understood as maturation of the circadian processes that underlie sleep timing and that work in concert with the homeostatic need for sleep (Borbély, 1982; Fuller, Gooley, & Saper, 2006). The cessation of day-time sleep during the preschool period has been postulated to reflect changes in the speed of accumulation of sleep drive, with a faster accumulation in early infancy and a gradual reduction over time (Jenni & Carskadon, 2007; Jenni & LeBourgeois, 2006). This reduction in sleep drive may be evidenced by an increase in sleep onset latency (time it takes to fall asleep) and a reduced ability to fall asleep during nap times, as well as a decrease in behaviours known to be associated with sleepiness during waking hours (e.g. increased irritability). Understanding of the changing developmental value of daytime sleep across this period of rapid transition is limited. The biologically normative cessation of daytime sleep, however, most likely indicates that habitual napping (i.e. napping
as daily routine) is no longer a necessary or developmentally productive event, and points towards differential effects of napping across time.

**The Importance of Napping in Early Childhood**

Although napping represents a significant characteristic of sleep patterns during the first years of life, there are currently surprisingly few studies on the independent effects of this component of sleep during early childhood (Thorpe et al., 2014). Much of the evidence of the value of napping has come from studies in adult populations (for review see Ficca, Axelsson, Mollicone, Muto, & Vitiello, 2010; Milner & Cote, 2009). Collectively these studies indicate that napping aids neurocognitive functioning; including both declarative and procedural memory, alertness, concentration and mood. While napping in healthy adult populations can confer significant benefits, there is also growing recognition that this relationship is complex and likely moderated by a number of factors, including the timing and duration of the nap, experience with napping, and age (Ficca et al., 2010; Milner & Cote, 2009). In addition, whether napping occurs as a restorative measure following sleep deprivation, as prophylaxis prior to anticipate sleep debt, or under conditions of normal sleep has impact on the nature and magnitude of benefits reported (Milner & Cote, 2009).

A small number of studies have specifically examined the effects of napping on health, behavioural and cognitive outcomes in early childhood (Bell & Zimmerman, 2010; Berger, Miller, Seifer, Cares, & Lebourgeois, 2012; Boto et al., 2012; Dionne et al., 2011; Gómez, Bootzin, & Nadel, 2006; Hupbach, Gomez, Bootzin, & Nadel, 2009; Kurdziel, Duclos, & Spencer, 2013; Lam et al., 2011; Lukowski & Milojevich, 2013; Spruyt et al., 2008; Touchette et al., 2008; Valent, Brusaf erro, & Barbone, 2001; Yokomaku et al., 2008). With few exceptions (Bell &
Zimmerman, 2010; Boto et al., 2012; Dionne et al., 2011; Touchette et al., 2008; Valent et al., 2001), these studies have focused on children within narrow age bands and therefore cannot account for variation in the effects of napping across the dynamic period of early childhood. Consistent with studies of napping in adult populations, these studies suggest a complex picture in which the effects of napping vary by measurement, design and familiarity with napping (i.e. whether a child habitually naps) and, likely, the age of the child.

Studies of napping and health outcomes have focused primarily on two outcomes, risk of paediatric obesity (Bell & Zimmerman, 2010; Touchette et al., 2008) and accident or injury (Boto et al., 2012; Valent et al., 2001). Bell and Zimmerman (2010) and Touchette et al. (2008) both use prospective longitudinal cohort designs to examine the relationship between sleep duration in early childhood and subsequent childhood obesity. Although these studies report an increased risk of overweight or obesity for children with shorter nighttime sleep duration, in both cases no significant effects for day-time sleep were observed. Alternatively, two studies examining accidental injury report higher rates of injury among young children who did not have daytime sleep in the time proceeding presentation at paediatric health services (0-5 years; Boto et al., 2012; Valent et al., 2001). Both studies were based on retrospective parent report of children attending health services who presented (case) and did not present (control) with accidental injury. While the strength of these studies lies in the use of a case-control design, their value is limited by the potential for differential recall bias in the comparison groups, because these reports are non-random and retrospective. These two studies direct attention to the impact of sleep on behavioural and emotional regulation,
hypothesising that these are the mechanisms that connect absence of sleep to increased accidental injury.

Studies examining impacts of napping on emotional-behavioural regulation present a more complex picture (Berger et al., 2012; Hall, Scher, Zaidman-Zait, Espezel, & Warnock, 2012; Spruyt et al., 2008; Yokomaku et al., 2008). An experimental study of children, aged 30-36 months, reported poorer emotional regulation when routine napping was restricted (Berger et al., 2012). In contrast, a correlational study of the first year of life (Spruyt et al., 2008) reported increased behavioural regulation associated with naturally occurring decreases in daytime sleep. Similar variation in findings is emerging for cognitive performance. Current evidence suggests an adverse effect on cognitive functioning in habitual nappers, aged < 16 months, under experimental conditions of napping restriction (Lukowski & Milojevich, 2013) or after manipulation of timing of cognitive testing relative to routine nap time (Gómez et al., 2006; Hupbach et al., 2009). In addition, Kurdziel et al. (2013) in a study of children aged three to six years, showed improved memory recall following a nap. This effect was found to be independent of age, but only observed amongst children who habitually napped. This study represents the first and only study, to the author’s knowledge, to use polysomnography to examine the relationship between specific sleep processes and sleep dependent changes during naps in young children. It identified that the density of sleep spindles was associated with memory recall performance. Collectively these experimental studies suggest that, at least amongst children who habitually nap, napping is important for learning.

In contrast, correlational studies of cognitive outcomes in children report a negative association between cognitive functioning and duration of napping (Dionne et al., 2011; Lam et al., 2011). To date, perhaps the most informative study to
examine developmental outcomes of sleep consolidation across time is the study of Dionne et al. (2011). This study captures the complexity of the transition across the full period of sleep transition (6 – 60 months) and focuses on longitudinal change in sleep consolidation (with day sleep expressed as a ratio of night sleep) rather than sleep duration alone. The study examined the association of sleep consolidation measured at 6-, 18- and 30- months with language development measured at 18-, 30- and 60- months. They report that, in the first two years of life, children with less mature sleep consolidation, characterised by higher amounts of daytime sleep as a ratio of total sleep, were at increased risk of language delay at 60 months. This study suggests sleep consolidation is a marker of neurological maturation, and identifies the child’s positioning along the transition from polyphasic to monophasic sleep patterns as critical to understanding the value of daytime sleep. Lam at al. (2011) examined the effects of napping for children, aged three to five years, all of whom were attending full-time childcare. This study used continuous physiological measurement of activity, via actigraphy, to examine the independent effects of both daytime and nighttime sleep duration on cognitive and behavioural outcomes. The findings showed that longer duration of nighttime sleep was positively associated with cognitive function. However, longer duration of daytime sleep was associated with both decreased night sleep and poorer outcomes on cognitive measures. One possible explanation of these findings relates to cognitive maturity, such that the reduction in daytime sleep reflects brain maturation processes and also accounts for more advanced cognitive functioning. An alternative explanation relates to the homeostatic sleep drive. That is, napping may discharge some sleep need, thereby reducing the homeostatic drive and the propensity for nighttime sleep. As a consequence of poor night sleep, cognitive function may be impaired. This
explanation aligns with the consistent and growing number of studies that report a negative association between duration of daytime napping and duration and quality of young children’s nighttime sleep (Acebo et al., 2005; Fukuda & Asaoka, 2004; Fukuda & Sakashita, 2002; Jones & Ball, 2013; Komada et al., 2012; Thorleifsdottir et al., 2002; Ward, Gay, Anders, Alkon, & Lee, 2008).

While it is possible that daytime sleep may be compensatory for sleep debt due to shortened and interrupted nighttime sleep patterns as a result of child, family or environmental factors, to date the few studies examining the direction of association between duration of napping and nighttime sleep suggest an alternative direction of effect (Fukuda & Asaoka, 2004; Fukuda & Sakashita, 2002; Komada et al., 2012). Two of these studies (Fukuda & Asaoka, 2004; Fukuda & Sakashita, 2002) compared the sleeping patterns of children who attended Nursery schools, where children were required by the government to have an obligatory afternoon nap of 1.5 hours as part of their daily routine, to those attending kindergartens where nap periods were optional. Children in Nursery school settings went to bed later and had more sleep related difficulties than children attending kindergartens (Fukuda & Sakashita, 2002). These effects were still observed into the elementary school years, well after the routine of afternoon naps had stopped (Fukuda & Asaoka, 2004). In addition, Fukuda and Sakashita (2002) and, more recently Komada et al. (2012), examined the direction of association with nighttime sleep. Komada et al. (2012) report a significant negative association of napping on subsequent night sleep onset, while Fukuda and Sakashita (2002) report no significant difference in night sleep duration in the preceding night, but significantly later night sleep onset following a daytime nap in ECEC. The results suggest that napping in ECEC settings reduces children’s homeostatic sleep drive, such that children who nap during the day have
reduced duration and quality of their nighttime sleep and that this may also establish enduring patterns of nighttime sleep disturbance.

In sum, the current body of evidence, though small, provides sufficient reason to question the benefit of routinely scheduled napping once a child consolidates their sleep into the nighttime period. While environmental factors that reduce quality or quantity of night sleep may be remediated by a nap, in the absence of such difficulties the findings raise the potential that napping can cause disruption to nighttime sleep, a consistent predictor of health and well-being. Concurrently, the evidence also suggests that disrupting napping patterns in children who have not reached monophasic sleep (i.e. children who habitually nap) may also have detrimental effects for learning and behaviour. These findings draw attention to the importance of policies and practices in ECEC settings that both recognise and respond to individual variations in children’s sleep needs.

The Importance of Sleep in ECEC

ECEC settings provide a fertile context for understanding daytime sleep patterns and the effects of these patterns on young children. It is therefore not surprising that ECEC settings have been the focus for recruitment for childhood sleep studies. Yet the impact of the ECEC context on the sleep of children who attend, and the implication for sleep policy and practice within these contexts, is not well addressed in the literature. In the absence of a coherent translation of the evidence base, current practices in ECEC settings vary considerably (El-Sheikh et al., 2012; Fukuda & Sakashita, 2002; Marriott, Staton, Thorpe, Pattinson, & Smith, 2013; Siren-Tiusanen & Robinson, 2001; Staton et al., 2013; Ward, Gay, Anders, et al., 2008; Watamura et al., 2002). There are four key forms of variation. First, some centres have standard scheduled sleep times while others have practices that change
in response to perceived needs of different age groups or, more rarely, individuals (Siren-Tiusanen & Robinson, 2001; Staton et al., 2013). In addition, the time allocation for sleep varies in both duration and scheduling. For example, an Australian study of 130 ECEC centres found a range of 0-180 minutes of scheduled sleep time for children aged three to six years with start times ranging from 11.30am -1.30pm (Staton et al., 2014). Second, some centres require all children in a group to lie down without alternatives during sleep times (Fukuda & Sakashita, 2002; Staton et al., 2013; Ward, Gay, Alkon, et al., 2008; Watamura et al., 2002), while others have more flexible practices in which sleep time is optional and alternative activities are provided for non-sleepers (Fukuda & Sakashita, 2002; Staton et al., 2013). Third, some centres employ strategies that align with current evidence on sleep promotion while others provide environments that are incongruent with this evidence (Marriott et al., 2013). Fourth, some centres routinely consult with parents regarding factors affecting their child’s daily sleep requirements (e.g. child health or incidence of sleep disruption), while others maintain standard polices that do not allow such responsiveness (Siren-Tiusanen & Robinson, 2001). Accordingly, in translation of current evidence from sleep science to policy and practice in ECEC settings there are four key questions to consider:

1. Should there be uniform scheduling of naptime for all children?
2. How should the needs of non-nappers be met?
3. How should the needs of nappers be met?
4. How should contextual and individual variations in sleep need be accommodated?
Translation of Evidence to Policy and Practice

1. Should there be uniform scheduling of naptimes? ECEC centres can be challenging environments for young children. Attendance involves extended periods of separation from parents, interactions with multiple adults and age peers and often, high levels of activity. Such experiences have been identified as potentially stressful (Vermeer & van Ijzendoorn, 2006). Given this context and the concurrent developmental decline in normative daytime sleep, in ECEC settings there is a strong rationale for the provision of both the opportunity for sleep for those who need it and, for those who no longer sleep, for rest. However, there is a need to clearly distinguish between uniform scheduling of sleep time and flexible opportunity for sleep or rest.

In ECEC centres children are typically grouped across wide age bands (e.g. 0-18 months, 18 months-3 years, 3-5 years). As a consequence there is inevitably considerable variation in sleep need across and within ECEC rooms. This variation pertains not only to duration of napping and age of cessation, but also to the timing of sleep need relative to individual circadian rhythm phases and homeostatic drive. Accordingly, the practice of scheduling fixed time and fixed duration sleep periods within a room or centre is unlikely to be optimal in addressing the sleep needs of all children. The practice of scheduling uniformed sleep times for all children does not address the needs of those who do not require sleep and may not necessarily meet the sleep needs of those who do.

2. How should the needs of non-nappers be met? Collectively, international representative population studies indicate that less than a third of children will habitually nap by age four (e.g. Blair et al., 2012; Iglowstein et al., 2003; Komada et al., 2012; Ottaviano et al., 1996; Snell et al., 2007; Weissbluth, 1995). There is
considerable variation in age of cessation with some children ceasing to nap as early as 12 months (Figure 2). This means that there is likely to be a proportion of children in ECEC settings who do not nap, even when opportunities to sleep are provided. Observational studies show this is the case even under conditions of extended mandatory sleep times in which no other activity is permitted (Ward, Gay, Anders, et al., 2008). For non-nappers, scheduling of mandatory sleep time translates to extended periods of restricted activity. While short periods of quiet activity may serve to provide rest, extended periods of inactivity may not be restful but may instead be experienced as stressful (Pattinson, Staton, Smith, Sinclair, & Thorpe, 2014).

Sleep latency, that is the time it takes to fall asleep once attempting to, of children in the early childhood period is on average between 16-19 minutes (Galland et al., 2012). This finding provides a rationale in ECEC settings for allowing a period of rest on a bed, for at least this duration, to accommodate the needs of children who are in transition from biphasic to monophasic sleep (i.e. sleeping some days and not others). However, for those who do not fall asleep, provision of restful alternative activity may be more appropriate.

3. How should the needs of nappers be met? Studies of night sleep in children identify a range of environmental factors that influence, both positively and negatively, the quality and duration of children’s sleep (Owens, 2004; Touchette et al., 2009). Broadly, these fall into three major categories: the sleep environment (e.g. temperature, light, noise), the behavioural environment (e.g. arousal levels, routines and predictability), and the individual daily context (e.g. diet, physical activity). While there are few studies of the impact of these factors in regards to daytime sleep, it is likely that they are of equal, or potentially greater importance, in the context of
supporting sleep in ECEC, where children are required to sleep in a group setting. The body of literature identifies sleep-supporting environments as those that are comfortable, predictable and of low arousal. A recent observational study of sleep practices in ECEC centres reported that while all centres provided a sleep time, only a minority (39%) provided environments that aligned with evidence on sleep supporting behaviour (Marriott et al., 2013). While opportunity to sleep was provided in many centres, opportunity for undisturbed or high quality sleep was not. Given the existing evidence highlighting the negative impact of disruptions to habitual napping (Berger et al., 2012; Lukowski & Milojevich, 2013), the provision of environments that mitigate against disruption for children who require sleep is significant. These findings direct attention to the need for evidence-based practice guidelines and professional development of early childhood educators in facilitating sleep health.

4. How should contextual and individual variation in sleep need be accommodated? Children attending ECEC settings come from a diversity of family contexts and bring with them a range of individual characteristics and circumstances that may affect their sleep need. A substantial body of studies documents family, individual and social-environmental factors that are associated with children’s sleep patterns and problems (Figure 3; Iwata, Iwata, Iemura, Iwasaki, & Matsuishi, 2011; Owens, 2004; Touchette et al., 2009). Most of these studies relate to night sleep, however, disrupted night sleep may increase the need for restorative day sleep in some children.

A consistently reported finding is an association between family characteristics and circumstance, including socio-economic status (Acebo et al., 2005; Arman et al., 2011; Hale, Berger, LeBourgeois, & Brooks-Gunn, 2009), parent
age (Sadeh, Raviv, & Gruber, 2000), parent education (Blair et al., 2012; Hale et al., 2009; Sadeh et al., 2000), family structure (Blair et al., 2012; Hale et al., 2009) and racial or ethnic background (Blair et al., 2012; Crosby, LeBourgeois, & Harsh, 2005) with children’s sleep patterns. These factors may be chronic or acute. For example, family stress (Sadeh et al., 2000) and constraints due to work and lifestyle arrangements (Iwata et al., 2011) can have an on-going impact on family functioning and parent’s ability to support optimal night sleep, or may have a strong but transient effect. The research highlights the potential for complex and significant variation in sleep need across context and time, and directs attention to the significance of on-going communication about daily sleep need between ECEC practitioners and families. More importantly, there is an imperative for sleep practices that allow appropriate response to changing individual sleep needs due to environmental constraints.

Extremes of variation in sleep patterns can also be a marker of underlying developmental and neurocognitive disorder and pathology (for review see Alfano & Gamble, 2009; Owens & Witmans, 2004; Touchette et al., 2009). The co-morbidity of sleep disruptions with a wide range of disorders, including attention deficit hyperactivity disorder, anxiety disorders, autism and depression has been well documented. For examples, studies have shown significant variations in both daytime (Schwichtenberg, Iosif, Goodlin-Jones, Tang, & Anders, 2011) and nighttime (Anders, Iosif, Schwichtenberg, Tang, & Goodlin-Jones, 2011) sleep patterns across a six month period for children with autism spectrum disorders or developmental delay, when compared to matched typically developing controls. Children’s health status, including transitory infection and more serious health conditions, may also affect sleep need and sleep patterns (Newman, O'Regan, &
Hensey, 2006; Stein, Mendelsohn, Obermeyer, Amromin, & Benca, 2001). Again, these variations among children highlight the critical role of parent-practitioner communication regarding sleep need. Additionally, the ECEC environment may be an important setting for observation of behaviours, including sleep behaviours, which may contribute to diagnoses of pathologies, early intervention and ongoing management.

**Providing Evidence Based Policy and Practice**

Sleep is undoubtedly an important biological process that has broad ranging impacts on human functioning throughout the life span (Carskadon & Dement, 1994; Vassalli & Dijk, 2009). Given that there is strikingly little evidence concerning the impacts of daytime sleep and that the scheduling of nap-time is commonplace in ECEC settings, a focus on sleep practices in this context presents a critical direction for ongoing research. The variation in sleep practices across centres affords opportunity to explore the interface of biological and environmental effects. Considering the large number of children attending ECEC (OECD, 2014), and the current diversity of practices pertaining to sleep within these settings (El-Sheikh, Buckhalt, Keller, & Granger, 2008; Fukuda & Sakashita, 2002; Siren-Tiusanen & Robinson, 2001; Staton et al., 2014), there is an imperative to address the large gap in research evidence on the effects of napping. How napping affects development, and specifically the contribution of napping within the ECEC context is largely unknown. Accordingly, we propose four key directions for investigation.

First, further studies are needed to examine the independent effects of napping on development across the early childhood period. Given the documented dramatic transition of sleep patterns across early childhood, these studies must include examination of the potential differential effects of daytime sleep periods for
children of different ages that are tracked across time. To fully understand the 
independent effects of napping, detailed attention to developmental milestones and 
context is essential because these are key indices of biological and environmental 
influences. Studies must include both experimental and naturalistic approaches to 
disentangle the effects of perturbation of sleep patterns and those of naturally 
occurring biological and environmental variation. Finally to improve our 
understanding of sleep architecture and other neuropsychological aspects of napping 
in young children methodologies that include the use of polysomnography and other 
objective measures of sleep and neurophysiological functioning should be employed.

Second, studies must examine the influence of practices in ECEC services on 
developmental patterns of sleep. Studies are particularly needed that focus on the 
effects of enforcing daytime sleep periods for children who have transitioned away 
from a biphasic sleep pattern. Identification of specific characteristics of ECEC 
settings that may influence sleep quality and duration is also required. While we 
know that a range of factors in the home environment influence children’s sleep 
(Iwata et al., 2011; Owens, 2004; Touchette et al., 2009), currently we do not 
understand the effect of equivalent factors in ECEC environments.

Third, studies must consider the effects of current sleep practices in early 
childhood services on children’s immediate and long-term health, well-being and 
development. Longitudinal studies that track effects across time and allow modelling 
of pathways from sleep to child development outcomes are required. In Figure 4 we 
propose a range of theoretical mechanisms that warrant exploration, that implicate 
both biological and social pathways. Physiological and observational measurement 
of sleep, stress and environment in addition to more common parental report
approaches is important in providing a comprehensive investigation of these mechanisms.

Finally these studies must consider not only what effects practices regarding sleep in ECEC have, but also for whom these practices may confer benefit or risk. While there is evidence of different sleep patterns for groups of children with psychological diagnoses (Schwichtenberg et al., 2011), currently the research evidence is not sufficiently developed to advance to studies of individual differences within the ECEC context. However, a future program of work should consider the interface of social and cultural variation, temperament, physical health and psychological diagnoses with sleep practices in childcare.

The proposed research agenda has high salience for the many families utilising ECEC. This agenda is also essential for ongoing translation into policy and practice regarding sleep, and indeed time-scheduling more broadly within these services, such that they optimise children’s development, learning and well-being. The growing body of data associating early sleep patterns with long-term health outcomes identifies sleep in early childhood settings as a focus for public health intervention.
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Figure 1. Normative developmental transition of sleep patterns over the first 5 years of life. Each diagram denotes indicative sleep pattern over a 24hr period. (a) Percentages represent those who have reached the respective sleep pattern by the indicated age (e.g. 50% of children have reached monophasic sleep by age 3 years) and are based on those reported by Iglowstein, Jenni, Molinari and Largo (2003).
Figure 2. Percentage of children napping at different ages based on data from longitudinal studies of sleep patterns. Markers indicate data collection points. Samples derived from (a) Switzerland, N=493 children; (b) United Kingdom, N=11,500 children; (c) United States, N=172 children.
Figure 3. Child, family background and environmental factors associated with sleep patterns and sleep problems in young children. Identified factors are adapted from reviews by Iwata et al. (2011), Owens (2004) and Touchette et al. (2009).
Figure 4. Theoretical mechanisms and effects of mandatory nap time in early childhood education and care settings on child outcomes. a) Decreased homeostatic sleep drive following nap; b) Reduced sleep propensity may lead to increased difficulty initiating nighttime sleep; c) Lagged effect at school entry due to difficulty adjusting to sudden removal of nap time; d) Reduced physical/emotional stress due to opportunity for quiet rest and relaxation; e) Increased emotional stress as a response to extended periods without alternative activity provided; f) Disruption of nighttime sleep due to associating sleep with a stressful experience.
Chapter 9: Paper 6 – Practices and Policies Regarding Sleep and Rest Time in ECEC

9.1 PUBLICATION STATUS AND CO-AUTHOR CONTRIBUTION

9.1.1 Publication Status and Target Journal

This paper is accepted with revision for publication for the Australasian Journal of Early Childhood. This peer-reviewed journal provides an important platform for translation and critical exchange of evidence-based information to teachers, academics and students within the early childhood field. This paper was strategically targeted to this journal to facilitate dissemination to practitioners working within the early childhood sector. The following paper is formatted in accordance with the requirements of the Australasian Journal of Early Childhood.

9.1.2 Statement of Contribution

Ms Staton conceptualised and designed the paper and contributed to the drafting of the manuscript; Dr Irvine contributed to the drafting and critically reviewed the manuscript; Ms Pattinson contributed to the drafting and critically reviewed the manuscript; Dr Smith critically reviewed the manuscript; Professor Thorpe conceptualised and designed the paper (as primary supervisor) and contributed to the drafting of the manuscript.

Principal Supervisor Confirmation

I have sighted email or other correspondence from all Co-authors verifying their authorship.

Professor Karen Thorpe

Name

K. Thorpe

Signature

22/10/2014

Date
The sleeping elephant in the room:

Practices and policies regarding sleep and rest time in ECEC

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Abstract

The National Quality Framework (NQF) for Early Childhood Education and Care (ECEC) in Australia identifies the need for services to make provision for each child’s sleep, rest and relaxation within a national early year’s policy framework that also requires that opportunities for learning and physical health are optimised, and that the agency of each child and their family is respected. Against this background, the scheduling of a standard sleep-time in ECEC centres remains a common practice, even in rooms catering for older children for whom daytime sleep may no longer be necessary. We review accounts from educators, parents and children that highlight tensions between the practice of scheduling, and sometimes mandating sleep-time, for pre-school age children (3–5 years), and contemporary views regarding high quality practice in ECEC, as defined by the NQF. We investigate different views and experiences of sleep-time, with an aim of supporting critical reflection on practice and continuous quality improvement in ECEC.

Keywords: early childhood education; national quality standards; sleep; rest

Word Count: 6,477


Introduction

Sleep is important. Across the lifespan sleep, alongside nutrition and exercise, is a key pillar of health that affects daily functioning and life-long well-being (Galland, Taylor, Elder, & Herbison, 2012; Wong, Halaki, & Chow, 2013). Sleep is particularly important in childhood. Commensurate with findings from adult populations, the quantity, quality, rhythmicity and regularity of sleep experienced by children predicts their ongoing well-being (Bell & Zimmerman, 2010; Lam, Hiscock, & Wake, 2003). Sleep in early childhood may have a greater importance, however. Early childhood is both a foundational period in sleep development and one in which sleep patterns are increasingly sensitive to the environment (Touchette et al., 2013). From birth to 5 years, sleep consolidates into the night period and habitual daytime sleep ceases. The speed with which this happens and the patterns of sleep that develop are affected by the care environment, both in the home and early childhood education and care (ECEC) setting (Jones & Ball, 2013; Staton, Smith, Pattinson, & Thorpe, 2014).

Sleep in early childhood is controversial. In early childhood, the regulation of children’s sleep patterns affects not only the child but also the wellbeing of their adult carers and other family members (Hiscock & Wake, 2001; Martin, Hiscock, Hardy, Davey, & Wake, 2007). A perennial issue is the way in which the needs of adult and child should be balanced and the degree to which adult carers should shape or respond to a child’s sleep pattern (Blunden, Thompson, & Dawson, 2011; Douglas & Hill, 2013). Most controversy has centred on parenting. For example, there has been considerable debate about the relative value of adult-led behavioural modification of children’s sleep (controlled crying, controlled settling) compared
with that of alternative child-led approaches that advocate education about normative sleep development and promote more responsive approaches to children’s sleep behaviour (Middlemiss, 2004). In contrast there has been relatively little public debate about sleep practices in settings outside the home (Staton, Smith, & Thorpe, in press). This is surprising given that the out-of-home context has the added complexity of a triadic relationship in which decisions about sleep practices involves, and affects, the family, ECEC educator and the individual child (Ahnert & Lamb, 2003; Groeneveld, Vermeer, van Ijzendoorn, & Linting, 2010; Pierrehumbert, Ramstein, Karmaniola, Miljkovitch, & Halfon, 2002).

The purpose of the current paper is to shed light on this ‘sleeping elephant’ in the early childhood education and care room, and in ECEC services more broadly. In this paper, we draw on the Education and Care Services National Regulations (NSW Government, 2011), and use the broad phrase ‘sleep and rest’ to refer to standard routines and practices designed to meet children’s needs for sleep and/or rest during the day while attending an ECEC service. While the practice of sleep and rest time is evident across all formal ECEC services (e.g. long day care, kindergarten and family day care), our focus is centre-based services. In particular our interest is in the requirements and expectations for children aged 3 – 5 years because after the age of 3 years the majority of children cease to require daytime sleep (Acebo et al., 2005; Iglowstein, Jenni, Molinari, & Largo, 2003). We examine theory, research, policy and practices regarding sleep in ECEC in Australia, from historical and contemporary perspectives, and raise questions for debate and critical reflection among professionals, parents, policymakers and researchers in contemporary ECEC.

Setting the context: The National Quality Framework
In 2009, the Council of Australian Governments (COAG) committed to a new comprehensive National Quality Framework (NQF) to cover all formal ECEC services prior to school entry. The NQF marks an important shift in quality assurance in Australian ECEC, from what was a prescriptive two-tiered system of state regulations and national accreditation, to an integrated system that combines minimum regulation standards and higher quality aspirational standards to promote and support continuous quality improvement. Perhaps, most significantly, the NQF applies performance-based standards that allow flexibility, professional judgment and local interpretation.

Within this context, the NQS identifies the need for ECEC services to make provision for each child’s sleep, rest and relaxation needs:

**Quality Area 2, Element 2.1.2:** Each child’s comfort is provided for and there are appropriate opportunities to meet each child’s need for sleep, rest and relaxation. (NSW Government, 2011, p. 165)

However, this standard does not stand-alone. Reflecting contemporary research and practice wisdom, the NQF adopts a holistic perspective on quality and learning in ECEC, and quality areas and elements are seen to be inter-dependent. The standard relating to sleep, rest and relaxation is specified against a background of other requirements within the NQS that also have relevance to the provision of sleep and rest time.

In Figure 1, we specify some key quality standards relevant to the practice of scheduled sleep and rest time in ECEC and the issues they raise. There are three broad areas of tension that emerge. First the relative costs and benefits of sleep-rest
time are set against those of costs and benefits to child learning (Quality area 1) and other aspects of health and wellbeing (Quality area 2). Second, the issue of child and family agency in determining sleep-rest needs and the appropriate timing for meeting these needs is set against the decisions made by services and educators to schedule sleep-rest time (Quality area’s 5 and 6). Finally the level of supervision of children and the use of sleep rest time for other staff duties emerges as an area of tension (Quality area 4). To understand how best to provide for sleep and rest in ECEC contexts, there is a need to recognise the range of available practices, reflect on these in light of research evidence including the accounts of children, parents and educators in response to sleep-rest practices.

**Sleep rest practice Australian ECEC**

There is currently a range of practices relating to provision for children’s sleep, rest and relaxation documented in Australian ECEC settings. In Table 1, we outline and define these practices. Across ECEC services in Australia provision for sleep and rest for 3-5 years olds may include responsiveness to individual children through provision of quiet places to rest and retreat and, in a few centres, activities such as massage, mindfulness and guided imagery. More commonly provision is made through the standard scheduling of a sleep and rest time in the middle of the day (Staton et al., in press). There is however considerable variability in the practices used within this scheduled period. These vary in the levels of choice and autonomy for the child. Both the standard scheduling of sleep and rest time and mandating of a period of sleep present challenges of incompatibility with other requirements specified in the NQS (see Figure 1). The mandating of sleep and rest raises questions about whether some services and educators recognise sleep and rest time as part of
the educational program, and therefore subject to these requirements, or whether they see this as a period of time outside the educational program.

**Children’s requirements for sleep and rest**

There are many reasons why children may require sleep or rest during their day in an ECEC program. First, there is considerable variation in the timing of the biological transition from daytime napping through to monophasic sleep in which the requirement for daytime sleep ceases. Among preschool children age 3-5 years, while the majority will have ceased to require daytime sleep, between 15% and 30% of children will not yet have achieved monophasic sleep and will require sleep during the daytime, at least on some days of the week (Acebo et al., 2005). Second, daytime sleep may compensate for disrupted night sleep. In some families, particularly those living in conditions of social disadvantage, higher levels of disruption to children’s night sleep associated with factors such as noise, overcrowding and family stress has been reported, and may mean that more children will require opportunity to sleep or rest during the day (Kelly & El-Sheikh, 2011; Mezick et al., 2008). Third, a quieter, less social period of time may reduce the stress of a busy and long day in ECEC. Evidence from biological studies measuring salivary cortisol (a marker of stress) across the ECEC day suggests ECEC, especially across a long day, can be stressful for some children (Sims, Guilfoyle, & Parry, 2006). A following argument has been that a period of sleep or rest serves to reduce such stress (Desjean-Perrotta, 2008). However, current evidence on the impact of sleep time on cortisol does not show that rising cortisol patterns across the ECEC day are reduced by the experience of sleep time (Ward, Gay, Alkon, Anders, & Lee, 2008; Watamura, Sebanc, & Gunnar, 2002). Further, differential effects are found for children who do and do not sleep
within an allocated sleep time (Staton, Pattinson, Smith, & Thorpe, 2013; Ward et al., 2008). Finally, sleep and/or rest may benefit learning. Studies have shown that for children who still typically need a daytime sleep (biphasic sleep stage), memory and learning performance is better after sleep (Kurdziel, Duclos, & Spencer, 2013).

While all of the justifications for making provision for sleep within ECEC are important to consider and potentially valid, it is notable that there is considerable individual variation in sleep and rest need. None of the circumstances that necessitate daytime sleep or rest apply uniformly to all children and do not justify standard scheduling and/or mandating of a sleep period. The NQS standard relating to sleep and rest clearly acknowledges variation in need, requiring consideration of children’s ages, developmental stages and individual circumstance. The key focus then is how and who determines individual need and the appropriate practice response. Theories about competence and agency of children to determine their own needs, what constitutes effective teaching and learning in the early years, and the relative positioning of the views of children, parents and educators become central in determining practice. In the next section, we reflect on historical and contemporary perspectives on ECEC philosophies, principles and practices and consider how these have shaped and influenced current sleep routines and practices for preschool children who attend ECEC centres today.

**Current research evidence about the impacts of sleep-rest time in ECEC**

There is a growing body of evidence that testifies to the importance of sleep in early childhood. Disrupted and shorter duration of night sleep is associated with obesity (Bell & Zimmerman, 2010), raised risk for accidents (Boto et al., 2012), poorer cognitive functioning and behavioural difficulties (Lam, Mahone, Mason, & Scharf,
2011; Touchette et al., 2007). Establishing positive sleeping patterns early in life likely has long-term health promoting effects (Landhuis, Poulton, Welch, & Hancox, 2008). A recent Australian study, for example, estimates the cost of sleep problems in children aged 0-7 years to be $27.5 million per annum in primary healthcare costs alone (Quach et al., 2013). Data from the Longitudinal Study of Australian Children (LSAC), estimated that almost 30% of Australian children aged 4-5 experience sleep problems, ranging from mild to severe (Hiscock, Canterford, Ukoumunne, & Wake, 2007). Children with such problems were 37% more likely to sustain an injury requiring medical attention than children with no sleep problems (Hiscock et al., 2007).

Limited evidence on the impacts of ECEC practice on children’s sleep comes from just two studies conducted in Japan (Fukuda & Asaoka, 2004; Fukuda & Sakashita, 2002). Both compare the night-time sleep of children attending programs in which sleep time is mandated with those attending programs in which sleep is a choice. These studies found that mandated sleep time disrupted night sleep, through both delayed onset and increased night waking (Fukuda & Sakashita, 2002) and that these effects endured beyond the ECEC years into the school years when mandatory sleep had ceased (Fukuda & Asaoka, 2004). These studies suggest that the impact of sleep practices in ECEC are neither transitory nor restricted to the ECEC years and warrant consideration. Additionally, a recent Australian study reports that the emotional climate declines significantly between active sessions and sleep-time in ECEC centres (Pattinson, Staton, Smith, & Thorpe, 2014). Sleep and rest, rather than serving to provide a period of rest, may paradoxically be a source of stress for both children and educators.
Acknowledging the holistic nature of child development in the early years, and the impact of the quality of ECEC services on children’s health, learning and wellbeing, in the immediate and long-term, we assert that ECEC services have an important role to play in supporting the development of healthy sleep and rest practices. We also recognise diversity in children’s individual and developmental needs, and families’ needs and preferences regarding sleep and rest practices in ECEC. In this final section, we explore some different perspectives on how high quality sleep and rest practices in ECEC can be defined, with a view to supporting critical reflection and improved practice.

**Meeting each child’s requirement for sleep and rest in Australian ECEC: pedagogical approaches**

For at least 60 years, a period of daytime sleep or rest has been documented as a routine part of the ECEC day in Australia. This practice is evident even in the older preschool age group (i.e. 3 – 5 years). Gahan’s (2005) history of Chislehurst kindergarten in Queensland, for example, described sleep as an integral part of the daily program and one that was “not an extra” regardless of the social background of the children attending. Similarly, a recent study of 130 kindergarten and long day care centres, also conducted in Queensland, found that 90% of centres routinely scheduled sleep in their programs (Staton et al., in press). These practices are not unique to Australia but also occur internationally (Kurdziel et al., 2013; Ward et al., 2008; Watamura et al., 2002).

Although there has been continuity in the practice of allocating a sleep and rest time across 60 years, in the same period there has been considerable change in the underpinning theoretical understandings of childhood, children and the purpose of
Documents from the 1940s indicate a theoretical assertion that the role of an educator is to provide for the regulation of child behaviour and for imprinting a mark of routine to establish lifetime patterns.

(The object of the Nursery school) is to ensure the fullest development possible for each child by providing an environment which offers suggestions for normal and natural growth of body, mind, personality and character from the very beginning of life, during the first and most important years of life – as first impressions leave their mark for all time. The child ...learns to adjust himself normally and naturally to his environment, including other children and adults....Nothing is forced, and children are never over-stimulated. Sleep and rest divide the morning from the afternoon. (Principal of the Brisbane Kindergarten Training College (1944) as cited in Byrne, 1986)

The rationale for inclusion of sleep and rest as an integral component of a preschool program follows logically from this assertion. The teacher, drawing on her expert knowledge, would determine sleep-time practices.

The pedagogical practice is one of adult-led modelling of individual behavioural regulation as a means to achieve later self-regulation. This approach contrasts markedly with contemporary social constructivist pedagogical principles and practices that promote the child as a competent, active and equal agent in learning, within a community of learners comprising peers, educators and families (Sylva, Melhuish, Sammons, Siraj-Blatchford, & Taggart, 2004). Through this philosophical lens, emphasis is placed on achieving a balance between child and adult-led activities, recognising and responding to individual strengths, interests and needs and supporting increasing child autonomy (Sylva et al., 2004). Within this philosophical
context, children should be given opportunity to make inputs into any decision about their need for sleep and be provided with a range of defined alternative activities. Compulsion and/or whole group uniform practices are incompatible with this perspective and seem to conflict with many elements of the NQS (Figure 1). Though the national Early Years Learning Framework (EYLF) makes little specific mention of the role of sleep within the educational program, there is not a logical sequence from social constructivist based curriculum and pedagogy to practices that involve scheduled and/or mandated sleep time for all children without provision of alternative activities.

When set alongside the broader NQF, and standards and expectations for quality educational programs and practices how are current practices that schedule and/or mandate sleep time explained? We suggest that the apparent misalignment between the quality standards and practices observed in many ECEC settings have two potential explanations. First, sleep and rest time may not be seen by some as a part of the educational program but rather as an activity that sits outside the curriculum objectives of the EYLF and, in contrast to the approach in the 1940s, not an integral focus for learning but rather ‘time out’ from teaching and learning. Alternatively, sleep and rest time may be viewed as a response to a perception that all children in ECEC services should sleep or rest to promote their health, development, learning and wellbeing. This view appears to be stronger for children attending long day care services where hours of attendance are longer (Sinclair, Staton, Smith, Pattinson, & Thorpe, 2013). Within contemporary theoretical understandings, the voices of educators, parents and children are important in understanding the value of inclusion of sleep-time in ECEC. We therefore examine their accounts.
Meeting each child’s requirement for sleep and rest in Australian ECEC: The experiences of educators, parents and children

The views of educators, parents and children from across the 60-year period present a picture of diverse responses to sleep and rest-time in the ECEC setting. In Table 2, we present a representation of quotes from Gahan’s interviews with adults who were variously teachers, parents and children attending Chiselhurst kindergarten in the 1940s and 1950s (Gahan, 2005) against recent studies of educators (Inglis, Staton, Smith, Pattinson, & Thorpe, 2013), parents (Sinclair, Staton, Smith, Pattinson, & Thorpe, 2013) and children (Nothard et al., 2013). Together these accounts indicate that sleep and rest time, both historically and currently, has received mixed reaction from educators, parents and children. The historical accounts from Chiselhurst provide a picture of educator-led practice that, while acceptable to some parents and children, was to others reluctantly accepted and privately contested. More recent accounts present open ambivalence and contestation. Current educators’ accounts are particularly interesting in their description of sleep and rest time. They present a picture of competing demands in which the needs of educators, parents and children are oftentimes in conflict. Educators variously describe the scheduling of sleep and rest for children as a “tricky” balance of competing needs, “a time to get things done”, a time for educators to “de-stress” and a time for children to sleep or rest (Inglis et al., 2013). Issues emerge when educators’, parents’ and children’s needs and expectations are pitched against each other. Interestingly, one contemporary educator described the child’s view as the lowest priority. Operator and/or educator needs also seem to be given higher priority than children’s needs and preferences in some centres. Parent and child accounts reflected the sense that many do not want routine scheduling of a sleep and rest time. Sinclair and colleagues (2013), in their
analysis of 1700 parent accounts from the E4Kids data reported that 80% of parents, if given the choice, would prefer their 4-6 year olds not sleep in their ECEC program.

Some parents reported negative impacts stemming from the practice of mandated sleep-time. One factor to emerge is the distinction parents make between sleep and rest with many accepting the need for a quieter period during the day but not the requirement of sleep for children who have ceased to habitually nap at home. Children’s accounts, both historical and current, provide descriptions that depict them managing sleep time with imagination and subversive games (e.g. playing under the blankets; positioning themselves near windows or bookshelves; drawing pictures on the ceiling in their mind). Children’s accounts of opportunity to exercise choice and to engage in alternative activities to sleeping, allowed in some but not all contemporary centres, were more positive. This included allowing children to make informed decisions about their need for sleep or rest on a daily basis, proactive teacher-led approaches such as group massage and mindfulness sessions to support rest and relaxation, and differentiated activities (i.e. sleep, rest and/or ‘quiet’ alternative activities) to meet diverse child and family needs (Nothard et al., 2013). How well contemporary practices in sleep and rest time align with the NQF, that promotes the agency and rights of the child, inclusive and responsive educational programs and practices, and genuine partnership with families, is a question clearly raised by the accounts of the teachers, parents and children.

**Awakening the debate about appropriate provisions for each child’s sleep, rest and relaxation**

The NQS provides a broad and flexible framework for what constitutes positive sleep rest practices and identifies some general expectations regarding the provision of
opportunities for sleep, rest and relaxation" (NSW Government, 2011) for all children in ECEC, regardless of age. Emphasis is placed on flexible practices that are sensitive and responsive to individual need for sleep, rest and/or relaxation throughout the day. Within the context of performance-based standards, educators are expected to draw on contemporary community standards, to consult with families and to exercise professional judgment to determine appropriate and responsive sleep and rest practices. Compliance with this standard is determined through an Assessment and Ratings Process based on external observation of practice, conversation with educators and review of policy and practice documentation.

In what may constitute a landmark case in this area, a centre’s overall rating was recently determined on the basis of their sleep and rest practices. According to ACEQA (2013) documentation a centre’s sleep and rest practices were initially rated as ‘Meeting the NQS’, leading to an overall centre rating of ‘Meeting the NQS’. The centre believed their sleep practices were of a higher quality and sought a first tier review. Upon examination of the assessor’s original documentation, and consideration of current community standards, the State Regulatory Authority determined the centre’s sleep practices did not meet the NQS standard. The sleep practices were deemed to be overly structured because all children (sleeper and non-sleeper) were required to rest for approximately 25 minutes, during a scheduled sleep period, with no alternative activities permitted. The centre’s rating for this area of practice was amended to ‘Working towards the NQS’, leading to a subsequent reduction in the overall centre rating (ACECQA, 2013). The centre contested this decision. Upon receipt of evidence of an updated sleep and rest policy and approach, developed in consultation with families, that required children to rest for a ‘short’ (undefined) period and then be offered quiet activities, the centre was found to meet
requirement. The final outcome was that original rating was reinstated (ACECQA, 2013).

Provision for sleep rest practices in Australian ECEC programs are specified by the NQS as integral to programs. The NQS presents a holistic and integrated perspective on what constitutes quality practice in ECEC, and the various standards, including those on sleep and rest, are interrelated and meant to be read together. Further the EYLF definition of ‘curriculum’ infers, sleep and rest time is considered to be part of the educational program and the EYLF principles and pedagogical practices are seen to apply to sleep, rest and relaxation. This includes, for example, the view of children as active participants and decision-makers within the educational program, the expectation that educators will work in partnership with families and respect diversity in family views, needs and preferences. Links can also be made to the EYLF learning outcomes including the broad focus on supporting early learning and successful transition to school, and to some specific areas such as ‘children taking increasing responsibility for their own health and physical wellbeing’ (COAG, 2009; Outcome 3.2).

To date there is a greater silence and larger challenge to practice with regard to the provision of relaxation. In our definition of relaxation provided in Table 1, we do not infer that relaxation necessarily implies sleep or rest but rather indicate this as distinct. For many individuals, including young children, relaxation is achieved actively rather than passively. Going for a walk or climbing a tree may be a way to “let off steam” and relax. Consideration of individual perspectives on what is relaxing in the context of ECEC presents a great diversity of individual possibilities
for enactment of the NQS and is a place for ongoing discussion, data collection and reflection.

**Conclusion**

Physical and emotional wellbeing underpin effective learning. Sleep, rest and relaxation play a central role in attaining positive wellbeing and are, therefore, rightly recognised by the NQS as integral to ECEC programs. How sleep, rest and relaxation are best achieved in ECEC settings is a “really tricky” problem. There is a need for debate, discussion, data collection and documentation of consultative practices solutions to ensure that sleep rest practice best serve children, families and educators.

**References**


Figure 9.1. NQS element and questions raised regarding provisions for sleep and rest.

<table>
<thead>
<tr>
<th>Quality Area</th>
<th>Element</th>
<th>Questions regarding sleep and rest time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - Educational program and practice</td>
<td><strong>Element 1.1.3</strong> The program, including routines, is organised in ways that maximise opportunities for each child’s learning.</td>
<td>Should children who do not require sleep have a standard mandated sleep time?</td>
</tr>
<tr>
<td>2 - Children’s health and safety</td>
<td><strong>Element 1.1.6</strong> Each child’s agency is promoted, enabling them to make choices and decisions and to influence events and their world.</td>
<td>What are children’s experiences and responses to sleep and rest time?</td>
</tr>
<tr>
<td>4 - Staffing arrangements</td>
<td><strong>Element 2.1.2</strong> Each child’s comfort is provided for and there are appropriate opportunities to meet each child’s need for sleep, rest and relaxation.</td>
<td>Is a scheduled sleep and rest time in the middle of the day the most appropriate response?</td>
</tr>
<tr>
<td>5 - Relationships with children</td>
<td><strong>Element 2.2.2</strong> Physical activity is promoted through planned and spontaneous experiences and is appropriate for each child.</td>
<td>Is requirement of sleep or rest time a promotion of sedentary behaviour?</td>
</tr>
<tr>
<td>6 - Collaborative partnerships with families and communities</td>
<td><strong>Element 2.3.1</strong> Children are adequately supervised at all times.</td>
<td>Is reduction of supervision or the focus on administrative activities during sleep and rest time appropriate?</td>
</tr>
<tr>
<td></td>
<td><strong>Element 4.1.1</strong> Educator-to-child ratios and qualification requirements are maintained at all times.</td>
<td>Is the reduction of staffing during sleep and rest time appropriate?</td>
</tr>
<tr>
<td></td>
<td><strong>Element 5.1.1</strong> Interactions with each child are warm and responsive and build trusting relationships.</td>
<td>Are children allowed agency in defining their sleep and rest needs?</td>
</tr>
<tr>
<td></td>
<td><strong>Element 6.2.1</strong> The expertise of families is recognised and they share in decision making about their child’s learning and wellbeing.</td>
<td>Are parents allowed agency in defining their child’s sleep and rest needs?</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
<td></td>
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<tr>
<td>-------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>Group provision for sleep and rest</td>
<td>Centres allocate a time for sleep and lower levels of stimulation for the group during the day.</td>
<td></td>
</tr>
<tr>
<td>Individualised provision for sleep rest</td>
<td>Centres allocate space for sleep and lower levels of stimulation and retreat throughout the day to enable response to individual child need.</td>
<td></td>
</tr>
<tr>
<td>Scheduled sleep and rest time</td>
<td>Centres define a specific time in the day, typically following lunch, during which a sleep and rest period occurs.</td>
<td></td>
</tr>
<tr>
<td>Mandated sleep</td>
<td>Centres allocate a period of time in which children are required to lie on bed or cot with no other activity permitted regardless of whether they sleep.</td>
<td></td>
</tr>
<tr>
<td>Mandated rest</td>
<td>Centres allocate a period of time in which all children are required to engage in a quiet activity.</td>
<td></td>
</tr>
<tr>
<td>Relaxation</td>
<td>Centres make provision for children to engage in activities that reduce the child’s levels of emotional stress.</td>
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</tbody>
</table>
Table 9.2. Historical and current perspectives of educators, parents and children regarding sleep and rest time in ECEC.

<table>
<thead>
<tr>
<th>Perspectives</th>
<th>Historical (1940s-50s)</th>
<th>Current</th>
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<td></td>
<td>Anne Clark (principal) insisted that a “worthwhile” kindergarten programme should include a strong focus on the physical care of children – and that lunch and sleep routines were therefore not “an extra”, even for healthy, well-cared-for middle class children. Chiselhurst mothers ...recalled Miss Clark strongly advocating the benefits of a cooked lunch and sleep at kindergarten – as much for them as for their children.</td>
<td>“Really tricky with range of ages, balancing parent’s needs, children’s needs and staff needs. We tend to honour parents’ views- put as having a higher value than children’s views, because we still have to work with them.” “It’s a time when we get things done – play journals, art activities cleaned up or prepared, toilets are cleaned, kitchen cleaned, checklists ticked off.” “For some kids it is really important, and they tend to get really emotional otherwise.” “They (children) probably don’t like it, but you have to do things you don’t like, it’s part of the routine.” “Some children have just grown out of nap time, but we need to keep our children quiet for the other rooms in the centre.”</td>
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<td></td>
<td>“Miss Clark saw to it that they had a little nap after lunch which I liked” Eileen, indicated that she had approached Miss Clark to ask whether her daughter, Catherine, could have a short rest, as “she had never been a good day-sleeper, and Catherine had told me she was having to draw pictures on the ceiling (in her head) because she was bored at sleep time” Eileen recalled that Miss Clark politely pointed out, in response, that while she believed that all young children benefited from the opportunity to rest, she would get staff to “monitor Catherine’s mood at the rest-time”. On reflection, Eileen suspects, that Catherine probably had to rest like all the others, and she did not press the issue further, since she “trusted and valued” Miss Clark’s advice and support</td>
<td>“When my child slept at Child Care she was then awake up until 10 p.m. at night and a lot of stress was involved.” “Nap time is part of the daily routine, however my son resents it as he hasn’t had to nap at home for a long time.” “He is in school next year and needs to be able to stay awake all day without tiring too much.” “I believe an hour or two sleeping every day is good for the development of children, mentally, and physically.” “It gives me some more time with him in the evening while his younger sister is sleeping to do one-on-one activities - puzzles, games, lego.”</td>
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<td>“I remember the sleep time and a big room full of small beds in rows. I can’t imagine how, but thirty children went to sleep simultaneously. I certainly feel it happened gently and we woke up aware of others stirring but not crying. We used to sing a medley of songs afterwards, before ‘going home’ time.”</td>
<td>“You have to lay down and be really quiet”</td>
<td>“You have to lay down and be really quiet”</td>
</tr>
<tr>
<td>“I remember rest time on the canvas stretchers and the smell of the stretchers. It seemed as though there was an enormous amount of space between me and the ceiling of the huge room. You had to lie on your bed and be deathly quiet. I had a little crocheted rug on my bed, and I remember poking my fingers up through the holes pretending they were puppets to keep myself entertained.”</td>
<td>“We do massage… We do massage and relaxation sometimes”</td>
<td>“We do massage… We do massage and relaxation sometimes”</td>
</tr>
<tr>
<td></td>
<td>“You just rest all the time because you’re not allowed to play”</td>
<td>“You just rest all the time because you’re not allowed to play”</td>
</tr>
<tr>
<td></td>
<td>“They [teachers] don’t make you. You can just sit up or lay down or sleep or rest anything”</td>
<td>“They [teachers] don’t make you. You can just sit up or lay down or sleep or rest anything”</td>
</tr>
<tr>
<td></td>
<td>“I like having rest time”</td>
<td>“I like having rest time”</td>
</tr>
<tr>
<td></td>
<td>“if you can’t get to sleep they [teachers] pat you... they are trying to help you get to sleep”</td>
<td>“if you can’t get to sleep they [teachers] pat you... they are trying to help you get to sleep”</td>
</tr>
<tr>
<td></td>
<td>“They [teachers] just clean”</td>
<td>“They [teachers] just clean”</td>
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</table>
Chapter 10: General Discussion

Emerging evidence from sleep science identifies early childhood as a critical time in the development of sleep patterns (Davis et al., 2004) with significant consequences for health (Carter et al., 2011), behaviour (Paavonen et al., 2009), and learning (Touchette et al., 2007). The significance of sleep is also recognised by Australia’s National Quality Standards (NQS) for Early Childhood Education and Care (ACECQA, 2013b), that require ECEC services to be responsive to each child’s need for sleep and rest. The enactment of these requirements can be controversial, however (ACECQA, 2013a). Individual requirements for sleep and rest vary considerably in the early years of life (Galland et al., 2012) and provision for different needs can be complex (Staton et al., in press). Moreover, provision for sleep and rest can conflict with other pedagogical standards that necessitate that opportunities for learning are optimised, that children’s autonomy is supported and that children and families have choice in the activities undertaken while at ECEC (ACECQA, 2013b). The current thesis began the process of addressing this complexity. By providing the first systematic analysis of existing evidence of the contribution of napping to young children’s health and development (Paper 1), alongside the first documentation of sleep practices in ECEC services for children within the preschool period (Paper 2) this thesis identifies a disjunction between sleep practices and both current philosophy and legislated standards in ECEC. Following this, this thesis provides an analysis of the effects of mandatory sleep practice on children sleep patterns both within (Paper 2) and beyond the ECEC context (Paper 4) and reveals an impact on interaction quality between children and educators (Paper 3). Further, through commencing the first step in translation of
current sleep science into recommendations for sleep practice in ECEC (Paper 5), this thesis delivers a formative evidence base to inform ongoing research and guidance to support educators in managing the complex individual and organisational needs associated with appropriate provisions for sleep and rest consistent with current educational philosophy and legislation.

Specific discussion of the strengths, limitations and future directions is provided in each of the papers. This final chapter provides instead a summary of key outcomes resulting from this thesis (section 9.1), recommendations for sleep policies and practice in ECEC deriving from these outcomes (section 9.2) and a discussion of directions for ongoing research (section 9.3).

10.1 SUMMARY OF KEY OUTCOMES

The key purpose of this thesis by published papers was to provide the first documentation of the prevalence and effects of current sleep practices in ECEC settings, with the aim of establishing a foundation of evidence to inform sleep practice. Consistent with this purpose, the papers within this thesis address six research questions (RQ) focused specifically on assessing the value of mandatory naptimes for preschool aged children in ECEC.

Paper 1 evaluated the current research evidence regarding the effects of napping for young children (RQ 1). Through systematic review, this study demonstrated, for the first time, the scarcity of consistent or strong evidence regarding the impacts of napping on children’s development and health. This paper identified consistent reports that napping is associated with delayed night sleep onset and shorter and poorer quality night-time sleep. Alongside, the need for more extensive and higher quality studies of the effects of napping on learning, behaviour and health was indicated. Critically this paper showed insufficient evidence to support the practice
of prolonging napping behaviour once sleep consolidates into the night-time. This paper raises concern for the assumed universal value of mandatory nap times for children in ECEC settings and indicates the possibility that promotion of daytime napping could disrupt children’s night-time sleep.

Despite the scarcity of evidence regarding the benefits of napping promotion amongst preschool aged children, Paper 2 documented that allocation of mandatory nap times for children aged 3-5 years in Australian ECEC settings is widespread. Paper 2 provided the first documentation of the range and characteristics of mandatory sleep practices in ECEC settings (RQ 2), and the relationship between these practices and rates of napping (RQ 3). Although the methodologies of several studies indicate the occurrence of mandatory sleep times in ECEC internationally (Kurdziel, Duclos, & Spencer, 2013; Ward, Gay, Alkon, et al., 2008; Ward, Gay, Anders, Alkon, & Lee, 2008; Watamura et al., 2002), prior to the commencement of this thesis the prevalence of such practice across ECEC settings and their relationship with napping were not known. Paper 2 showed large variation in the way ECEC services provide for sleep and rest; ranging from no allocated sleep time, to over 2 hours of mandatory sleep time for all children. Over three-quarters of ECEC rooms allocated mandatory sleep time for children aged 3-5 years. Yet, overall less than one-third of children slept. Increased duration of mandatory nap times was associated with a large and significant increase in the number of children napping. This paper provides the first evidence that long mandatory nap times may increase rates of napping amongst preschool age children.

The demonstrated miss-match between practices of extended mandatory nap times and overall rates of napping amongst preschool aged children indicated the potential for behavioural and emotional challenges associated with sleep times in
ECEC settings. To assess this concern, Paper 3 examined the relationship between mandatory naptimes and the quality of interactions between children and educators within ECEC environments (RQ 4). This paper demonstrated that sleep practices within ECEC settings are associated with decreased quality of emotional climate and behavioural management across the day. Emotional climate significantly declined at sleep time, particularly in rooms with longer duration of mandatory sleep time, and alongside the need for behavioural management increased. Additionally the paper contributes extension of existing observation methodologies into the new context of measurement of emotional climate during sleep time. The results indicate that sleep time in ECEC presents measureable, emotional and behavioural challenges for both children and educators.

Together, paper 2 and 3 indicated that variation in sleep practice in ECEC have implications for sleep patterns and quality of adult-child interactions within ECEC settings. Extending from these findings, Paper 4 examined if practices may also have an influence for sleep health beyond the context of ECEC (RQ 5). This paper examined the relationship between duration of mandatory naptimes in ECEC and children’s concurrent and on-going night-time sleep. Night sleep duration was a focus as this is an established predictor of on-going health (e.g. Snell et al., 2007), learning (e.g. Touchette et al., 2007) and behaviour (e.g. Paavonen et al., 2009). The paper provides the first direct evidence that, through the active promotion of napping, extended periods of mandatory sleep times within ECEC room may reduce the duration of children’s night sleep. With effects present both during the time of attendance at ECEC, and persisting into the first school year when daytime allocation of sleeping ceases. This paper indicates that sleep practices in ECEC can, through modification of sleep patterns, impact on children’s health beyond the ECEC setting.
Finally, Paper 5 and 6 provide directions for translation of the research evidence. The two translational papers serve distinct purposes. Paper 5, an international invited paper, applies current knowledge in sleep science, including that generated in the thesis, to provide guidance to practitioners and future directions of research for those in the scientific field (RQ 6). Paper 6 specifically focuses on the historical and legislative context of sleep practice in Australian ECEC. The target audience is ECEC practitioners in Australia and the specific context of Australia’s national quality standards that guide quality of practice in ECEC (RQ 7).

10.2 SIGNIFICANCE OF KEY OUTCOMES

The research and papers within this thesis provide a number of significant key contributions knowledge relevant to sleep practices in ECEC settings, including:

1. The first systematic analysis of existing evidence of the contribution of napping to young children’s health and development.

2. The first documentation of sleep practices for children within the preschool period across a large sample of ECEC services.

3. The first evidence of the impact of sleep practice on interaction quality between children and educators within ECEC settings.

4. The first evidence of the effects of variations in duration of mandatory sleep time on children’s sleep patterns both within and beyond the ECEC context.

5. The first translation of current sleep science into recommendations for sleep practice in ECEC and agenda for future research to inform this field.
10.3 FUTURE DIRECTIONS FOR RESEARCH

A detailed agenda for future research to inform sleep practice in ECEC is provided in Paper 5. In order to avoid repetition, this section focuses instead on the immediate directions for the continuation of the current research. Five key directions are identified: (1) extension of the current work to examine sleep practice in children below age 3 years, (2) examination of the effects of mandatory naptimes for non-napping children, (3) application of objective sleep measurement and examination of sleep patterns across time, (4) examination of the effects of mandatory naptimes for children’s learning, behaviour and health, and (5) on-going translation into sleep guidelines for ECEC.

10.3.1 Sleep practices for children 0-3 years

The body of work already undertaken, though extensive, does not yet extend to children aged 0-3 years. Issues surrounding appropriate practice and the balance between parent, child and educator perspectives are likely to be even more complex in this period. Prior to age 3 there are substantial challenges that result from greater variability in child sleep need, including timing, duration and number of sleep periods (Iglowstein et al., 2003), settling behaviours (Middlemiss, 2004) and the complexity of parent demands (Inglis et al., 2013). These factors likely present greater challenges to educators in determining appropriate policy and practice regarding meeting the NQS requirements for sleep and rest in ECEC. The PhD program has established the foundations of evidence and developed new methodologies to facilitate the extension of the work into the 0-3 year period.
10.3.2 Effects for non-nappers

A large proportion of preschool aged children do not sleep during sleep periods in ECEC settings, even within rooms with long duration of mandatory sleep time. Whilst the current study demonstrated that mandatory naptime may, through the promotion of napping, decrease children’s night-time sleep, whether these periods also have effects for children who do not nap is less clear. Findings of decreasing emotional negativity and increasing need for behavioural management during mandatory sleep times in ECEC raise the potential for increased stress particularly for non-napping children within ECEC settings. Preliminary findings, presented in Appendix A, suggest variations in diurnal cortisol patterns for children who do and do not sleep in relationship to mandatory sleep practice in ECEC (Staton, Smith, Pattinson, & Thorpe, 2013). Whether children may learn to associate sleep with any stress encountered during sleep periods in childcare, leading to generalised disruption of sleep behaviours, is not known, but warrants further investigation. The psychological impacts of mandatory sleep times are potentially significant and require cortisol measurement to assess stress levels in children who may internalise rather than externalise behavioural responses. This work is ongoing and has been funded by the Foundation for Children in a grant awarded to the candidate and her supervisors.

10.3.3 Application of objective sleep measurement

A key strength of the current study is the application of detailed direct observation of sleep practice and children’s response to practice in ECEC settings. Whilst this approach has provided detailed data of sleep and practice within ECEC, the current study was limited to parent report of sleep practice outside ECEC. Application of objective measurement, such as actigraphy, would strengthen the
current body of research by providing the ability to (1) examine sleep patterns across days in and out of ECEC, (2) provide a more accurate measure of sleep duration, and (3) examine the relationship between sleep practices and other known indices of sleep health including sleep efficiency (Gruber et al., 2007) and consistency (Biggs, Lushington, van den Heuvel, Martin, & Kennedy, 2011).

10.3.4 Effects for learning, behaviour and health

A number of studies have shown that children early sleep patterns have implications for key health and development outcomes including behavioural difficulties (e.g. Paavonen et al., 2009), learning (e.g. Touchette et al., 2007) and risk of overweight/obesity (e.g. Snell et al., 2007). While the current thesis focused primarily on the effects of mandatory sleep practices on children’s night-time sleep, the need to extend this work to examine the potential implications for other health and development outcomes is evident. Such studies should consider both the potential for direct effects through the reduction of opportunity for learning, social interaction and physical activity resulting from mandatory sleep time, and indirect effects through the reduction of duration of night-time sleep. Details of these mechanisms are provided in Paper 5.

10.3.5 Development and evaluation of guidelines for sleep in ECEC

ECEC services present strategic sites for universal health promotion and early intervention. They capture the majority of the early childhood population across the preschool period and are central sites for dissemination of timely information to support positive family health and education behaviours. The development of guidelines to support ECEC services and staff is a clear direction for translational research as indicated in papers 5 and 6. The implementation of evidence based
guidelines and staff training would follow strategies common in implementations science. Randomised control trials of the uptake of the guidelines would be assessed in observation of practise while evaluation would assess impacts on educators, children and families. Based on the evidence of this thesis the outcome evaluation would include assessments of emotional climate, behavioural management and sleep behaviour both in and outside ECEC. Longitudinal assessments of the effects of the intervention would attend to child learning and health. An ultimate goal is to make inputs into the National Quality Standards for ECEC in Australia.

10.4 IMPLICATIONS FOR ECEC POLICY AND PRACTICE

A key outcome of this thesis is the identification of the disjuncture between current knowledge from sleep science and current practices in ECEC. Although there is considerable scope for improving and expanding the evidence base, the work generated has immediate implications for ECEC practice and policy within the Australian context. Drawing on the findings across the 6 papers presented within this thesis, the following implications for ECEC policy and practice are identified.

**Implication 1.** The immediate and specific need for consideration of the appropriateness of allocation of extended periods of mandatory sleep time for preschool aged children in ECEC.

The studies undertaken indicated that whilst many Australian ECEC centres allocate a mandatory sleep time, many children in preschool rooms did not sleep during this time. The findings direct attention to significant associated problems. For the child who does not or cannot sleep extended mandatory naptimes represent a loss to alternative activities that may contribute to learning or physical health (e.g. activity rather than sedentary behaviour). For the educator, the time is also
potentially stressful as behavioural management increases and emotional climate decreases (Pattinson, Staton, Smith, Sinclair, & Thorpe, 2014). For the service the practice is an infringement of national quality standards that assert the need for the child to have choice and learning to be maximised. Mandatory sleep time presents risk for lower accreditation rating (ACECQA, 2013a). The need for reflection on current practices and provision of alternative is immediate.

This thesis has demonstrated that there is currently limited evidence to support the allocation of extended periods of mandatory sleep time in ECEC for children within the pre-school years. The results raise questions about the immediate and on-going implications on sleep patterns of extended mandatory naptimes for children, beyond the age at which monophasic sleep patterns would typically emerge. The evidence presented does not imply, however, that availability of opportunity to sleep in ECEC should cease. Indeed, the results from our observations also show that a number of children within this period continue to require sleep throughout the preschool years.

In addressing this implication, three suggested alternate approaches are offered for consideration. These approaches are based on successful strategies observed during observations undertaken as part of data collection for this thesis. The first approach is the provision of a designated sleep space for children throughout the day within ECEC environments. Such an approach is seen within ECEC settings for younger infant and toddler rooms, but would be viable also for preschool rooms. During observations a small number of services were observed to employ this approach. Such a provision was dependent on availability of a small space connected to the ECEC room, to ensure appropriate supervision, in which beds were available throughout the day. Whilst this approach may represent the most flexible
means of supporting variation in sleep requirement within ECEC, it is recognised that this approach is not likely to be currently feasible within the economic, staffing and structural constraints of many ECEC settings. Where the allocation of a separate sleep or rest space may not be feasible alternate approaches are required. A second approach, feasible within centres with more than one room, is the option for a designated sleep time in which children are provided with the choice of spending that time in a room where sleep is the designated activity or joining a room where continuation of non-sleep activities are provided. This approach affords children autonomy in regulating their sleep need and ensures provision of a sleep supporting environment for those who require it. A final approach, suited to centres with only one room available, is the allocation of a designated sleep time for children in which all children participate, but alternate activities are permitted for non-sleepers within the same room. This may include the provision of quiet activities within the room or outdoor activities away from children requiring sleep or rest. This approach would be best suited to centres with only one room available. It is important to note that both the second and third approaches described here, though allowing for greater flexibility, do not address the potential variability of timing of sleep need.

**Implication 2.** The need for evidence based practice guidelines for managing sleep, rest and relaxation in Australian ECEC settings.

Documentation of current sleep practices within this PhD underscore the need for evidence based practice guidelines for ECEC. All ECEC services within Australia have a legislated responsibility to cater for children’s sleep needs. The National Quality Standard (NQS) requires that “each child’s comfort is provided for and there are appropriate opportunities to meet each child’s need for sleep, rest and
relaxation” (Quality Area 2: Element 2.1.2; ACECQA, 2013b). Yet, there is currently limited evidence to guide educators in the most appropriate ways to meet these requirements and currently no evidence-based guidelines to support sleep practices in ECEC services (Staton et al., in press). The imperative for evidence-based guidelines is strong. Since the legislation of the NQS in 2012 there have been a number of legal challenges centred on the provision for sleep in ECEC services (ACECQA, 2013a). Further, research conducted alongside the current thesis indicates that a large proportion of ECEC settings (60%) currently employ sleep practices that do not align with those identified by sleep science as supportive of children’s sleep (Marriott, Staton, Thorpe, Pattinson, & Smith, 2013). These practices matter. As demonstrated within the current thesis, ECEC sleep practices have the potential to impact not only children’s sleep and interaction quality whilst in ECEC, but also may have impacts on children’s sleep more broadly. The detailed translation of current sleep science to sleep practice in ECEC presented in Paper’s 5 and 6 provides an initial basis for informing the development of such guidelines.

**Implication 3.** The need for the development of strategies for communication between parents, educators and children regarding individual sleep need.

In the course of the thesis five masters theses were co-supervised by the candidate that obtained accounts from parent, children and educators about sleep and rest times in ECEC (see Appendix A). These accounts portrayed conflicting views regarding approaches to sleep and rest. While educators viewed sleep time as important for child health, behaviour and learning (Inglis et al., 2013), the large majority of parents indicated that, if given the option, they would choose for their
preschool child to sleep at ECEC (Sinclair, Staton, Smith, Pattinson, & Thorpe, 2013). This work indicates the importance of communication strategies that enable ECEC educators and parents to consult regarding sleep needs. Figure 10.1 provides an example of one services approach to addressing the needs of parents, educators and children within its preschool room. Importantly this example indicates that children’s accounts and inputs are an important voice within this process (Nothard, Staton, Pattinson, Smith, & Thorpe, 2013).

**Implication 4.** The need for increased training of ECEC educators regarding sleep in young children and strategies for supporting sleep, rest and relaxation.

Whilst the Australian government is investing in promoting health in young children through the medium of education and care settings (Commonwealth of Australia, 2012), to date the training focuses on exercise and nutrition. The third pillar of health, sleep is absent from any health promoting strategy. This is a particular concern as we know sleep relates to a range of health outcomes, including obesity and attendant pathways into chronic disease (Cappuccio et al., 2008; Chen et al., 2008). The thesis indicates that there may be fundamental misconceptions held by educators about the value of mandatory sleep times for preschool aged children. Additionally external constraints, relating to factors such as staffing and cleaning, weights in favour of the scheduling of mandatory sleep time (Inglis et al., 2013). Training should provide information on normative sleep patterns and transitions across the early childhood period, individual and environmental factors that influence sleep need, appropriate strategies for managing and supporting the diverse sleep needs of children that align with National Quality Standards in ECEC and strategies for communicating with parents regarding children’s sleep.
Chapter 6: General Discussion

Figure 10.1. A case exemplar of a teacher who consulted with parents and children in regards to the service’s sleep and rest practices.

**Policy Context**
- National Quality Framework

**Service**
- Service propose phasing out sleep time as children would be moving into school the following year.
- Teacher was unsure and decided to talk with parents and children about their views.

**Parents**
- Some parents did not want to get rid of sleep time as children were too tired at night
- Other parents indicated that they did not want a sleep time as the children went to bed too late at night if they slept during the day.

**Children**
- Director discussed sleep time with children and encouraged children to come up with a list of quiet activities they could do during rest time.
- Children in collaboration with teacher developed a list of rules in order to facilitate other children who needed to sleep.

**Practice Outcome**
- Implemented a short rest time where children were encouraged to lie quietly, think and relax.
- Some strategies developed by the children for use during rest time included: reading stories, doing quiet drawing, or doing quiet activities away from other resting children.
10.5 CONCLUDING STATEMENT

Sleep is a key pillar of health that has profound effects on human functioning (Carskadon & Dement, 1994; Vassalli & Dijk, 2009). Early childhood is a particularly salient time in the founding of lifetime sleep patterns (Carno et al., 2003; Davis et al., 2004; Jenni & LeBourgeois, 2006). This study, presented in 6 papers, has focussed on sleep experiences outside the family home. The focus, mandatory sleep times occurring in early childhood education and care settings, is an exposure with the potential to disrupt normal sleep development. The data presented finds that for children aged 3-5 years in these settings the provision of mandatory sleep time often runs contrary to children’s normally developing sleep patterns and raises important questions about the impacts on health and learning. Moreover, for service providers the data raise significant challenges to current practices that present direction for future research. The quality of ECEC in Australia is a major national focus that, at the conclusion of the writing of this thesis, is manifest in the Productivity Commissions Enquiry (Productivity Commission, 2014) into the appropriate inputs of ECEC to the Nation’s economy, enabling parent work and supporting optimal child development. This work makes an important contribution to optimising the functioning of ECEC, an essential service for the economy, and for the development of the one million children who currently attend (Australian Bureau of Statistics, 2013).
Bibliography


*Sleep Medicine Clinics, 2*(3), 513-520.


Appendices

Appendix A
Published Abstracts deriving from the PhD research program

Reference


Abstract:

Introduction: Across developed nations more than two-thirds of children aged 3-6 years attend childcare services, yet there remains little understanding of the impacts of childcare attendance on children’s sleep patterns. Normative studies indicate that by age 3 approximately half of all children will have ceased regular napping. Despite this, a common practice in childcare programs in Australia, through to the time of school entry at age 6, is the scheduling of a period of mandatory sleep time during which children are not permitted to engage in alternative activity. This study is the first to examine the relationship between duration of mandatory sleep time in childcare, frequency of day-time napping and children’s nigh-time sleep. Method: Data was collected for 168 children (M=59 age months; 55% males) attending licensed, centre-based childcare services in Queensland, Australia. Duration of mandatory sleep time was assessed via direct observation of sleep periods. Teachers reported on children’s typical napping patterns whilst in childcare, whilst parents reported on children’s night-time sleep. Path analysis using AMOS was conducted to examine the relationship between duration of mandatory sleep time, frequency of day-time napping and children's nigh-time sleep. Results: The average duration of mandatory sleep time in childcare was 56 minutes (range=0-145 minutes). Path analyses showed a significant indirect path between mandatory sleep time and duration of night-time sleep, through increased napping in childcare ($p=0.001$). Children exposed to longer duration of mandatory sleep time in childcare had significantly shorter duration of night-time sleep and this relationship was mediated by increased frequency of napping in childcare settings. This relationship stayed significant after adjusting for potential confounding variables; age, gender, family income, parental education, childcare quality, days/week of attendance and service type. Conclusions: This study is the first to show a relationship between observed duration of mandatory sleep time in childcare settings and children's duration of nigh-time sleep. These effects are important as reduced night-time sleep in children has been found to be a significantly risk factor for reduce academic performance, behaviour difficulties and poorer physical health. Implications for future research and sleep practice in childcare are discussed.
Reference:

Abstract:
Introduction: Across developed nations more than two-thirds of children aged 3-6 years attend childcare services, yet there remains little understanding of the impacts of childcare attendance on children’s sleep patterns. Normative studies indicate that by age 3 approximately half of all children will have ceased regular napping. Despite this, a common practice in childcare programs in Australia, through to the time of school entry at age 6, is the scheduling of a period of mandatory sleep time during which children are not permitted to engage in alternative activity. This study is the first to examine the relationship between duration of mandatory sleep time in childcare, frequency of day-time napping and children's nigh-time sleep. Method: Data was collected for 168 children (M=59 age months; 55% males) attending licensed, centre-based childcare services in Queensland, Australia. Duration of mandatory sleep time was assessed via direct observation of sleep periods. Teachers reported on children’s typical napping patterns whilst in childcare, whilst parents reported on children’s night-time sleep. Path analysis using AMOS was conducted to examine the relationship between duration of mandatory sleep time in childcare, frequency of day-time napping and children's nigh-time sleep. Results: The average duration of mandatory sleep time in childcare was 56 minutes (range=0-145 minutes). Path analyses showed a significant indirect path between mandatory sleep time and duration of night-time sleep, through increased napping in childcare (p=.001). Children exposed to longer duration of mandatory sleep time in childcare had significantly shorter duration of night-time sleep and this relationship was mediated by increased frequency of napping in childcare settings. This relationship stayed significant after adjusting for potential confounding variables; age, gender, family income, parental education, childcare quality, days/week of attendance and service type. Conclusions: This study is the first to show a relationship between observed duration of mandatory sleep time in childcare settings and children's duration of nigh-time sleep. These effects are important as reduced night-time sleep in children has been found to be a significantly risk factor for reduce academic performance, behaviour difficulties and poorer physical health. Implications for future research and sleep practice in childcare are discussed.
Reference:

Abstract:
Introduction: Perturbation of normal sleep patterns in childhood has been independently associated with risk for obesity and accidents, poor neurocognitive functioning and behavioural problems. Childcare environments have the potential to affect children’s developing sleep patterns for better and worse yet little is known about the impact of sleep practices in childcare. This paper examines the impact of childcare practices on child wellbeing. Methods: We addressed three research questions: (1) what are the range of sleep practices in Australian childcare? (2) How do these sleep practices relate to current knowledge regarding healthy sleep promotion? (3) How do childcare practices relate to child wellbeing and physiological stress? Standard observations of 2300 children, aged 3-6 years, attending 130 childcare centres across sleep and non-sleep sessions were conducted. The range of policies and practices relating to type of scheduling, duration of scheduling and flexibility in provision for sleepers and non-sleepers were recorded and descriptive statistics generated. Observed sleep scheduling behaviours were coded against published positive sleep hygiene behaviours. Cluster analyses were applied to identify patterns of sleep practices. Finally the association of measures of emotional climate, child behavior and patterns of salivary cortisol and variation in sleep practices were assessed. Results: 90% of child care rooms scheduled a standard sleep time with a duration of 0-3 hours. The majority (70%) of children did not sleep during this time. Of centres scheduling sleep 50% did not permit alternate activity for non-sleeping children for a period exceeding 1 hour. Three clusters of sleep practices that variously align with good sleep hygiene recommendations were identified. Alongside, practices were systematically related to emotional climate, child distress. Conclusion: Many childcare centres do not have optimal sleep practices. There is a need for evidenced based sleep guidelines to optimise healthy sleep development in childcare.
Reference:


Abstract:

Introduction: Data from a large Australian longitudinal study suggests that almost three-quarters of preschool aged children (aged 3–6 years) do not sleep during sleep periods in early childhood settings. Despite this, many centres currently require all children to lie quietly, without alternate activities provided, during sleep periods of up to, and in some cases in excess of, 2 hours. Whether such practices have implication for children’s night-time sleep, health or development is currently unknown. It is possible that compelling children to lie down without other activity for prolonged periods when they are unable, or unwilling, to sleep could induce stress and that this stress may generalise to bedtime at home. This study utilised the variation in sleep practices across childcare centres to examine the effects of mandatory versus flexible sleep practices on children’s diurnal cortisol patterns.

Method: Salivary cortisol samples were collected from 62 children attending childcare centres with either mandatory (all children must lay on their beds without alternate activities allowed; n = 41 children), or flexible (alternative activities are provided for children who are unable or unwilling to sleep; n = 21 children) sleep practices. Salivary samples were collected across two days in which the child attended childcare, with measurement at four time points (morning waking, prior to daytime sleep period, directly following daytime sleep period and prior to night time sleep). Each child’s sleep in the childcare setting was assessed using both direct observation and actigraphy. Analyses were conducted to examine the effects of sleep practice (mandatory vs. flexible) and child response (sleepers vs. non-sleepers) on children’s diurnal stress trajectories.

Results: Our results suggest a relationship between childcare sleep practices and diurnal cortisol patterns. Notably, non-sleepers in childcare settings with mandatory sleep practices did not show a significant reduction in cortisol levels between post sleep period at childcare and night-time sleep. Discussion: The findings from this study raise important questions regarding the effects of mandatory sleep practices in childcare for children. Future studies should examine the potential implications of variations in diurnal cortisol patterns between children in childcare settings with mandatory versus flexible sleep practices on children’s night-time sleep patterns and behaviours.
Reference:


Abstract:

Introduction: During the early childhood years children’s sleep patterns are characterised by a gradual consolidation of sleep into the night-time, and a commensurate reduction in day-time. There is a transition from polyphasic sleep/wake pattern seen in early infancy, where children sleep at multiple times during the day, through a biphasic sleep/wake patterns where children nap only once and finally a monophasic pattern of a single night sleep characteristic of adult patterns. Whilst most studies agree that rates of day-time sleep decrease beyond age two and cease by the time children enter school, there remains considerable cultural variation regarding the timing of cessation of napping for children over the preschool years. To date, no studies have reported on the rates of napping for preschool aged children in the Australian population. Accordingly, this study aimed to (1) provide the first data regarding the rates and cessation of napping behaviour for preschool aged within an Australian cohort and (2) examine the effects of child and family characteristics on reported rates of napping within this period. Method: This study utilised data from E4Kids a large longitudinal study of Australian pre-school children. Parent reports of children’s sleep patterns, including day-time sleep duration, sleep locations and timing of cessation of day-time sleeps, and familial and child characteristics were analysed for 1700 children in the year prior to school (mean age 4 years 6 months). Regression analyses were conducted to examine the effects of familial background (SES, cultural group, parent education, parent work status, age at first birth, current maternal age) and child characteristics (age, temperament, gender, disability and health status) on children’s napping patterns. Results: Normative patterns in Australian preschool age children confirm that the majority have ceased napping in the pre-school year though with some sub-group variation. Discussion: This study documents for the first time the rates of napping amongst preschool aged children in Australia. The findings from this study are important in informing not only parent expectation about day-time sleep patterns for this age group, but also sleep policies and practices for preschool aged children within the early childhood education and care sector and may form the basis of practice guidelines in these settings.
Abstract:

Introduction: Children aged 3–5 who engage in daytime sleep are more likely to go to bed later and have more night waking than children who do not. Children’s sleep disruptions can impact the family functioning and well-being so it is important to understand parental view points and the factors which influence parent preferences when reviewing daytime sleep/rest periods. In Australia, approximately 50% of children aged 3–5 attend an Early Childhood Education and Care (ECEC) settings, and a daytime sleep/rest period is a prominent feature of their daily routines. Previous research reports that parental decisions regarding children’s sleep patterns are influenced by various factors, including financial conditions, family size, cultural practices and beliefs, parent work schedules and child factors, to name a few. To date, no research has been conducted to examine a) parental preferences towards the daytime sleep/rest period in ECEC settings and b) the underlying reasons behind these preferences.

Method: We present data from a large, longitudinal project of preschool-aged children in Australia. Participants included Australian parents (N = 1302) of preschool aged children (aged 3–6.5) from metropolitan, regional and rural sites across two Australian states and included the diversity of social groups in Australia. Children participating in the study were enrolled in a range of ECEC services including long day care, kindergarten and family day care. Results: This study utilised both quantitative and qualitative data obtained from parent-report questionnaires to document parental preferences regarding the day sleep/rest period in ECEC settings and to obtain their rationale for their preference. The association of these responses with demographic indicators, family/child factors and systemic, contextual factors were explored to assess their influence on parental desires towards preschool children’s day sleep routines. Conclusions: The results provide important information on the views of parents towards the sleep/rest period in ECEC settings. The data on parental preferences inform policy and practice in early childhood education and care.
Reference:


Abstract:

Introduction: The majority of children cease napping between 3 and 5 years old, yet the allocation of up to 2 hours per day for sleep/rest through to school entry is common practice in Early Childhood Education and Care (ECEC) settings in Australia. Sleep-time in these PrePrep rooms may cause a divergence from normative sleep patterns and practices. This divergence may increase the risk of emotional and behavioural challenges, both for children and for their supervising carers. To date no studies have directly examined the emotional context of sleep in ECEC settings. Methods: This study used a subset of the Classroom Assessment and Scoring System (CLASS) Pre-K (Pianta, LaParo & Hamre, 2008) to assess the change in emotional climate and behavioural management between the morning and sleep-time sessions in 113 ECEC rooms in Queensland, Australia. A total of 2,114 preschool-aged children (age range = 3 to 6.4 years) were observed within these rooms. Centres had varying policies regarding the permitted level of activity for children not sleeping during sleep-time which were classified into three groups: Flexible (≤30 mins, lie on bed only, 24 rooms), Inflexible (31 to 60 minutes, lie on bed only, 41 rooms) and Highly Inflexible (≥61 minutes, lie on bed only, 48 rooms). Results: 71% of children did not sleep at any point during the allotted sleep-times. The CLASS Pre-K measure detected a significant drop in emotional climate between the morning and sleep-time sessions in all groups $F (1, 110) = 193.30, p < .001$. Furthermore, Highly Inflexible policy in ECEC rooms was associated with significantly lower overall emotional climate and ratings of behavioural management ($p < .05$). Discussion: Rigid sleep practices for preschool aged children in ECEC centers present the potential for daily difficulties with behavioral management and attendant reduction in the classroom’s emotional climate. This study raises questions about the biological and developmental worth of a standard scheduled sleep-time for all children in the later years of ECEC, and directs attention to the value of flexibility in policy and practice. Further studies are needed to examine the antecedents and consequences of sleep in ECEC on children’s night-time sleep, health and well-being.
Reference:


Abstract:

Introduction: Sleep is an essential component of the physiological restoration of the body. Poor sleep is linked to negative effects on not only physiological wellbeing, but psychological health and cognitive functioning as well. The study of sleep practice and environments is generally acknowledged to cover three domains; the immediate environment of the sleeper, the behaviour and practices that precede sleep and activities undertaken during the day that may impact on the quality of sleep. The regulation of these variables ensures effective and continuous sleep that is seen as being of benefit to the individual. Although there is a substantial body of research in the literature on the sleep practices and environments of specific populations, there is very little information on sleep practices and environments for children in a general sample and no information about the use of sleep practices and environments to assist in day time sleep for young children. Nap time, sleep or rest periods are currently a curriculum component of many early childhood education and care (ECEC) settings in Australia. This study focuses on the sleep practices and habits that facilitate quality sleep and the practices that surround day time napping or sleep in ECEC settings. The data for this paper comes from an Australian study on the sleep practices and children’s sleep patterns in ECEC settings. Methods: Observations of full sleep/rest periods using a structured observation protocol were conducted in 118 kindergarten and long-day care centres in Brisbane. This study investigates the observational data to qualitatively explore what is happening in ECEC settings during rest/nap time and how this relates to positive sleep practices and environments. Results: Our results suggest that practices in many centres do not provide sleep environments that are conducive to positive sleep experiences, with particular problems relating to abrupt transitions into the sleep period and negative characteristics of the immediate sleep environment including noise levels, disruptive activity and negative emotional tone. Preliminary results suggest the need to assess the impact of current practices on children and review provisions in ECEC sleep environments.
Reference:


Abstract:

Introduction: Research across a range of cultures document that after the age of three years, the majority of children cease to have a daytime sleep. However, in Australian childcare centres up to 2 hours a day is allocated to sleep or rest periods for children until they enter school. While some children sleep during these assigned sleep-rest times, others do not. Several studies have identified the subgroup of children who find it difficult to nap or lie still during sleep/rest time as problematic. To date, the factors that distinguish this subgroup of children from those who nap is unclear, and the aetiology of the “problem” of failure to nap is unclear. Method & Results: We present data from a study conducted in Australia where most childcare services provide sleep periods through to the time children enter school. This study utilized the variation in napping behaviour across centres to explore the child characteristics and demographic variables associated with problem nappers and to identify the underlying explanations for children’s inability to sleep during nap time at childcare centres. Data were obtained from children (N = 245) attending early childhood education and care programs (N = 130) in which sleep/rest observations were conducted. Child outcomes included parent report of sleep behaviours and sleep difficulties, parent and teacher report of behavioural difficulties via the Strengths and Difficulties Questionnaire (SDQ) and direct assessments of cognitive and academic functioning via the Woodcock Johnson III (WJIII). Analyses examined differences between those identified as nappers and non-nappers on each of the measures. Conclusions: Our findings provide important information regarding policy and practice of sleep time for all children in childcare settings and suggest that being a non-napper is not a problem of the child, but rather the context.
Reference:


Abstract:

Introduction: In Australia over a million children attend Early Childhood Education and Care (ECEC) settings. Children’s experiences in these settings have a significant impact on their health and well-being. Among these experiences is the daily sleep-time during which children in many centres children are required to lie down without alternative activity even if they are unable to sleep. In the pre-school year this presents particular challenges as many children have already achieved monophasic sleep and do not need to sleep. There is an evident disparity between current policies and practices in childcare and the biological needs of most children. Emerging evidence from cortisol studies suggest that the experience of sleep time may be stressful. Given the importance of understanding the impact of these policies and practices, first hand reports from children on their experiences and perspectives of the sleep period in ECEC settings is informative. This study is the first to document children’s own reports of their experiences of the sleep period in childcare.

Method & Results: Interviews were conducted with preschool aged children (aged 3–6 years) across six full-day childcare centres. A standard protocol was applied to measure: 1) the spontaneous reference to sleep time by children as a liked or disliked activity, and 2) children’s expressions of their specific experiences of childcare practices during the sleep period. Interviews with the children were subsequently analysed to identify major emergent themes. Group differences in experiences of sleep periods between children in centres with flexible practices (where the child is able to choose to sleep if needed) and compulsory practices (where day time sleep period is mandatory for all) were examined.

Conclusions: Our results provide a detailed account of the impact and experience of current ECEC policies and practices around the sleep time by children in these settings. The results highlight the need for greater attention to individual experiences of children across centres with flexible and compulsory sleep practices. This insight is essential to informing quality standards relating to sleep practices in childcare setting that promote positive child development and well-being.
Reference:


Abstract:

Introduction: Current napping practices for preschoolers in early childhood centres in which sleep times are mandated, seems at odds with normative sleep patterns for children and has been shown to result in later bed times, more night waking and worse mood in the morning. Normative data for 31/2–41/2 year old children indicates that the average duration of naps is 15 minutes. So why are many early childhood centres mandating nap times which can last up to 21/2 hours? This study is the first study to examine childcare staff’s beliefs about children’s daytime sleep and obtains data on staff knowledge about sleep, constraints to changing sleep practices and the response of staff to mandated nap periods. Method & Results: We present data from a stratified sample of early childhood centres examining childcare workers beliefs about children’s daytime sleep. Six focus groups examining beliefs about napping practices and constraints to changing napping practices were conducted. Participants were directors, teachers and assistants from early childhood centres who work with children aged 3–6 years. Centres were approached within the Brisbane area and self-selected to participate. Thematic analysis was used to examine emerging themes around current practices, beliefs about sleep, staff experiences and staff interaction with children and parents regarding sleep. Conclusions: Our findings provide important information regarding dysfunctional beliefs about children’s sleep, staff’s experiences in enforcing mandatory nap periods and barriers to changing outdated practices. Implications are discussed for the educational needs for childcare workers in the area of sleep, as well as the importance of including sleep training in childcare courses.
Appendix B
Queensland University of Technology Thesis by Published Papers Guidelines

Introduction
1 In 2000, QUT adopted an additional model for presentation of PhD theses, called Thesis by Publication. Hence QUT now recognises three types of PhD thesis, with the others being the Traditional Monograph Thesis and Thesis by Creative Works. Students in the Faculty of Health can submit their thesis either by monograph or publication.

Thesis by Publication Regulations
2 The QUT PhD Regulations 14.1.1 and 14.1.2 state:

_The Queensland University of Technology permits the presentation of theses for the degree of Doctor of Philosophy in the format of published and/or submitted papers where such papers have been published, accepted or submitted during the period of candidature._

_Papers submitted as a PhD thesis must be closely related in terms of subject matter and form a cohesive research narrative._

3 In addition to the guidelines set down by QUT, the following guidelines should be addressed by students enrolled in the Faculty of Health intending to submit their thesis by publication.

8 For thesis by publication, PhD Regulation 14.2.1 to 14.2.3 states:

14.2.1 _The thesis may be comprised of published papers, manuscripts accepted for publication, manuscripts submitted for publication or under review._

14.2.2 _The minimum number of papers and/or manuscripts is normally three. At least one paper must have been published, accepted, or be undergoing revision following refereeing. For the Faculty of Health, one paper must have been published or accepted._

14.2.3 _Where the papers have multiple authorship, the candidate must be the principal author on at least two of the three papers and have written permission from the co-authors._

9 Although published and available in reprint format, it is required that an electronic version of the article is re-formatted, eg, to a WORD document, to simplify production and enhance presentation and ease of reading with the other chapters. When the article has been reformatted there should be a footnote containing a full citation of the published paper.
Appendix C
Detail of the methods used for the Sleep in Childcare Study

Research aims.
The focus of the current study is childcare settings in Australia. The study addresses three key questions regarding sleep practices in these settings:

1. Are compulsory sleep periods in childcare settings stressful for Australian children?
2. Do sleep periods in childcare disrupt children’s night-time sleep patterns and behaviours?
3. Are there any immediate and on-going adverse or positive effects of sleep practices in childcare on children’s behaviour, well-being and health?

Procedure.
Data collection included three phases:

1. Recruitment: Participating centres were selected from the pool of 130 centres in the Queensland-E4Kids sample that were observed during sleep time in 2011. Centres were selected based on the following criteria: 1) long day care in type and 2) located within a high SES area (SEFA ranking > 8). From the centres meeting these criteria, 4 centres with mandatory sleep time (defined as practices in which children are required to lie still without any alternative activity for an average period of 1 hour) and 2 centres with flexible sleep practices (no mandatory sleep time) were randomly selected for this study.

2. Data collection year 1: Sleep and activity both inside and outside the childcare setting was measured continuously over a 2 week period using actigraphy measured with a wrist device. At the start of data collection the wrist devices were attached to children with instruction to parent and staff. On the same childcare day across each week of actigraphy measurement, salivary cortisol measures were taken 4 times. Morning and night-time salivary cortisol samples were collected by parents who were provided with detailed instructions and collection kits. Observations of the centre, including sleep time, were undertaken and children weighed and measured. Parents completed questionnaires containing standard measures of sleep behaviour, behavioural difficulties, dietary intake and demographics.

3. Data collection year 2: Parent questionnaire and anthropometric measures were obtained from parents 12 months after the first data collection, with repeat measures of standard assessments of sleep behaviour and difficulty, behavioural difficulty, general health.

Sample. Data was collected for 62 children.
Figure 5. Summary of research sample, design, and method

Measures. Measurement of child outcomes at both time points utilised published and well-regarded report measures.

1. Childcare practices - Independent observation. Sleep in the childcare setting will was assessed by trained observers using piloted protocols developed in the Sleep Observation Study. These structured observations provided detailed information about pre-sleep and sleep practices including settling strategies, emotional climate and environmental disruptions. General quality of the environment were also measured using the Classroom Assessment Scoring System (CLASS).

2. Stress - Salivary Cortisol. Child stress levels inside and outside the childcare setting were estimated from salivary cortisol levels. Salivary cortisol testing is a non-invasive and widely used method of examining stress responses in young children. Salivary samples were collected for all children on two days (to ensure measurement stability) in which the child attended their long-day care service. Collections on both days was made at four time points (at waking, prior to children’s daytime sleep period, directly following the sleep period and prior to night time sleep) using Salimetrics children’s saliva sampling kits. Parents were provided with sampling kits and detailed written instructions to obtain the first sample at home, following the general procedures of Dettling et al., while samples within the childcare setting was collected by research staff. Samples were immediately refrigerated before storage at -20°C until non-isotopic immunoassay for cortisol by an independent laboratory.

3. Sleep Patterns – Actigraphy. Each child’s sleep in the childcare setting and their habitual sleep at home was assessed using Actigraphs (Philips Respironics Activewatch II). These unobtrusive “watch” devices are worn on the non-dominant wrist of each child and allow continuous assessment of activity. Actigraphy provides objective data regarding sleep-wake behaviour and level of physical activity and is regarded as a reliable and valid sleep assessment method that has been used previously with this age group. Actigraphy data was
summed in 1-minute epochs for analysis with Actiware 5.2 software to provide standard quantitative sleep indices.

4. **Body Mass Index - Anthropometric measurements.** Children’s body mass index (BMI) z-scores (controlling for age and gender) was recorded by the research staff using standard World Health Organisation anthropometric measurements protocols.

5. **Sleep and Behavioural Difficulties - Parent survey.** Parent surveys were administered to parents and included standard measures of children’s sleep difficulties (Children’s Sleep Behaviours Questionnaire-CSBQ\(^5\)), Behavioural Difficulties (Strengths and Difficulties Questionnaire –SDQ\(^6\)) and measures of potential confounding factors including age, family demographics, child temperament, history and time in childcare and dietary intake.

**References**

Appendix D
Key measures and approaches used within the E4Kids study

Key E4Kids Measures

<table>
<thead>
<tr>
<th>Variable</th>
<th>Measure</th>
<th>Type</th>
<th>Descriptor</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Child Development and Well-Being Measures</strong></td>
<td></td>
<td></td>
<td>------------------------------------------------------------------------------------------------------</td>
<td>------------------------------------------------</td>
</tr>
<tr>
<td><strong>Behaviour</strong></td>
<td>Strengths and Difficulties Questionnaire (SDQ)</td>
<td>Parent report</td>
<td>The SDQ is a brief behavioural screening instrument for children aged 4 to 16 years. 5 subscales: peer-problems, emotional difficulties, conduct problems, hyperactivity and pro-social behaviour and a total difficulties score.</td>
<td>Goodman, 1997, 2001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Teacher report</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Cognitive development</strong></td>
<td>WJIII</td>
<td>Direct child testing</td>
<td>Standardised battery of cognitive and achievement tests</td>
<td>Flanagan, 2001</td>
</tr>
<tr>
<td><strong>Peer relationships</strong></td>
<td>Friendship Bus Story</td>
<td>Child report</td>
<td>Pictorial representation task of friendship quality</td>
<td>Thorpe, Staton, Morgan, Danby, &amp; Tayler, 2010b</td>
</tr>
<tr>
<td><strong>Health</strong></td>
<td>BMI</td>
<td>Direct Anthropometric measurement</td>
<td>Height, weight and tummy circumference</td>
<td>WHO organisation measurement standards</td>
</tr>
<tr>
<td><strong>Environmental and background variables</strong></td>
<td></td>
<td></td>
<td>------------------------------------------------------------------------------------------------------</td>
<td>------------------------------------------------</td>
</tr>
<tr>
<td><strong>Quality of care</strong></td>
<td>Classroom Assessment Scoring system (CLASS)</td>
<td>Direct Observation in each child’s ECEC setting</td>
<td>Standardised observation measure of quality of preschool environment across 11 dimensions.</td>
<td>Pianta, La Paro, &amp; Hamre, 2003</td>
</tr>
<tr>
<td><strong>History of care and Time in care</strong></td>
<td>Record of years in care and type of care</td>
<td>Parent Report</td>
<td>Parent Survey Items</td>
<td>Developed for E4Kids study</td>
</tr>
<tr>
<td><strong>Demographics</strong> (e.g. age, gender)</td>
<td>Parent survey items</td>
<td>Parent Report</td>
<td>Parent Survey Items</td>
<td>Developed for E4Kids study</td>
</tr>
</tbody>
</table>
Appendix E
Sleep items included within the parent survey of the E4Kids study

6  In the last 12 months, have you ever been told that the study child has impaired hearing or vision?
   □ Yes  □ No

7  How would you rate the study child’s dental health
   □ Excellent □ Very good □ Good □ Fair □ Poor

8  In the last 12 months, has the study child ever had a toothache, or had to go to the dentist because of decay?
   □ Yes  □ No

9  On a typical night, when does the study child usually go to sleep?
   □ Before 5pm □ 5pm □ 5:30pm □ 6pm □ 6:30pm
   □ 7pm □ 7:30pm □ 8pm □ 8:30pm
   □ 9pm □ 9:30pm □ 10pm □ 10:30pm
   □ 11pm □ 11:30pm □ Midnight or after midnight

10  On a typical morning, when does the study child usually wake up?
   □ Before 4am □ 4am □ 4:30am □ 5am □ 5:30am
   □ 6am □ 6:30am □ 7am □ 7:30am
   □ 8am □ 8:30am □ 9am □ 9:30am
   □ 10am □ After 10am

11  Does the study child ever have problems with their sleep?
   □ No never  Go to 12 on the next page  □ Less than weekly  Go to 11 (a)
   □ At least once per week  Go to 11 (a) □ 4 or more times per week  Go to 11 (a)
   □ Every day or night  Go to 11 (a)

11 (a) In your opinion, how severe are the study child’s sleep problems?
   □ Mild □ Moderate □ Severe

11 (b) Please describe the problems the study child has with their sleep?
12 Does the study child ever nap (sleep during the day)?

☐ Yes  Go to 12 (a)  ☐ No  Go to 12 (d)

12 (a) In a typical week, on how many days does the study child usually nap?

☐ 7 days per week  ☐ 6 days per week  ☐ 5 days per week  ☐ 4 days per week

☐ 3 days per week  ☐ 2 days per week  ☐ 1 day per week

☐ Only some weeks / less than 1 day per week

12 (b) On days when the study child naps, how long do they usually nap for?

☐ 0-15 mins  ☐ 15-30 mins  ☐ 30-45 mins  ☐ 45 mins to 1 hr

☐ 1 hr to 1 hr 30 mins  ☐ 1 hr 30 mins to 2 hrs  ☐ more than 2 hours

12 (c) Where does the study child usually nap:

12 (c) i  At home in bed?  ☐ Yes  ☐ No

12 (c) ii  While watching TV?  ☐ Yes  ☐ No

12 (c) iii  In the car?  ☐ Yes  ☐ No

12 (c) iv  At their early childhood service or school?  ☐ Yes  ☐ No

12 (c) v  Does the child nap anywhere else?  ☐ Yes  Go to 12 (c) v (i)  ☐ No  Go to 13

12 (c) v (i)  Where else does the study child nap?  After completion Go to 13

12 (d) At what age did the study child stop napping?  ___ ___ months
13 If given an option, would you choose for the study child to sleep at their early childhood service or school?

☐ Yes, everyday ☐ Yes, some days ☐ Yes, on odd occasions

☐ No, never ☐ Study child does not attend an early childhood service or school

13 (a) Please tell us why this is your preference for sleep at your child’s early childhood service or school

Section complete, please continue onto the next page
Appendix F

Sleep items included within the teacher survey of the E4Kids study

7 Do the children in the classroom or group have a sleep/rest time?
   ☐ Yes ☐ No  Survey complete, please continue onto the next survey

7 (a) On a typical day, what time does the children's sleep/rest time start?
   _____ : _____ ☐ pm ☐ am

7 (b) On a typical day, what time does the children's sleep/rest time end?
   _____ : _____ ☐ pm ☐ am

7 (c) How many of the children have to sleep/rest during this time?
   ☐ All  ☐ Almost all  ☐ Some  ☐ A few  ☐ None

During sleep/rest time, what are the children allowed to do?

7 (d) i Sleep only?
   ☐ Yes  ☐ No

7 (d) ii Lie quietly in their bed or cot?
   ☐ Yes  ☐ No

7 (d) iii Read books or do other quiet activities (e.g. drawing, puzzles etc.) in their bed or cot?
   ☐ Yes  ☐ No

7 (d) iv Do quiet activities not in their bed or cot?
   ☐ Yes  ☐ No

7 (d) v Play outside?
   ☐ Yes  ☐ No

7 (d) vi Other?
   ☐ Yes  Go to 7 (d) vi (a)  ☐ No  Survey complete, please continue onto the next survey

7 (d) vi (a) What else are the children allowed to do during sleep/rest time?

Survey complete, please continue onto the next survey
Appendix G

Brief ECEC sleep and rest policy and practice screening tool

![Sleep/Rest Observation Items](image_url)
Appendix H
Full Sleep Observation Measure for ECEC (SOME)

Sleep/Rest Observation Protocol

Instructions

Background
ECEC settings have strong potential to provide a framework for fostering healthy sleep habits and routines in children during their early years of development. The first step towards providing a healthy sleep environment for children is to get a clear understanding of current practices around sleep and sleep issues. There is currently very limited data regarding the impact of sleep periods in ECEC setting on children’s sleep patterns and behaviours, and none regarding the practices around sleep employed in these settings. The current observations will be the first to provide a detailed examination of sleep/rest periods in ECEC settings and how children respond to these periods. Findings from these observations will have important implications for practice and policy.

The sleep/rest observations are to be completed in ALL Long-Day Care and Kindergarten rooms in QLD. These observations are NOT conducted in school (prep) or family-day care rooms.

The sleep/rest observation protocol has 2 sections:
1) A front sheet (to be completed outside the observation period)
2) An observation record sheet (for each 30 minute observation period)

1) Front Sheet
The front sheet includes questions about the room, the room/group schedule, the typical sleep behaviours of the focus children* and changes in the sleep/rest period. You will need to talk to the teacher and, where available, refer to the class schedule to complete this section. The front sheet should be completed outside the observation time.

*Focus Children - The focus children are those within the class/group who are participating in the 54Kids study. In most rooms this will be between 1 and 4 children. You will need to ensure you have identified the names of the 54Kids children in the room/group from the portal prior to the observation. Please note that when there are >4 children participating in the study in a room, an additional researcher will be present at the observation.

For questions 1 and 2, regarding the timing and duration of the sleep/rest period, this refers specifically to the ‘scheduled’ sleep/rest period for the room – that is the time indicated on the daily plan for the room. If the room does not have a scheduled sleep/rest period, please record the observed sleep/rest period start and end time and make a note that this is based on the observation in the additional notes section at the bottom of the page.

Questions 4 & 5 are intended to capture if there are changes in the sleep/rest practices through the week &/or through the year. For example a centre may have different sleep/rest arrangements on different days of the week, or may reduce the length of the sleep/rest period later in the year. Other examples of possible responses may include changes in timing or changes in activities allowed during sleep/rest time.

2) Observation Record Sheet
Sleep/rest observations are to be conducted over the entire sleep/rest period for the room. If you are conducting a CLASS observation during the transition to sleep time, do not start the sleep/rest observation until you have completed the full CLASS observation period. Sleep/rest time begins when the first child is on their bed/cot on completion of the standard CLASS observation.

Observations of sleep/rest periods are conducted in 30 minute intervals (e.g. during a 30 minute sleep/rest period you will complete 1 x 30 minute sleep/rest observation, for a 2 hour sleep/rest period you will complete 4 x 30 minute sleep/rest observations). Each 30 minute observation includes 5 components: (i) five dimensions from the CLASS measure (Positive climate, Negative Climate, Regard for Student Perspective, Teacher sensitivity and Behavioural Management), (ii) Counts of child responses recorded at 10 minute intervals, (iii) record of child responses for focus children at 10 minute intervals, (iv) strategies used by staff during the observation period (v) record of staff waking the children and count of disruptive incidents during the observation period.
(i) Five dimensions from the CLASS measure
During each 30 minute observation period you need to observe and score each of the 5 CLASS dimensions, Positive climate, Negative climate, Regard for Student Perspective, Teacher sensitivity and Behavioural Management. These observations are conducted as per the standard protocol for CLASS observations. Due to the coding of child responses (see below) the observation period for CLASS observations during the sleep/rest period are 25 minutes of observation, followed by 5 minute for scoring. It is important that you clearly record the start and finish time of each observation, as per the normal protocol for CLASS observations (i.e. the finish time is 25 minutes after the start time and does not include the scoring time) and who is present during the observation (i.e. is it the teacher, assistant or other staff member). Remember that the number of staff and children is recorded at the start of the observation (as per the CLASS protocol).

Please note that the scoring for the CLASS is the same as that for all other CLASS observations – i.e. the reference point does not change because it is sleep/rest time.

(ii) Counts of child responses
During the 30 minute observation a count of the behaviours of the children in the room is recorded at 10 minute intervals (i.e. 3 times). At 5 minutes, 15 minutes and 25 minutes record the number of children within each of the behaviour categories. The categories and description for each are as follows:

<table>
<thead>
<tr>
<th>Category</th>
<th>Descriptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Awake (Moving &amp;/or eyes open)</td>
<td>Child is clearly moving and/or has their eyes open at time of recording. This category includes children who are moving with their eyes open, have their eyes open but are lying still and children who are facing away from you (i.e. you can’t see their eyes) but is clearly moving at time of recording.</td>
</tr>
<tr>
<td>Asleep (lying still/eyes closed)</td>
<td>Child is lying still and eyes are closed at time of recording. To be placed in the category children must be both lying still and have their eyes closed at time of recording.</td>
</tr>
<tr>
<td>Lying still/unsure about eyes</td>
<td>Child is lying still but due to position (e.g. facing away from observer) could not be identified as having eyes open or closed.</td>
</tr>
<tr>
<td>Disruptive/distressed</td>
<td>Child is disruptive or distressed at time of recording, e.g. shouting out, disrupting other children verbally or physically, crying.</td>
</tr>
<tr>
<td>Doing activity on bed</td>
<td>Child is doing an activity on bed or cot at time of recording (e.g. reading a book, doing a puzzle, playing with a toy, drawing, listening to teacher read a book to class). Please note that this category does not include children holding or playing with a soft toy (e.g. teddy or rabbit), in this case please code in the ‘awake’ category.</td>
</tr>
<tr>
<td>Away from bed/cot</td>
<td>Child is away from bed or cot at time of recording e.g. doing an activity not in bed/cot (reading a book in a book corner, playing outside, drawing at a table). This category includes children moving away from bed/cot to interact with staff or, for example, visiting the toilet.</td>
</tr>
</tbody>
</table>

Please note that all children should be allocated to ONE CATEGORY ONLY. To ensure that you have not doubled up on your count record the total for each minute at the bottom of the column and cross check against the number of children for the room.

(iii) Record of child responses for focus children
During the 30 minute observation a record of the behaviours of each of the focus children in the room is also made at 10 minute intervals (i.e. 3 times in each observation). At 5 minutes, 15 minutes and 30 minutes record, by ticking, the behaviour of each focus child. For each focus child record ONE category only based on the descriptors outlined above.

Prior to the observation you will need to ensure that you have identified (with the help of the staff) who the focus children (E4Kids participants) are so that you can identify these children during the sleep/rest observation period.
(iv) Strategies used by staff during the observation period
You need to record the strategies used by staff during the observation period. Please note that strategies are not limited to those used specifically to get the children to sleep, i.e. if the staff member reads to a child to get them to rest (or stay quiet) during sleep/rest time, then this is also included as a strategy used by the staff during sleep/rest time. Please ensure you note any additional strategies not included in the list under ‘other’—e.g. ‘other’ strategies may include moving children to specific positions to stop them from interacting with others, using meditation techniques etc.

(v) Record of what children are allowed to do, staff waking the children and disruptive incidents
Record what the children are allowed to do during the observation period by ticking the appropriate box. Please note in the ‘additional observations’ section if the children are permitted to do something that does not fit within these categories. Also note if there is a significant change in what the children are allowed to do during the observation session, and the time this occurred, in the additional observation notes (e.g. if children are given permission to read in the last 5 minutes of the observation). You also need to record if the staff deliberately wake any of the children during the 30 minute observation, including: (1) the number of children woken and (2) if any of the focus children were woken, which focus children these were. Finally, please record if there are any disruptive incidents during the observation and when these occurred. Examples of disruptive incidents include; a staff member entering the room and making considerable noise (e.g. raised voice), skipping CD, disruption in adjacent room (i.e. child screaming/yelling), fire alarm.

Completion of the sleep/rest observation
The sleep/rest observation ends when there are no longer any children left in their bed/cot in the room.
# Sleep/Rest Observation – Front Sheet

Service Names: __________________________ Observer: __________________________
Room Name: __________________________ Date: __________________________ Day of week: Mon / Tues / Wed / Thurs / Fri
Date of birth of youngest child in room: _____/_____/______ Date of birth of oldest child in room: _____/_____/______

1. Does the room have a scheduled sleep/rest time?  □ Yes  □ No

2. According to the schedule, what time does sleep/rest time Start: ____________ (am/pm) End: ____________ (am/pm)

3. Where do the children sleep/rest?  □ Main indoor room/play area  □ Separate sleeping area or bedroom  □ Other – please specify: ______________

<table>
<thead>
<tr>
<th>1) Child Name:</th>
<th>Always</th>
<th>Often</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does ‘this child’ usually sleep during sleep/rest time?</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>At sleep/rest time, does ‘this child’ have difficulties...</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Getting to sleep?</td>
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<td></td>
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<tr>
<td>Staying asleep?</td>
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<tr>
<td>Lying quietly?</td>
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</table>

<table>
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<tr>
<th>2) Child Name:</th>
<th>Always</th>
<th>Often</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never</th>
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</thead>
<tbody>
<tr>
<td>Does ‘this child’ usually sleep during sleep/rest time?</td>
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<tr>
<td>Getting to sleep?</td>
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<tr>
<td>Staying asleep?</td>
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<tr>
<td>Lying quietly?</td>
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</table>

<table>
<thead>
<tr>
<th>3) Child Name:</th>
<th>Always</th>
<th>Often</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never</th>
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</thead>
<tbody>
<tr>
<td>Does ‘this child’ usually sleep during sleep/rest time?</td>
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<tr>
<td>At sleep/rest time, does ‘this child’ have difficulties...</td>
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<tr>
<td>Getting to sleep?</td>
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<tr>
<td>Staying asleep?</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Lying quietly?</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>4) Child Name:</th>
<th>Always</th>
<th>Often</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never</th>
</tr>
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<tbody>
<tr>
<td>Does ‘this child’ usually sleep during sleep/rest time?</td>
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<td></td>
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<tr>
<td>At sleep/rest time, does ‘this child’ have difficulties...</td>
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<tr>
<td>Getting to sleep?</td>
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<tr>
<td>Staying asleep?</td>
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</tr>
<tr>
<td>Lying quietly?</td>
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<td></td>
</tr>
</tbody>
</table>

| 4) Is the children’s sleep/rest time the same through the week?  □ Yes  □ No |
| If No, please describe any changes/variants (e.g. changes in length or start/finish time on different days of the week): |

| 5) Is the children’s sleep/rest time the same throughout the year?  □ Yes  □ No |
| If No, please describe any changes/variants (e.g. changes in length or activities allowed by children, differences from term 1-4): |

Additional Notes.
Observation 1
Observation start time: ___________ Observation end time: ___________
Number of children in room: ___________ Number of staff in room: ___________ Staff present: Teacher / Assistant / Other

<table>
<thead>
<tr>
<th>Positive Climate</th>
<th>1 2 3 4 5 6 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relationships, Positive Affect, Positive communication, Respect</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Negative Climate</th>
<th>1 2 3 4 5 6 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>negative Affect, punitive control, Sarcasm/Disrespect, Severe Negativity</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Teacher sensitivity</th>
<th>1 2 3 4 5 6 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Awareness, Responsiveness, Addresses Problems, Student comfort</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Regard For Student Perspective</th>
<th>1 2 3 4 5 6 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexibility and Student focus; Support for Autonomy and Leadership, Student expression, restriction of movement</td>
<td></td>
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<table>
<thead>
<tr>
<th>Behavioral Management</th>
<th>1 2 3 4 5 6 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>clear behavioural expectations, proactive, Redirection of Misbehaviour, Student behaviour</td>
<td></td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Count of children</th>
<th>5 min (Time:..............)</th>
<th>15 min (Time:.............)</th>
<th>25 min (Time:.............)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tally</td>
<td>#</td>
<td>Tally</td>
</tr>
<tr>
<td>Awake (Moving &amp;/or eyes open)</td>
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</tr>
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</tr>
<tr>
<td>Doing activity on bed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Away from bed/cot</td>
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<td>Total</td>
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<table>
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<tr>
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<th>1)___________</th>
<th>2)___________</th>
<th>3)___________</th>
<th>4)___________</th>
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<tbody>
<tr>
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</tbody>
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Strategies used by staff during the observation period:
- Music tape/cd or musical toy: Turn lights off
- Stroke part of the child: Patting on back or other part of the child
- Cuddling or rocking: Talking softly to children/individual child
- Reading a story to children: Leaves children to cry
- Offering a special toy/cloth: Stand or sit near bed without interacting with the children
- Give food/drink: Other (please describe):
- Singing a lullaby/song

What were the children allowed to do: Lie on bed □  Do activities on bed □  Do activities away from bed □
How many children were deliberately woken during this observation period? _______
Which of the focus children deliberately woken during this observation period? □1 □2 □3 □4 None □
Number of Disruptive Incidents during observation period: _______ (#)
Time of incident: _______ Description: _______
Time of incident: _______ Description: _______

Additional Observation Notes:
### Observation 2

**Observation start time:**

**Observation end time:**

**Number of children in room:**

**Number of staff in room:**

**Staff present:** Teacher / Assistant / Other

<table>
<thead>
<tr>
<th>Positive Climate</th>
<th>1 2 3 4 5 6 7</th>
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<tbody>
<tr>
<td>Relationships, Positive Affect, Positive Communication, Respect</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Negative Climate</th>
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<tbody>
<tr>
<td>Negative Affect, Punitive Control, Sarcasm/Disrespect, Severe Negativity</td>
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<tbody>
<tr>
<td>Awareness, Responsiveness, Addresses Problems, Student Comfort</td>
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<thead>
<tr>
<th>Behavioural Management</th>
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</thead>
<tbody>
<tr>
<td>Clear Behavioural Expectations, Proactive, Redirection of Misbehaviour, Student Behaviour</td>
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#### Count of Children

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<tr>
<th></th>
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**Total**

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</table>

#### Focus Children

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**Strategies used by staff during the observation period:**

- Music tape/cd or musical toy
- Turn lights off
- Stroke part of the child
- Patting on back or other part of the child
- Cuddling or rocking
- Talking softly to children/individual child
- Reading a story to children
- Leaves children to cry
- Offering a special toy/cloth
- Stand or sit near bed without interacting with the children
- Give food/drink
- Other (please describe):
- Singing a lullaby/song

**What were the children allowed to do:** Lie on bed □ Do activities on bed □ Do activities away from bed □

**How many children were deliberately woken during this observation period?**

**Which of the focus children deliberately woken during this observation period?** □ 1 □ 2 □ 3 □ 4 □ None □

**Number of Disruptive Incidents during observation period:** □ 1 □ 2 □ 3 □ 4 □ None □

**Time of incident:**

**Description:**

**Time of incident:**

**Description:**

**Additional Observation Notes:**
### Observation 3

**Observation start time:** __________  **Observation end time:** __________

<table>
<thead>
<tr>
<th>Positive Climate</th>
<th>1 2 3 4 5 6 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relationships, Positive Affect, Positive Communication, Respect</td>
<td></td>
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</tbody>
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<table>
<thead>
<tr>
<th>Negative Climate</th>
<th>1 2 3 4 5 6 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative Affect, Punitive Control, sarcasm/disrespect, severe negativity</td>
<td></td>
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<table>
<thead>
<tr>
<th>Teacher sensitivity</th>
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<tbody>
<tr>
<td>Awareness, Responsiveness, Addresses Problems, Student Comfort</td>
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<tr>
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<tbody>
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<tr>
<th>Behavioural Management</th>
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<tbody>
<tr>
<td>Clear behavioural expectations, Proactive, Redirection of Misbehaviour, Student Behaviour</td>
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</tbody>
</table>

### Count of Children

<table>
<thead>
<tr>
<th>Count of children</th>
<th>5 min (Time:___________)</th>
<th>15 min (Time:___________)</th>
<th>25 min (Time:___________)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tally</td>
<td>Total</td>
<td>Tally</td>
<td>Total</td>
</tr>
<tr>
<td>Awake (Moving a/ or eyes open)</td>
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<td></td>
<td></td>
</tr>
<tr>
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</tr>
<tr>
<td>Away from bed/cot</td>
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<td></td>
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<tr>
<td><strong>Total</strong></td>
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<td><strong>Total</strong></td>
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### Focus Children

<table>
<thead>
<tr>
<th>Focus Children</th>
<th>1) ___________</th>
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<th>3) ___________</th>
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<tbody>
<tr>
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<td>15</td>
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**Strategies used by staff during the observation period:**

- Music tape/co or musical toy
- Turn lights off
- Stroke part of the child
- Patting on back or other part of the child
- Cuddling or rocking
- Talking softly to children/individual child
- Reading a story to children
- Leaves children to cry
- Offering a special toy/cloth
- Stand or sit near bed without interacting with the children
- Give food/drink
- Other (please describe):
- Singing a lullaby/song

**What were the children allowed to do:**
- Lie on bed ☐
- Do activities on bed ☐
- Do activities away from bed ☐

**How many children were deliberately woken during this observation period?** ______

**Which of the focus children deliberately woken during this observation period?** ☐1 ☐2 ☐3 ☐4 None ☐

**Number of Disruptive Incidents during observation period:** ______ (#)

**Time of incident:** __________ Description: __________

**Time of incident:** __________ Description: __________

**Additional Observation Notes:**
Observation 4
Observation start time: __________ Observation end time: __________
Number of children in room: _______ Number of staff in room: _______ Staff present: Teacher / Assistant / Other

<table>
<thead>
<tr>
<th>Positive Climate</th>
<th>1 2 3 4 5 6 7</th>
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<tbody>
<tr>
<td>Relationships, Positive Affect, Positive Communication, Respect</td>
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<table>
<thead>
<tr>
<th>Negative Climate</th>
<th>1 2 3 4 5 6 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative Affect, Punitive Control, Sanction/Disrupt, Severe Negativity</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Teacher Sensitivity</th>
<th>1 2 3 4 5 6 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Awareness, Responsiveness, Adherence to Rules, Problems, Student Comfort</td>
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<table>
<thead>
<tr>
<th>Regard for Student Perspective</th>
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<tbody>
<tr>
<td>Flexibility and Student Focus, Support for Student Autonomy and Leadership, Student Expression, Restriction of Movement</td>
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<table>
<thead>
<tr>
<th>Behavioural Management</th>
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<tbody>
<tr>
<td>Clear Behavioural Expectations, Proactive,Redirect of Misbehaviour, Student Behaviour</td>
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### Count of Children

<table>
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<th>5 min (Time:___________)</th>
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<tr>
<td>Awake (Moving &amp;/or eyes open)</td>
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### Focus Children

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Strategies used by staff during the observation period:

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- Leaves children to cry
- Offering a special toy/cloth
- Stand or sit near bed without interacting with the children
- Give food/drink
- Other (please describe):
- Singing a lullaby/song

What were the children allowed to do: Lie on bed □ Do activities on bed □ Do activities away from bed □

How many children were deliberately woken during this observation period? _______

Which of the focus children deliberately woken during this observation period? □ 1 □ 2 □ 3 □ 4 □ None □

Number of Disruptive incidents during observation period: _______ (#)

Time of incident:_________ Description:

Additional Observation Notes:
**Observation 5**

Observation start time: ____________ Observation end time: ____________
Number of children in room: ____________ Number of staff in room: ____________ Staff present: Teacher / Assistant / Other

<table>
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</tr>
<tr>
<td>Away from bed/cot</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Focus Children</th>
<th>1)</th>
<th>2)</th>
<th>3)</th>
<th>4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Awake (Moving &amp;/ or eyes open)</td>
<td>5</td>
<td>15</td>
<td>25</td>
<td>5</td>
</tr>
<tr>
<td>Asleep (lying still/eyes closed)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lying still/unsure about eyes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disruptive/distressed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doing activity on bed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Away from bed/cot</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Strategies used by staff during the observation period:
- Music tape/cd or musical toy: Turn lights off
- Stroke part of the child: Petting on back or other part of the child
- Cuddling or rocking: Talking softly to children/individual child
- Reading a story to children: Leaves children to cry
- Offering a special toy/cloth: Stand or sit near bed without interacting with the children
- Give food/drink: Other (please describe):
- Singing a lullaby/song

What were the children allowed to do: Lie on bed ☐ Do activities on bed ☐ Do activities away from bed ☐

How many children were deliberately woken during this observation period? ________

Which of the focus children deliberately woken during this observation period? ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ None ☐

Number of Disruptive incidents during observation period: ________ (#)

Time of incident: ________ Description: ________

Additional Observation Notes:
Observation 6
Observation start time: ___________ Observation end time: ___________
Number of children in room: ___________ Number of staff in room: ___________ Staff present: Teacher / Assistant / Other

<table>
<thead>
<tr>
<th>Positive Climate</th>
<th>1 2 3 4 5 6 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relationships, Positive Affect, Positive Communication, Respect</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Negative Climate</th>
<th>1 2 3 4 5 6 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative Affect, Punitive Control, Sarcasm/Disrespect, Severe Negativity</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Teacher sensitivity</th>
<th>1 2 3 4 5 6 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Awareness, responsiveness, Addresses Problems, Student Comfort</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Regard For Student Perspective</th>
<th>1 2 3 4 5 6 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexibility and Student Focus, Support for Autonomy and Leadership, Student Expression, Restriction of Movement</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Behavioural Management</th>
<th>1 2 3 4 5 6 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear Behavioural Expectations, Proactive, Redirection of Mischief, Student Behaviour</td>
<td></td>
</tr>
</tbody>
</table>

Count of children

<table>
<thead>
<tr>
<th>5 min (Time:............)</th>
<th>15 min (Time:............)</th>
<th>25 min (Time:............)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tally</td>
<td>#</td>
<td>Tally</td>
</tr>
<tr>
<td>Awake (moving &amp;/or eyes open)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asleep (lying still/eyes closed)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lying still/unsure about eyes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disruptive/distressed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doing activity on bed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Away from bed/cot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Focus Children

<table>
<thead>
<tr>
<th>1)</th>
<th>2)</th>
<th>3)</th>
<th>4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>15</td>
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</tr>
<tr>
<td>Awake (moving &amp;/or eyes open)</td>
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<tr>
<td>Asleep (lying still/eyes closed)</td>
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<tr>
<td>Lying still/unsure about eyes</td>
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<td></td>
<td></td>
</tr>
<tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>Doing activity on bed</td>
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<td></td>
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<td></td>
<td></td>
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</tbody>
</table>

Strategies used by staff during the observation period:

- Music tape/cd or musical toy
- Turn lights off
- Stroke part of the child
- Patting on back or other part of the child
- Cuddling or rocking
- Talking softly to children/individual child
- Reading a story to children
- Leaves children to cry
- Offering a special toy/cloth
- Stand or sit near bed without interacting with the children
- Give food/drink
- Other (please describe):
- Singing a lullaby/song

What were the children allowed to do: Lie on bed ☐ Do activities on bed ☐ Do activities away from bed ☐

How many children were deliberately woken during this observation period? ________

Which of the focus children deliberately woken during this observation period? ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ None ☐

Number of Disruptive Incidents during observation period: ________ (#)

Time of incident ________ Description: ________

Additional Observation Notes:
Additional space for observation notes:

Observation 1

Observation 2

Observation 3

Observation 4

Observation 5

Observation 6
Appendix I
Brief protocol for use in rooms identified as not having a scheduled sleep period

<table>
<thead>
<tr>
<th>Sleep/Rest Observation - For rooms without a scheduled sleep/rest time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service Name: ________________________</td>
</tr>
<tr>
<td>Room Name: ________________________</td>
</tr>
<tr>
<td>Date of birth of youngest child in room: <strong><strong>/</strong></strong>/______</td>
</tr>
</tbody>
</table>

Does the room have a scheduled sleep or rest time? □ Yes □ No

Do any of the children in the room ever have a sleep during the day in this room? □ Yes □ No

If yes, on average how many children sleep during the day? ___________________________________________________________________________

How long do these children usually sleep for? ___________________________________________________________________________

At what time do the children sleep? ____________________________________________________________________________________

3. Where do the children sleep/rest? □ Main indoor room/play area
   □ Separate sleeping area or bedroom
   □ Other – please specify: ________________________________________________

<table>
<thead>
<tr>
<th>1) Child Name:</th>
<th>Always</th>
<th>Often</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does ‘this child’ usually have a sleep?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2) Child Name:</th>
<th>Always</th>
<th>Often</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does ‘this child’ usually have a sleep?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3) Child Name:</th>
<th>Always</th>
<th>Often</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does ‘this child’ usually have a sleep?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4) Are there any changes in the sleep arrangement through the week? □ Yes □ No

If No, please describe any changes/variations:

5) Are there any changes in the sleep arrangement through the year? □ Yes □ No

If No, please describe any changes/variations:

Additional Notes:

Additional Notes:

3. Where do the children sleep/rest? □ Main indoor room/play area
   □ Separate sleeping area or bedroom
   □ Other – please specify: ________________________________________________

Appendices
Observation during the room visit:

Did you observe any of the children sleeping? ☐ Yes ☐ No
If yes, how many children slept? _______

Where did the children sleep?
______________________________________________
______________________________________________

At what time and for how long did these children sleep?
______________________________________________
______________________________________________

Did any of the focus children sleep? ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ None

At what time and for how long did the focus children sleep?
Focus child 1) ___________________________________________
Focus child 2) __________________________________________
Focus child 3) __________________________________________

Did the staff wake any of the children? ☐ Yes ☐ No
If yes, how many children were woken? ___________

Did the staff deliberately wake any of the focus children? ☐ 1 ☐ 2 ☐ 3 ☐ None

Observation notes:
### Table A.

**CLASS definitions of Positive Climate and specific examples for sleep-time.**

<table>
<thead>
<tr>
<th>Positive Climate</th>
<th>Low (1,2)</th>
<th>Mid (3, 4, 5)</th>
<th>High (6, 7)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CLASS Definition</strong></td>
<td>Specific Examples to Sleep-time</td>
<td>Specific Examples to Sleep-time</td>
<td>Specific Examples to Sleep-time</td>
</tr>
<tr>
<td>Disconnectio</td>
<td>Children tell the teacher personal things and the teacher may ignore them or end the conversatio</td>
<td>General positive regard but constrained at times.</td>
<td>Sometimes close proximity to children and asks more than one question “why can’t you sleep?” “Are you too hot?” but not genuinely interested and may go back to managerial tasks quickly.</td>
</tr>
<tr>
<td>n, flat affect</td>
<td>and limited enthusiasm from teachers and children. Limited to no affection shown and they rarely display respect.</td>
<td>Teacher displays positive affect with some children and not others or mismatched affect. Sometimes communicate respect and affection, other times this is not evident.</td>
<td>Some shared smiles between children on mats/bedding other times children are agitated and less positive towards one another. Sometimes sincere with words like “please” and “thank you” but not consistently and may sound insincere</td>
</tr>
<tr>
<td>n, flat affect</td>
<td>and limited enthusiasm from teachers and children. Limited to no affection shown and they rarely display respect.</td>
<td>Teacher sits close to children with positive physical contact of patting children on back to soothe child whilst smiling and making positive comments with children, “Wow you are really resting well today.” Communicate s respect by using names, eye contact and with language like “Could you please help your friend with that?” Children show concern for their peers.</td>
<td>Teacher sits close to children with positive physical contact of patting children on back to soothe child whilst smiling and making positive comments with children, “Wow you are really resting well today.” Communicate s respect by using names, eye contact and with language like “Could you please help your friend with that?” Children show concern for their peers.</td>
</tr>
</tbody>
</table>

---

**Appendix J**

**Online Supplementary Material Tables for Paper 3**
Table B.

**CLASS definitions of Negative Climate and specific examples for sleep-time.**

<table>
<thead>
<tr>
<th>Negative Climate</th>
<th>Low (1,2)</th>
<th>Mid (3, 4, 5)</th>
<th>High (6, 7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLASS Definition</td>
<td>Specific Examples to Sleep-time</td>
<td>CLASS Definition</td>
<td>Specific Examples to Sleep-time</td>
</tr>
<tr>
<td>Teacher and children do not show (or very rare instances) of negative affect. No yelling or threats from the teacher. No sarcasm or severe negativity evidenced (such as bullying and victimization).</td>
<td>One or two children getting off their beds and asking to go to the toilet or talking and teacher responds in an irritated tone “I told you to stop talking”. However these examples are rare and do not last long. Teacher remains calm when dealing with misbehavior no sarcasm and no bullying or victimization from children or teachers.</td>
<td>Mild and occasional low-level negativity such as irritation and annoyance. Occasional yelling, anger or threats to gain control. May have occasional instances of sarcasm and disrespect but no instances of severe negativity.</td>
<td>Teacher occasionally shows mild irritation towards children “I have told you to stop.” Teacher occasionally yells “go to sleep!” or use threats to gain control “If you don’t lie down you won’t get to play any games outside this afternoon”. Sarcasm is rare but can be seen with teachers and/or children rolling eyes to comments or saying things to shame children like “Sophie is being a bit of a baby today.” Consistent irritability and/or negative affect. Teacher frequently yells at children or makes threats. Teacher and/or children are often sarcastic. Instances of severe negativity between teacher and children or between children observed.</td>
</tr>
</tbody>
</table>

*Note.* Negative Climate is scaled opposite to the other CLASS dimensions where higher negativity score (6, 7) equates to lower quality.
### Table C.
**CLASS definitions of Teacher Sensitivity and specific examples for sleep-time.**

<table>
<thead>
<tr>
<th>Teacher Sensitivity</th>
<th>Low (1, 2)</th>
<th>Mid (3, 4, 5)</th>
<th>High (6, 7)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CLASS Definition</strong></td>
<td>Specific Examples to Sleep-time</td>
<td>Specific Examples to Sleep-time</td>
<td>Specific Examples to Sleep-time</td>
</tr>
<tr>
<td>Children are disengaged or frustrated and it takes a long time for children to get the attention of their teacher. The Teacher is unresponsive or dismissive, ineffective at addressing problems and children rarely seek support or share their ideas.</td>
<td>Children may sit up on their bedding and put their hand up or call out but it takes a long time for the teacher to see that they want attention. Dismissive responses may include “I’m busy and you are sleeping.” “If you are crying I can’t understand you.” The teacher may not recognize emotion when addressing problems for example saying “just roll the other way.”</td>
<td>Occasionally the teacher is aware of children needing extra support or attention. The teacher can be responsive at times and dismissive at others.</td>
<td>Teacher may be aware that some children are not sleeping and hands books out however, misses or ignores other children in the far corner that are awake. At times the teacher may respond to comments but dismisses other comments “this is not a talking time.” Some children approach the teacher freely however other children are clearly reluctant to talk to the teacher which could lead to issues like bedwetting. Anticipates problems. Notices children having difficulties. Is responsive to individual needs and abilities, effective at addressing social and academic concerns and children are comfortable approaching teacher.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Teacher may be aware that some children are not sleeping and hands books out however, misses or ignores other children in the far corner that are awake. At times the teacher may respond to comments but dismisses other comments “this is not a talking time.” Some children approach the teacher freely however other children are clearly reluctant to talk to the teacher which could lead to issues like bedwetting. Anticipates problems. Notices children having difficulties. Is responsive to individual needs and abilities, effective at addressing social and academic concerns and children are comfortable approaching teacher.</td>
<td>When introducing nap time the teacher says “I know not everyone needs a nap but we will be respectful of our classmates who do.” Teacher responds consistently to comments “I know you are upset about not having that book” then reassures “maybe when Lauren is finished with it we can read it together? While we wait here are some other lovely books.” Children approach teacher with sleep and non-sleep related issues.</td>
</tr>
<tr>
<td>CLASS Definition</td>
<td>Specific Examples to Sleep-time</td>
<td>CLASS Definition</td>
<td>Specific Examples to Sleep-time</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------------</td>
<td>---------------------------------</td>
<td>---------------------------------------------------------------------------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>Teacher-driven routine that is inflexible and does not allow children to be autonomous or have leadership opportunities. Child talk and expression is minimal and movement or placement is highly controlled</td>
<td>Beds are assigned to all children in sleep-time with Teacher setting out sheets. Children are not allowed to speak, move or do other activities to sleep or rest.</td>
<td>Teacher sometimes rigidly adheres to schedule, other times is more flexible to children’s ideas. Some opportunities for leadership and autonomy. Teacher talk predominates but children contribute occasionally. Some control of movement and placement of children.</td>
<td>Beds may be laid out by teacher but children are allowed to set up their blankets where they want. The teacher asks the children what music they would like to listen to however, then decides on the CD, “No, we listened to that yesterday, we will listen to this one instead.” Children may be allowed to talk and do activities for some of the observation but not at other times.</td>
</tr>
</tbody>
</table>
Table E.
CLASS definitions of Behavior Management and specific examples for sleep-time.

<table>
<thead>
<tr>
<th>Behavior Management</th>
<th>Low (1,2)</th>
<th>Mid (3, 4, 5)</th>
<th>High (6, 7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLASS Definition</td>
<td>Specific Examples to Sleep-time</td>
<td>CLASS Definition</td>
<td>Specific Examples to Sleep-time</td>
</tr>
<tr>
<td>Unclear and inconsistent enforcement of rules and expectations. The teacher is reactive to misbehavior and ineffective at redirecting this behavior. Children engage in active misbehavior</td>
<td>The teacher may not set up expectations of sleep. As such children move off their beds and start moving around the room and the room may seem chaotic. Children engage in active misbehavior like hiding around corners instead of being in beds after they have been told and the teacher is reactive to escalation. Unclear instructions like “Shhhh!” instead of giving instructions on how to moderate behavior.</td>
<td>Clear but inconsistent enforcement of rules and expectations. There are reactive and proactive strategies used to control misbehavior and it rarely escalates. Most children are well behaved but have instances of misbehavior.</td>
<td>Sometimes children seem to know the rules, like lights off means books down; at other times children begin to throw toys and disrupt other’s from sleeping. The teacher is proactive to problems “can you two sleep next to each other?” however has to correct misbehavior “that’s it, I am moving you to the other side of the room.” Some positive strategies are used “I like how Jessie is lying quietly” however it is inconsistent.</td>
</tr>
</tbody>
</table>