11-8-2022 2:00 PM

The Developmental Importance of Napping in Preschool Children

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A thesis submitted in partial fulfillment of the requirements for the Doctor of Philosophy degree in Psychology

Abstract

Most children cease napping between 2- and 5-years-old. Little is known about the predictors or outcomes related to this cessation, or the interrelation of different components of nap behavior. Four empirical studies were conducted to investigate the developmental importance of napping among preschool children.

Studies 1 and 2 used a large, longitudinal sample of Canadian children to investigate the predictors (Study 1) and outcomes (Study 2) related to early nap cessation. Early nap cessation was defined as stopping daytime sleep before three years old. In Study 1, parents reported on their own, child, and family functioning at two timepoints (0-1 years-old and 2-3 years-old). At 2-3 years-old, ~11% of children had ceased napping. Early nap cessation was predicted by demographic (e.g., female sex), perinatal (e.g., birthweight ≥ 2500 grams), developmental (e.g., more developmental milestones achieved), and sleep-related (i.e., longer nighttime sleep duration) variables. Study 2 presented the evaluation of behavioral and language outcomes related to early nap cessation. After controlling for the predictors identified in Study 1, and other demographic predictors of these outcomes (e.g., income, parental education), early nap cessation predicted higher receptive language and lower anxiety at 4-to-5-years-old.

Studies 3 and 4 used representative cross-sectional samples. Study 3 presented the development and psychometric properties of two scales of parents' nap beliefs – The Parents' Nap Beliefs Scale and the Reasons Children Nap Scale. In independent pilot (N = 201) and replication samples (N = 702) these scales demonstrated excellent reliability and validity. Study 4 presented an empirical approach to classifying nap behavior (i.e., Latent Profile Analyses) and a prediction of nap behavior using parental beliefs and previously established correlates of nap behavior. Nap behavior was associated with parental beliefs, parents' own nap behaviors, family functioning, and child nighttime sleep problems.

Nap cessation appears to be a developmentally normative process for Canadian preschool children. This process is complex and marked by high intra- and inter-child variability. This complexity is best understood using a socioecological approach which accounts for developmental, demographic, child-parent, and child-environmental factors. Key future

directions include replicating these results in non-North American countries and implementing more longitudinal studies.

Keywords

daytime sleep, napping, development, preschool, children, parents

Summary for Lay Audience

Most 2-year-old children have a daytime nap, while few 5-year-olds nap. Though nearly all children eventually stop napping, little is known about: (1) why some children stop napping at younger ages than others; (2) how children who stop napping when younger may be different than their peers; or (3) how different components of nap behavior might be related (like nap duration, timing, and frequency). Four studies were conducted to investigate these questions.

Studies 1 and 2 used a large sample of Canadian children and their parents, at multiple timepoints, to investigate "early nap cessation," that is, children who stop napping before their third birthday. Study 1 reported that about 11% of children stop napping early. Early nap cessation was predicted by demographic (e.g., child is a girl), perinatal (e.g., child having a normal birthweight), developmental (e.g., child meeting more developmental milestones), and sleep-related (i.e., child sleeping for longer at night) factors. Study 2 investigated the outcomes related to early nap cessation. Children who stopped napping early understood more words and had lower (better) anxiety levels at 4-to-5-years-old than their peers.

Study 3 presented the development and evaluation of two scales of parents' nap beliefs – The Parents' Nap Beliefs Scale and the Reasons Children Nap Scale. Both these scales had excellent statistical properties across two samples. Study 4 presented a statistics-based definition to understand related components of nap behavior (e.g., duration, timing, frequency). Parents' beliefs about their children's naps, parents' own nap behaviors, family functioning, and children's nighttime sleep problems predicted nap behavior.

Children's transition from daytime and nighttime sleep to exclusively nighttime sleep appears to be developmentally normative for Canadian preschool children. However, this process is complex and varies greatly from child-to-child. We can begin to make sense of this complexity by understanding the developmental and demographic factors related to napping. Then, we can build on this understanding by incorporating the interactions between children and their parents, and children and their environments. More studies are needed to understand (1) how the results of this dissertation differ in non-North American countries and (2) how nap behavior may differ over time.

Statement on Co-Authorship

This dissertation is composed of four studies. The first two studies (Chapters 2 and 3) were part of the National Longitudinal Study of Children and Youth (NLSCY). The original methods were designed by Statistics Canada. This dissertation conducted secondary data analyses on this NLSCY data. The views expressed in these chapters and in this dissertation do not represent the views of Statistics Canada. The objectives and methodology for the studies included in this dissertation were designed by Adam Newton and reviewed by Dr. Graham Reid. Adam Newton was responsible for data cleaning, data analysis planning, statistical analyses, and manuscript writing for these studies. Dr. Graham Reid provided supervision and editing. Dr. Paul Tremblay provided guidance on statistical approaches for these manuscripts and manuscript editing. Dr. Laura Batterink provided guidance on the theoretical approach and manuscript editing.

Chapters 4 and 5 were part of a primary data collection project. The objectives and methodology for these studies were designed by Adam Newton and reviewed by Dr. Graham Reid. Adam Newton was responsible for facilitating data collection, project management, data cleaning, data analysis planning, statistical analyses, and manuscript writing for these studies. Dr. Graham Reid provided supervision and editing. For Chapter 5, Dr. Paul Tremblay provided guidance on statistical approaches for these manuscripts and manuscript editing. Dr. Laura Batterink provided guidance on theoretical approach and manuscript editing.

Each of these studies have been submitted for publication as journal articles and are currently under review. References are provided below in the order in which they appear in the dissertation:

Newton, A. T., Tremblay, P. F., Batterink, L. J., Reid, G. J. (Under Review). Predictors of Early Nap Cessation: Longitudinal Research from a Large Study of Young Children. *Manuscript under review in Sleep Epidemiology.*

Newton, A. T., Tremblay, P. F., Batterink, L. J., Reid, G. J. (Under Review). Early nap cessation in young children as a predictor of language and psychosocial outcomes: Evidence from a Large Canadian Sample. *Manuscript under review in Sleep Health.*

Newton, A. T. & Reid, G. J. (Under Review) Parents, Preschoolers, and Napping: The Development and Psychometric Properties of Two Nap Belief Scales in Two Independent Samples. *Manuscript under review in SLEEP*.

Newton, A. T. & Reid, G. J. (Under Review). Patterns of Preschool Children's Nap Behavior and their Predictors. *Manuscript under review in Sleep Medicine.*

Acknowledgements

Firstly, I would like to thank each of the parents and children who participated in the National Longitudinal Study of Children and Youth and in the Preschool Napping Study. Without you, this dissertation (and many other research studies) would not be possible.

To my research supervisor, Dr. Graham Reid – thank you for your continuous support in my development as a scientist. I have greatly enjoyed your mentorship. Thank you for helping to shape these projects from broad questions into developed studies. To my lab-mates, peers, and friends – thank you for listening to my various presentations and ramblings and for offering your feedback and advice.

To my advisory committee members, Dr. Paul Tremblay and Dr. Laura Batterink – thank you for your support and feedback throughout this dissertation. I have truly appreciated your thoughtful comments and insights. To my examination committee members, Dr. Debra Jared, Dr. Ryan Stevenson, Dr. Rachel Heydon, and Dr. Karen Thorpe – thank you for volunteering your time and offering your feedback.

To my parents, Barbara and Wayne, and brother, Ian – thank you for your constant support throughout my university educational journey across these many years. From rides to meals to playing games, you made this journey much easier.

To my wife, Rachel, and my son, Leo – thank you for your unwavering support and encouragement. Thank you for bringing me so much joy each time I am with you. I am excited to see where our journey takes us next!

This dissertation was supported by Western University's Network for Economic and Social Trends Doctoral Fellowship, the Western Strategic Support for Social Sciences and Humanities Research Council (SSHRC) Success, and the SSHRC Insight Grant. This dissertation was also supported by dedicated research assistants (Charee Botha, Mobeen Ramzan, and Leo Ye) and thoughtful Statistics Canada analysts.

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Chapter 1

1 Developmental Importance of Napping in Preschool Children: An Introduction

Young children vary greatly in the frequency and duration of their daytime naps. Most children stop napping consistently between 2-5 years old. In a recent meta-analysis, 3% of children have been found to cease napping by 24 months, while 33% of children cease napping by 36-months and 94% of children have ceased napping around 60-months (Staton et al., 2020). What accounts for the considerable change in napping rates occurring between 24- and 36-months? There is limited research into the predictors of why some children may cease napping earlier or later than their peers. When children give up naps may have implications for understanding their development (Dionne et al., 2011). In the recent meta-analysis on daytime sleeping trends among preschool-age children, the authors call for this research to "extend beyond point-prevalence rates" and to evaluate social determinants of nap behavior (e.g., child and family sociodemographic characteristics) and apply longitudinal methodologies (Staton et al., 2020). This dissertation aimed to answer this call to further our understanding of the developmental importance of napping in preschool children.

This dissertation can have theoretical and practical implications for researchers, early childhood educators, practitioners working with young children, and parents. Staton and colleagues (2020) have argued that there is little-to-no consensus on when it is most beneficial for children to cease napping. Further, Thorpe and colleagues (2015) have identified that daytime sleep from 0-2-years-old is necessary for obtaining 24-hour sleep requirements, and that naps may not be required after 2-years-old. As such, napping past 2-years-old may instead represent a redistribution of sleep across 24-hours. There are also differences in how childcare centers implement naptimes. For example, one study identified that about 80% of childcare centers (in Australia) had at least a short mandatory nap time (Staton et al., 2017). In Ontario, there is no requirement for children to nap while attending childcare or preschool, but licensed centers are required to have safe sleeping spaces available for these children. There is no Canadian data analyzing the implementation of napping policies. However, mandatory napping policies seem to be at odds with parents' own preferences. Specifically, Sinclair et al. (2016) reported that 78.7%

of Australian parents of 2-5-year-old children attending childcare did not want their child to nap regularly while in care. Most of these parents believed that regular naps were no longer appropriate and could negatively impact their child's nighttime sleep. This research highlights that there can be clear disagreements between parental preferences and napping practices. More empirical research is required to improve our understanding of nap behavior, its predictors, the outcomes related to aspects of nap behavior, and the roles of parental preferences related to napping in preschool children.

This dissertation applied the socioecological model to understand the developmental and environmental influences on children's nap behavior. In this introductory chapter, I discuss key definitions of nap behavior, its measurement, and typical nap patterns among preschool children. Then, I will introduce a preliminary theoretical model to understand nap behavior. Finally, I will discuss what is currently known about what predicts children's nap behavior and cessation and the outcomes related to these concepts.

1.1 Nap Definitions and Measurement

Children's nap behavior is complex and multifaceted. It is important to consider which components of nap behavior are typically measured and how these components are measured. Firstly, the components of nap behavior that are typically measured include: (1) frequency (e.g., number of naps per week); (2) duration (e.g., how long the naps lasted); (3) timing (e.g., when in the day a nap occurred); (4) sleep consolidation (e.g., proportion of sleep that occurred during the daytime over total 24-hour sleep); and (5) nap cessation (e.g., whether the child still naps or not). Nap cessation is of special interest as it represents the endpoint of children's transition to monophasic sleep (see Section 1.2 below).

Most studies have focused on a single component of nap behavior (e.g., Jones & Ball, 2013; Komada et al., 2012; Lam et al., 2011). Less commonly, studies have developed a classification that combined multiple components (Hall et al., 2012; Smith et al., 2019). Studies using multiple components have used heuristics (i.e., rules of thumb) to define groups. For example, Smith and colleagues (2019) classified children attending daycare into four groups based on their napping frequency and whether they had difficulty lying quietly at naptime. Of note, no research prior to

this dissertation has applied an empirical approach to classifying nap behavior. That is, no previous study has analyzed multiple aspects of children's napping with the aim of identifying sub-groups of children that vary in their nap behavior.

The measurement of nap behavior among preschoolers includes actigraphy (sleep inferred through movements), parent-reported sleep diaries, structured retrospective parent-reported questionnaires, teacher/daycare provider reports, and direct observation. Measures are then coded: (1) continuously, (2) categorically (i.e., [a] duration by time chunks [e.g., 30 minutes or less, 1 hour, 2 hours or more] or [b] by frequency [e.g., consistent napper, inconsistent napper, non-napper]), or (3) dichotomously (napping vs. not napping). Each measurement has inherent strengths and limitations. Actigraphy may provide better minute-to-minute estimates of sleep time versus waking time than other methods but should be compared to parent sleep diaries to ensure accuracy (Hall et al., 2015; Mazza et al., 2020). Researchers have suggested the need for more studies which objectively measure napping (e.g., actigraphy, direct observation; Staton et al., 2020); however, objective measures are expensive and difficult to implement for large-sample studies. Sleep diaries can also provide accurate ratings of daytime sleep but can involve higher participant-burden compared to questionnaires and are also more difficult to implement in large-sample studies. Retrospective questionnaires may contain bias but are able to provide daytime sleep information briefly, are useable in large-sample studies, and do correlate well with more objective sleep measurements (Acebo et al., 2005; Sadeh, 1994, 1996).

Recognizing the strengths and limitations of these approaches, this dissertation applied a mixture of retrospective reports and parent-reported sleep diaries to measure daytime sleep throughout the projects described in the subsequent chapters.

1.2 Typical Nap Patterns

Nearly all children in Western countries transition from multiple daytime naps, and a nighttime sleep period (polyphasic sleep), to a single daytime nap and a longer sleep period (biphasic sleep), to exclusively nighttime sleep (monophasic sleep) during their first 5 years (Staton et al., 2020). This process of sleep consolidation demonstrates a gradual decrease in the frequency of children's daytime sleep. There is a considerable increase in the proportion of children who have

stopped napping between 12-months-old and 36-months-old. Specifically, about 3% of 12- to 24-month-old children have stopped napping; whereas about 33% of 24- to 36-month-old children have stopped (see Table 1.1).

There are also changes in the duration and timing of naps during the preschool years. Among preschool children who nap, the total duration of daytime sleep also decreases with age. The recent meta-analysis found, for example, napping 1–2-year-old children had an average of 2 hours and 19 minutes of daytime sleep, whereas still napping 4–5-year-old children had an average of 1 hour and 32 minutes of daytime sleep (Staton et al., 2020). This decrease in the frequency and duration of daytime sleep, in children, is accompanied by increases in nighttime sleep and therefore a decrease in the proportion of daytime sleep. There also appear to be normative shifts in nap timing. In a large cross-sectional, ecological study of 0–3-year-old children, naps among 8–12-month-old children occurred in two sessions: a first nap around 9:30 AM and a second nap around 2:00 PM (Mindell et al., 2016). Whereas, 13–18-month-old children tended to nap only once between 12:00 PM and 2:00 PM. Further, still-napping 29–34-month-old children in this study tended to nap once a day, slightly later in the afternoon than 13–18-month-old children. These findings suggest a trend that preschool children slowly consolidate their daytime sleep and tend to nap later in the afternoon as they become older (Mindell et al., 2016).

Some researchers have posited that daytime sleep may not be required for children to meet their 24-hour sleep needs after 2-years of age (Staton, Smith, & Thorpe, 2015). As such, the 2-to-4-year age range may be critical to understanding preschool children's nap behavior. This dissertation sought to answer three main questions which stem from these normative trends, including: (1) what are the predictors of nap cessation and children's nap behaviors? (2) what outcomes are related to nap cessation? (3) what definitions of nap behavior best capture the complexity of this progression?

Table 1.1: Percentage of Children with a Daytime Nap

Age (Months)	% Ceased Napping	95% Confidence Interval
< 12 months	0.5%	0.0% - 1.5%
12-24 months	2.7%	0.7% – 5.7%
24-36 months	33.1%	22.8% - 44.2%
36-48 months	57.2%	41.5% - 72.2%
48-60 months	79.5%	62.2% - 92.6%
> 60 months	93.9%	90.6% - 96.6%

Note. Table adapted from Staton, S., et al. (2020). "Many naps, one nap, none: A systematic review and meta-analysis of napping patterns in children 0-12 years." Sleep Medicine Reviews **50**: 101247.

1.3 A Theoretical Model of Nap Cessation

The cessation of daytime naps is likely an interactional process involving the child, parent, and the environment. This interactional process can be conceptualized by applying the Socioecological Model (Bronfenbrenner, 1979) to children's sleep. Other authors have applied this model to understanding children's sleep problems, parent-child sleep interactions, and sleep health (Grandner, 2014; Meltzer et al., 2021; Newton et al., 2020; Sadeh et al., 2010).

The Socioecological Model incorporates proximal and distal levels of influence on behavior and emphasizes the interactions between these levels. When applied to children's sleep behavior, proximal variables may include the child's demographic characteristics, development, and temperament and the parents' parenting practices. Distal variables may include the child's family as well as broader environments, such as their family routines and cultural practices. This model

also stresses the interactions between these proximal and distal levels. For example, a child's developmental level may influence a family's routines, while cultural practices may influence parenting practices. The application of this model to preschool children's nap behaviors allows for the incorporation of multiple levels of influence to understand nap cessation.

Figure 1.1 is a visual representation of the application of the Socioecological Model to preschool children's nap behaviors. This model identifies three possible levels of influence: individual, social, and societal. The individual-level involves factors directly related to the child, such as their own development, maturation, and temperament. For example, children are less likely to nap as they age (Staton et al., 2020). The social-level involves factors related to the child's immediate environments (e.g., home, childcare) and includes parental preferences and local childcare policies and practices. For example, qualitative data has shown that parents who try to prevent their children from napping have children who nap for shorter durations (Jones & Ball, 2013). The societal-level also involves factors related to the child and family's broader environment (e.g., the country or region they live in) and includes cultural influences and national policies. For example, in Ontario, children attending kindergarten do not have a scheduled naptime which greatly discourages napping during school hours (Ministry of Education, 2016). Collectively, this model views nap behavior as resulting from child characteristics, which are influenced by (and influence) parental preferences, which are in turn influenced by (and influence) a family's culture and the practices of any childcare setting the child attends.

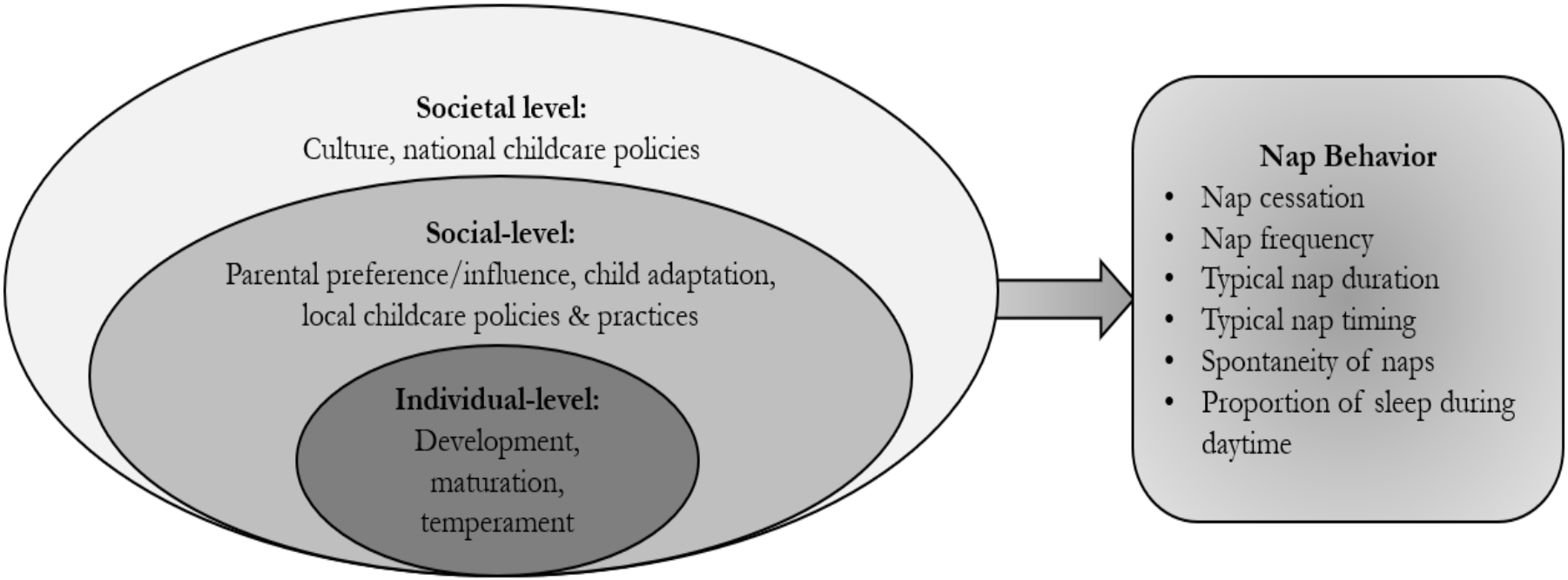

Figure 1.1: An adaption of the socioecological model to understanding preschool children's nap behavior.

1.4 Correlates of Children's Nap Behavior and Cessation

This dissertation drew from three areas of previous research that fit within the Socioecological Model to conceptualize predictors of nap behavior and cessation: (1) correlates of preschoolers' nap duration, (2) correlates of nighttime sleep behavior, and (3) correlates of general development. There is little research on the correlates of preschool children's nap behaviors. As such, this dissertation utilized research from related areas (i.e., correlates of nighttime sleep behavior and general development) to conceptualize other potentially relevant correlates. Finally, I describe some exploratory factors which fit within this model.

1.4.1 Correlates of Preschool Children's Nap Duration

Previous research on nap behavior has primarily focused on correlates of children's nap duration, rather than nap cessation. Shorter daytime sleep durations can reflect a transition toward nap cessation. Thus, the correlates of nap duration may be comparable to nap cessation, as nap cessation would represent the endpoint of a decline in nap duration. This previous research has focused on individual-level factors. Older child age, the child being White, typical developmental status (versus developmental delay), and longer nighttime sleep duration are consistently associated with shorter daytime sleep durations in preschool children (Crosby et al., 2005; Schwichtenberg et al., 2011; Zhang et al., 2020). For example, longer nighttime sleep duration may reflect greater sleep consolidation. This relation illustrates a gradual developmental transition toward monophasic sleep (Iglowstein et al., 2003; Touchette et al., 2013). Older child age, typical developmental status, and longer nighttime sleep duration suggest nap duration may relate to developmental processes.

Whereas, ethnic differences highlight potential cultural influences on nap cessation. For example, Crosby and colleagues reported non-Hispanic White children were less likely to nap at least once per week compared to Black children (Crosby et al., 2005). Importantly, race and ethnicity are social constructs and societal definitions of terms such as "White" have changed over time. For example, the 2021 Canadian Census has greatly expanded its ethnicity categories, compared with response options used in the 1998 National Longitudinal Study of Children and

Youth (used in this dissertation and in the Canadian census at that time). However, studies using secondary data analyses are limited to the definitions of ethnicity used when the study was conducted.

1.4.2 Correlates of Children's Nighttime Sleep Behavior

There are likely biological and behavioral mechanisms required for sleep onset during the day and night. As a brief review, these mechanisms include sleep homeostasis, circadian rhythms, and the individual and environmental factors that interact with these mechanisms. The former two mechanisms comprise "the two-process model" of sleep (e.g., Borbély et al., 2016). Sleep homeostasis refers to the body maintaining a regulated balance between sleep and wakefulness. According to this process, a child's "sleep drive" (i.e., internal force for sleep) increases the longer they are awake and decreases when they sleep. Sleep homeostasis is the mechanism that regulates this sleep drive. Circadian rhythms refer to 24-hour cycles that are part of the body's internal clock (also called the circadian pacemaker). Circadian rhythms coordinate physical and mental systems, including sleep-wake cycles. The body's internal clock is responsible for sending neural signals to regulate this activity throughout the body (Sollars & Pickard, 2015). When combined, these processes lead to tendencies to be predictably sleepy in the early afternoon (which may lead to napping) and evening (which usually leads to nighttime sleep). Individual and environmental factors can support or interfere with these processes and sleep behaviors. In the absence of detailed literature on nap behavior correlates, well-established correlates of preschoolers' nighttime sleep behaviors may enhance our understanding of nap behavior (Newton et al., 2020). These factors have been explored at the individual- and social-levels and are reviewed next.

Temperament, bedtime routines, and nighttime sleep problems are key factors at the individual-level. Temperament is a multi-faceted concept and includes several subdomains (e.g., rhythmicity, activity level, approach, mood); it is a consistent predictor of nighttime sleep problems among preschool-age children. More difficult temperaments are related to more parent-reported nighttime sleep problems, shorter nighttime sleep duration, and increased odds of frequent night-waking (Hall et al., 2007; Newton et al., 2020; Reid et al., 2009; Reynaud et al., 2016; Simard et al., 2008; Staples et al., 2015). Children with a more "difficult" temperament

may withdraw, have irregular habits, and may adapt more slowly to new situations. Children with these characteristics may have challenges adapting to new routines, such as a reduced daytime sleep period, and thus be more likely to continue napping until later in development.

Consistent bedtime routines are related to fewer nighttime sleep problems. Bedtime routines involve consistent practices that the child and parent engage in before sleep onset. These routines are often calming and can include teeth-brushing, a bath, a story, and songs. Bedtime routines are consistently associated with better nighttime sleep functioning (Allen et al., 2016; Newton et al., 2020). Consistent bedtime routines can predict better nighttime sleep functioning (e.g., longer nighttime sleep duration) which may then support children ceasing daytime naps when it is developmentally appropriate. This relation is exploratory. Relatedly, when children have lesser nighttime sleep problems (e.g., shorter sleep onset latency, fewer night-waking episodes), they may experience less sleep drive during the day, which could support nap cessation when it is developmentally appropriate. If children do not have consistent nighttime sleep of adequate quantity and quality, they may require daytime sleep until they are older to compensate (Jones & Ball, 2014). This dissertation will investigate these relations.

Positive parenting and predictable home environments are key factors at the family-level. Positive parenting practices (e.g., positivity, consistency) are reliably correlated with better child nighttime sleep functioning (e.g., shorter sleep onset latency, longer sleep duration, fewer night-wakings; Hall et al., 2007; Newton et al., 2020; Reid et al., 2009; Staples et al., 2015). Parents who are positive and consistent in their child-rearing approach foster a safe, predictable environment for their children. In turn, these parents may i) encourage cognitive maturation (Scharf et al., 2016), leading to more rapid development, and ii) foster the implementation of new sleep routines and a shift in circadian rhythms. Both these processes could facilitate the transition to monophasic sleep and nap cessation at a younger age. Conversely, more inconsistent parenting may manifest in poor routine consistency, less predictable home environments, and greater variability in day- and night-time sleep timing, which could then impair a shift in circadian rhythms. This reduced predictability may slow children's nap cessation, as they may be unable to establish consistent, consolidated nighttime sleep (thus requiring daytime sleep for longer; Jones & Ball, 2014).

Parental beliefs impact parents' behavior which in turn influences child functioning. Parental sleep-related beliefs are associated to children's nighttime sleep functioning (Coulombe & Reid, 2012; Sadeh et al., 2007; Sadeh et al., 2010), while general parenting beliefs are related to child developmental outcomes more broadly (Bugental & Johnston, 2000; Miller, 1995). As an illustrative example, if a parent believes in an active comforting approach[1] to their child's night-waking, they are more likely to hold and soothe their child during the night when they wake. When their child does wake during the night, the child will be more likely to call out or cry until the parent comes to hold and/or soothe them (Coulombe & Reid, 2014). We expect similar belief-related processes occur during naps. However, no measures of parental nap-related beliefs have been published. Qualitative data suggests that children of parents who allow or encourage them to nap have longer daily nap durations than children of parents who try to prevent them from napping (Jones & Ball, 2013). Parents may also have specific reasons for encouraging or discouraging their child to nap. In the same qualitative study, parents cited "napping would delay subsequent bedtimes and decrease nighttime sleep" as the most common reason for discouraging napping and that their child would become "bad tempered or misbehav[e] in the absence of naps" as the most common reason for encouraging a nap (Jones & Ball, 2013, p. 354). Parental nap-related beliefs are expected to be an important factor in understanding children's nap behavior; however, psychometrically sound measures must be developed. In Chapter 4 of this dissertation, I discuss the development of two psychometrically sound scales of parental nap-related beliefs.

1.4.3 Correlates of Children's General Development

Predictors of children's development in general may also relate to napping, especially if nap cessation is developmentally driven. I focused on factors associated at the individual and social-levels, consistent with key variables identified in the review of the sleep literature. Perinatal

[1] Active comforting refers to one way a parent responds to their child calling out at night (either at bedtime or in response to a night-waking). Specifically, the parent goes to their child and provides some soothing (e.g., talking, laying down with the child, picking the child up), often until child falls back to sleep.

factors such as birthweight, gestational age, and maternal alcohol use during pregnancy have been linked to children's development in general (Flensborg-Madsen et al., 2019; Flensborg-Madsen & Mortensen, 2017; Gatten et al., 1994; Nan et al., 2013) These factors may also influence neural development, which may be related to nap cessation (Smith et al., 2019). Given this logic, children with perinatal risks (e.g., lower birthweight, mothers consumed alcohol during pregnancy) may be less likely to cease napping earlier than peers.

1.4.4 Additional Exploratory Factors

There may be additional environmental factors which may predict nap cessation. These factors are exploratory and were generated from my conceptualization of nap behavior using the socioecological model. Children with older siblings may have a preference to cease napping earlier (a potential social-level factor). This may be through social learning mechanisms as they observe their older sibling(s) (Bandura & McClelland, 1977). Given sleep's role in physiological recovery (Vyazovskiy, 2015), younger children who are more often in poorer health may continue to be reliant on biphasic sleep (a potential individual-level factor). A child's care setting may also influence nap behavior, at the societal-level. For example, in Ontario, junior kindergarten students (~4 years old) are no longer provided with a scheduled nap time (Ministry of Education, 2016). As such, a junior kindergarten student would be far less likely to nap during school hours, due to a lack of opportunity. So, this student may end their daytime naps, nap later in the day (i.e., after school), or less frequently (e.g., on weekends only). In contrast, many preschool childcare programs have scheduled daytime naps with limited flexibility (Staton et al., 2017; Staton, Smith, Pattinson, et al., 2015). Children attending these programs may have greater difficulty ceasing naps, even if they are developmentally ready (Smith et al., 2019).

1.4.5 Integration with the Socioecological Model

In summary, the application of the socioecological model (described in Section 1.3) helps to conceptualize these diverse factors which likely contribute to nap behavior and cessation. The factors identified in these three areas of previous research can be categorized into the levels of the Socioecological Model. That is, these factors can be thought of as individual-level (e.g., temperament, child nighttime sleep duration), social-level (e.g., parental beliefs, predictable home

environments), or societal-level (e.g., attending childcare). It is expected that factors from each of these levels will be relevant to understanding nap behaviors in preschool children. Previous research on nap behavior correlates has primarily focused on individual-level factors. This dissertation seeks to understand the association between individual- and social-level factors and nap behaviors. However, this dissertation did not directly assess societal-level factors.

1.5 Outcomes related to Children's Nap Behavior and Cessation

Receptive language, behavioral functioning (e.g., anxiety, aggression, hyperactivity/ inattention), and cognitive abilities (e.g., memory, learning) have previously been tested as outcomes related to children's nap behaviors. There are complex relations between children's nap behavior and these outcomes, which may partially depend on: (1) how nap behavior is defined and (2) whether children nap consistently or inconsistently.

Some studies demonstrate that more frequent naps or napping for longer durations is associated with more negative outcomes (e.g., poorer receptive language, more behavioral problems); whereas others relate more frequent and longer naps to more positive outcomes (e.g., greater learning and memory). In general, more frequent and/or longer naps are associated with more positive outcomes for *consistently* napping children in experimental studies (Gomez et al., 2006; Kurdziel et al., 2013; Sandoval et al., 2017; Wang et al., 2022; Werchan et al., 2021; Williams & Horst, 2014); whereas inconsistently napping or non-napping children typically do not demonstrate these more positive associations in cross-sectional, longitudinal, and quasi-experimental studies (Dionne et al., 2011; Knowland et al., 2022; Lam et al., 2011; Werchan & Gomez, 2014). However, there do appear to be some tasks, such as word generalization and declarative memory, which may be improved by napping regardless of whether the child naps regularly (Sandoval et al., 2017; Spencer, 2021). This section reviews the literature on the relation between these outcomes and children's nap behaviors.

Napping has been inconsistently associated with child behavioral functioning in preschoolers. For example, Lam and colleagues found no association between nap behavior and parent-reported behavioral functioning (i.e., Hyperactivity and Inattention scales) in a sample of 3-5-year-old

children; (Lam et al., 2011); whereas, a study of 4-6-year-old children demonstrated that longer nap duration was associated with poorer parent-reported psychosocial functioning (Yokomaku et al., 2008). Importantly, both these studies were cross-sectional. This dissertation will use a longitudinal sample to understand the relation between nap behavior and aspects of behavioral functioning.

Cross-sectional, longitudinal, and experimental evidence demonstrates that preschool-age non-nappers may have better receptive language skills than nappers (Dionne et al., 2011; Lam et al., 2011; Werchan & Gomez, 2014). A large longitudinal study, which examined the relation between receptive language ability and the ratio of daytime to nighttime sleep, concluded that greater daytime sleep at age 6-months and 1.5-years predicted poorer receptive language abilities at 5-years-old (Dionne et al., 2011). These results were replicated in a cross-sectional study of 3-5-year-olds (Lam et al., 2011). This dissertation will use a longitudinal sample to investigate the relation between nap cessation and receptive language (Chapter 3).

The relation between nap behaviors and general cognitive ability has received less research attention. Lam and colleagues (2011) demonstrated that nap duration was negatively related to working memory but was not related to inhibition. Quasi-experimental studies have demonstrated that napping has an immediate positive impact on cognitive abilities such as working memory, among preschoolers, but only for those who nap daily (Kurdziel et al., 2013; Lukowski & Milojevich, 2013). These studies suggest important differences in the relation between napping and cognition between children who are at different stages of giving up their naps (i.e., consistent vs. inconsistent nappers; Kurdziel et al., 2013). More generally, Smith and colleagues (2019) found that a discriminant function containing nighttime sleep duration, intellectual ability, and age differentiated between four groups of preschool children. These groups were based on a heuristic definition of nap behavior (as described in Section 1.1). Napping children scored significantly lower on this function than the other groups (i.e., transitioners, resters, problem nappers). These findings suggest a potential contribution of developmental maturation beyond age. These findings were cross-sectional and require replication in longitudinal designs. This dissertation will investigate the association between cognitive ability and nap behaviors in a longitudinal design.

1.6 Overview of Dissertation

Children's transition from polyphasic to monophasic sleep is relatively well-understood (Iglowstein et al., 2003; Staton et al., 2020). However, the predictors of nap behaviors and cessation are not. There is some research on outcomes related to nap behavior; but more *longitudinal* research is needed to further understand these relations. Further, measurements for proximal factors which may relate to nap behaviors, such as parental beliefs, have yet to be developed. Finally, there is also a need for more integrated classifications of nap behavior to better conceptualize this transition. Nap behavior and cessation among preschool-age children are likely driven by developmental and ecological processes and as such napping is best understood with a transactional theoretical framework, such as the socioecological model.

The overarching purpose of this dissertation is to increase our understanding of the developmental importance of napping among young children. This dissertation seeks to understand the contributions of developmentally and ecologically related variables to nap behavior and cessation. Specifically, the objectives of this dissertation were to:

1. Understand predictors of why some children stop napping earlier than peers (i.e., nap cessation; Chapter 2)
2. Understand outcomes related to early nap cessation (Chapter 3)
3. Develop measurements for parental nap beliefs (Chapter 4)
4. Investigate a more complex definition of children's nap behavior, using an empirical approach, and the correlates of this definition (Chapter 5).

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Chapter 2

2 Predictors of Early Nap Cessation: Longitudinal Research from a Large Nationally Representative Study of Young Children

2.1 Abstract

Most children cease napping between 2-5-years-old, with considerable inter-child variability. We tested the predictors of early nap cessation (i.e., children who cease napping before three years old) using longitudinal data from 5504 Canadian children (51.1% male; 89.8% White) in three cohorts with two timepoints each. Children were 0-1-years-old at baseline (M = 10.19 months SD = 3.95 months) and 2-3-years-old at follow-up (M = 30.83 months, SD = 4.60 months). Parents reported on demographic, perinatal, growth, developmental, child and parent functioning, and child sleep variables. At follow-up, 10.9% ± 0.8% had ceased napping. Multigroup multivariate logistic regression was conducted using a model building approach to identify predictors of early nap cessation. Early nap cessation was predicted by older child age (ORs range from 1.15 to 1.24, moderated by cohort), female sex (OR = 1.29; 95% CI: 1.07-1.55), having an older sibling (OR = 1.33; 95% CI: 1.10-1.62), achieving more developmental milestones (OR = 1.08; 95% CI: 1.03-1.13), and longer nighttime sleep duration (OR = 1.06; 95% CI: 1.01-1.11). Non-White ethnicity (OR = 0.41; 95% CI: 0.28-0.60), birthweight < 2500 grams (OR = 0.60; 95% CI: 0.37-0.96), parent working/in school (ORs range from 0.50 to 0.58, moderated by cohort), and the birth mother consuming alcohol during pregnancy (OR = 0.56; 95% CI: 0.40-0.79) were related to a lower likelihood of nap cessation. Findings suggest nap cessation is influenced by developmental and socio-environmental factors.

2.2 Introduction

Young children vary greatly in the frequency and duration of their daytime naps. Most children stop napping consistently between 2-5 years old. Across studies, 1-6% of children have been found to cease napping by 2-years-old, while 23-44% of children cease napping by 3-years-old and 90-97% of children have ceased napping around 5-years-old (Staton et al., 2020). Thus, at 2 to 3 years old, there is marked variability in nap cessation. These developmental trends are well-established in Western countries. However, there is limited research into the predictors of why some children may cease napping earlier or later than their peers. A recent meta-analysis on daytime sleeping trends among preschool-age children calls for this research to "extend beyond point-prevalence rates," evaluate social determinants of napping cessation, and apply longitudinal methodologies (Staton et al., 2020). Understanding these determinants may aid in the development of daytime sleep policies in childcare and evidence-based recommendations for parents of young children (Staton, Smith, & Thorpe, 2015).

Research predicting children's nap behavior has yet to test *early nap cessation* as an outcome. This aspect of napping behavior differs from alternative definitions (e.g., duration, frequency, sleep consolidation) as it identifies the age at which children consolidate biphasic sleep into monophasic sleep, which appears to be an important developmental milestone (Schwichtenberg et al., 2011; Smith et al., 2019). Nap cessation may be a developmental milestone (Lokhandwala & Spencer, 2022). In this study, we considered early nap cessation as a potential marker of developmental advantage, which impacts sleep and other abilities linked to maturation. Some researchers have argued that nap cessation may signal greater development in children's neural control over sleep-wake processes (Jenni & Carskadon, 2012; Smith et al., 2019). Further, there is evidence that children who have more consolidated sleep (i.e., less daytime sleep) at 1.5-years-old have better receptive language abilities at 5-years-old, than children with less consolidated sleep (i.e., more daytime sleep) (Dionne et al., 2011).

We have operationalized "early nap cessation" as stopping napping before 3-years-old, as this age captures a point in development when nap cessation is more variable and when daytime sleep may no longer be required for children to meet 24-hour sleep requirements (Staton, Smith, & Thorpe, 2015). When children give up naps may also have implications for understanding

their development. Emerging evidence suggests that preschool children who cease napping at an earlier age or who nap for shorter durations may have better behavioral, language, and cognitive functioning than later or longer napping peers (Dionne et al., 2011; Lam et al., 2011; Spruyt et al., 2008; Werchan & Gomez, 2014). Thus, we investigated the predictors of early nap cessation in a longitudinal sample of Canadian preschool children.

2.2.1 Predictors of Naps Cessation

Children's transition from polyphasic (many short daytime naps and a longer nighttime sleep period) to biphasic (single shorter daytime nap and a longer nighttime sleep period) to monophasic sleep (single nighttime sleep period) is well-documented in Western countries (Blair et al., 2012; Iglowstein et al., 2003; Staton et al., 2020). However, this transition occurs with considerable variation and few studies have tested concurrent or longitudinal factors predicting children's nap cessation. Previous research has suggested this variation may be due to socioecological effects (e.g., ethnicity, family environment; (Dionne et al., 2011; Staton et al., 2020; Touchette et al., 2013)). A twin study demonstrated that environmental factors account for more of the variance in preschoolers' nap behavior than genetic factors (e.g., 58% of variance in daytime to nighttime sleep ratio due to shared environmental factors; (Touchette et al., 2013)). However, the specific environmental factors influencing nap cessation are unclear and have usually been limited to sociodemographic factors. A complementary theory suggests nap cessation may be a marker of greater developmental maturity (Schwichtenberg et al., 2011; Smith et al., 2019). For example, children with developmental delays show similar napping behavior to typically developing children who are 6-months younger (Schwichtenberg et al., 2011). As such, nap cessation may represent greater development in children's neural control over sleep-wake processes (Jenni & Carskadon, 2012; Smith et al., 2019). Considering these two perspectives on the influences of nap cessation, the present study investigated both socioecological and developmental predictors.

The cessation of daytime naps is likely an interactional process involving the child, parent, and the environment. This process can be conceptualized by applying the Socioecological Model (Bronfenbrenner, 1979) to children's sleep (e.g., (Grandner, 2014; Newton et al., 2020; Sadeh et al., 2010)). The Socioecological Model incorporates proximal and distal levels of influence on

behavior (e.g., individual demographic and developmental characteristics, parenting characteristics, and broader environmental factors). The application of this model allows for the incorporation of multiple levels of influence to understand nap cessation. We drew from three areas of previous research that fit within the Socioecological Model to select hypothesized predictors of nap cessation: (1) correlates of preschoolers' nap duration (Crosby et al., 2005; Iglowstein et al., 2003; Schwichtenberg et al., 2011; Staton et al., 2020; Touchette et al., 2013; Zhang et al., 2020), (2) correlates of nighttime sleep behavior (Hall et al., 2007; Newton et al., 2020; Reid et al., 2009; Reynaud et al., 2016; Scharf et al., 2016; Simard et al., 2008; Smith et al., 2019; Staples et al., 2015), and (3) correlates of general development (Flensborg-Madsen et al., 2019; Flensborg-Madsen & Mortensen, 2017; Gatten et al., 1994; Nan et al., 2013; Newton et al., 2020; Smith et al., 2019). Finally, we identified some exploratory factors which fit within this model, such as having an older sibling, child's health, and parental employment status.

Older child age, the child being White, typical developmental status (versus developmental delay), and longer nighttime sleep duration are consistently associated with shorter daytime sleep durations in preschool children (Crosby et al., 2005; Iglowstein et al., 2003; Schwichtenberg et al., 2011; Staton et al., 2020; Touchette et al., 2013; Zhang et al., 2020). If we assume that there are common biological and behavioral mechanisms required for sleep onset during the day and night (e.g., sleep homeostasis, circadian rhythms, environmental cues), factors that influence sleep at night would be expected to influence naps, including temperament, positive parenting practices (i.e., positivity and consistency), and parents' mental health (Hall et al., 2007; Newton et al., 2020; Reid et al., 2009; Reynaud et al., 2016; Scharf et al., 2016; Simard et al., 2008; Smith et al., 2019; Staples et al., 2015). Perinatal factors such as birthweight, gestational age, and maternal alcohol use during pregnancy have been linked to both children's development in general and nighttime sleep functioning (Flensborg-Madsen et al., 2019; Flensborg-Madsen & Mortensen, 2017; Gatten et al., 1994; Nan et al., 2013; Newton et al., 2020). These factors may also influence neural development, which may be related to nap cessation (Smith et al., 2019; Spencer & Riggins, 2022).

We identified some exploratory situational factors which may also relate to nap cessation. Children with older siblings may have a preference to cease napping at a younger age via social learning mechanisms (Bandura & McClelland, 1977). Given sleep's role in physiological

recovery, younger children who are more often in poorer health may continue to be reliant on biphasic sleep. Further, children with parents who work or attend school outside the home may be more likely to attend a childcare program where napping is encouraged, regardless of child preference. These exploratory factors were also examined. As these were secondary data analyses, our variable selection was influenced by the available data and the literature.

2.2.2 The Current Study

We investigated predictors of early nap cessation (i.e., before children's third birthday), using the Socioecological Model, in a large, nationally representative sample of Canadian children. Developmental and psychosocial correlates were expected to predict early nap cessation. We hypothesized that older child age, greater socio-motor development, better nighttime sleep functioning, easier temperament, better child health, having an older sibling, and greater positive and consistent parenting would predict a greater likelihood of nap cessation; whereas, being born at a low birthweight, the mother using alcohol during pregnancy, and lower parental mental health would predict a lesser likelihood of nap cessation. Finally, due to the impact of cultural factors, we also hypothesized that a non-White ethnic background may be related to continued napping.

2.3 Methods

2.3.1 Data and study population

Data from Cycles 3-6 of the National Longitudinal Study of Children and Youth (NLSCY) were analyzed. The NLSCY was a multi-year (1998-2009), nationally representative study conducted by Statistics Canada with the primary purpose of monitoring the development and well-being of Canadian children from infancy to adulthood, in data collection cycles occurring every 2 years. More information about the NLSCY can be found here: https://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&Id=4632.

Data were gathered via telephone or face-to-face interviews with the person most knowledgeable (PMK) about the child's functioning (most commonly parents). Cycle 4 was the first cycle to ask about children's nap duration, therefore Cycle 3 was the first available cycle with longitudinal

predictors of nap cessation. In the present study, the analyzed cycles: (1) contained the key outcome variable (i.e., nap status) and (2) provided longitudinal data.

The present study constructed three longitudinal cohorts with two cycles of data per cohort (a baseline and follow-up cycle). Cycles refer to a data collection period; for example, Cycle 3 data was collected between 1998 and 1999. Cohort 1 is composed of Cycles 3 (baseline; 1998-1999) and 4 (follow-up; 2000-2001); Cohort 2 is composed of Cycles 4 (baseline) and 5 (follow-up; 2002-2003); and Cohort 3 is composed of Cycles 5 (baseline) and 6 (follow-up; 2004-2005). In baseline cycles, children were 0-1-years-old (M = 10.19 months SD = 3.95 months) and in follow-up cycles, children were 2-3-years-old (M = 30.83 months, SD = 4.60 months).

2.3.2 Participants and Procedure

PMKs provided their informed consent and information on their children (N = 5504; $n_{\text{Cohort 1}}$ = 2663, $n_{\text{Cohort 2}}$ = 1528, $n_{\text{Cohort 3}}$ = 1313). The NLSCY was representative of the Canadian population at the time of data collection (Statistics Canada, 1999). Demographic characteristics are presented in Table 2.1.

The inclusion criteria and sampling strategy for the NLSCY are detailed elsewhere (e.g., Statistics Canada, 1999). Briefly, the NLSCY included non-institutionalized civilians who were 0-11 years old at the time of selection and living in Canada's provinces; this survey excluded children who were living on Indian reserves or Crown lands or one of the territories, those living in institutions, and those whose parents were full-time members of the Canadian Armed Forces. In the current study, children who were (1) 0-1-years-old at baseline and (2) were less than 3-years-old at follow-up and had valid outcome data (i.e., nap status, described below) were included (i.e., families who were lost to follow-up were excluded). Only parents of children who were less than 3-years-old at follow-up were asked questions about napping in the NLSCY protocol. Retention rates were 88%, 87%, and 65% for Cohorts 1, 2, and 3, respectively.

At baseline, PMKs reported on demographic variables, perinatal variables, child temperament, parenting practices, and PMK depression. At follow-up parents reported on child age, the presence of older and younger siblings, the child's height and weight, parenting practices, developmental milestones, the child's health, current sleep functioning, and nap status.

2.3.3 Measures

The survey questions and measures used in the NLSCY were selected by an expert advisory group (Statistics Canada, 1999). These scales are generally established measures, or short-form derivatives generated for the NLSCY. The construct validity of each scale was tested by Statistics Canada (Statistics Canada, 1999). Some item wordings and response options were consistent with Statistics Canada practice (e.g., Census items) at the time of data collection. It should be noted that Census items for various sociodemographic factors, including ethnicity, have been modified and expanded since these data were collected. Descriptive statistics for predictor variables are presented in Table 2.1 and Appendix B. The timepoints at which these measures were collected are presented visually in Appendix B.

Statistics Canada has standardized requirements for minimal cell sizes for variables to maintain confidentiality. Thus, some response options had to be aggregated (e.g., maternal alcohol use). For other variables, subgroups were combined to increase the interpretability of odds ratios in the analyses (e.g., developmental milestones).

Table 2.1: Parent, Child, and Family Demographic Characteristics

Characteristic	Category	% (*n*) or *M* (*SD*)
Parent		
Age	15 to 24 years	18.2% (1000)
	25 to 29 years	30.5% (1679)
	30 to 34 years	31.5% (1732)
	35 to 39 years	15.2% (838)
	40 years or older	4.6% (255)
Marital Status	Married/common-law	88.4% (4866)
	Single, widowed, separated, or divorced	11.6% (638)
Employment Status	Works or attends school	73.1% (4023)
	Does not work or attend school	26.9% (1481)
Relationship with Child	Biological mother	88.6% (4875)
	Biological father	9.9% (545)
	Another female primary caregiver	1.2% (68)
	Another male primary caregiver	0.3% (16)

Education Completed	Less than secondary school or equivalent	12.0% (660)
	Secondary school or equivalent graduate	14.7% (809)
	Some post-secondary school education	18.5% (1017)
	College or university graduate and above	44.3% (2436)
Family		
Income Adequacy	Lowest	2.7% (147)
	Lower-Middle	11.0% (604)
	Middle	28.4% (1561)
	Upper-Middle	38.9% (2140)
	Highest	19.1% (1052)
Province of Residence	Newfoundland	2.3% (127)
	Prince Edward Island	3.1% (172)
	Nova Scotia	6.6% (361)
	New Brunswick	5.9% (327)
	Quebec	18.1% (996)
	Ontario	28.0% (1540)
	Manitoba	8.6% (475)
	Saskatchewan	8.0% (441)
	Alberta	10.2% (559)
	British Columbia	9.2% (506)
Child		
Age (months)	At Baseline Cycle	10.19 (3.95)
	At Follow-Up Cycle	30.83 (4.60)
Sex	Male	51.1% (2815)
	Female	48.9% (2689)
Ethnicity	Arabic	0.9% (50)
	Black	1.4% (76)
	Filipino	0.8% (43)
	Indigenous	2.9% (161)
	Latin American	0.4% (20)
	East Asian	1.9% (105)
	South Asian	2.2% (122)
	Southeast or West Asian	0.3% (17)
	White	89.2% (4907)
	Another ethnicity	0.7% (37)

Siblings	Has an older sibling	54.6% (3007)
	Has a younger sibling	21.0% (1156)

2.3.3.1 Demographic Variables

The children's demographic variables included sex, age (months; reported at baseline and follow-up), ethnicity, and whether the child had older and/or younger siblings. The PMKs' demographic variables were marital and employment status (both reported during follow-up cycles), and highest education attained. Income adequacy (PMK-reported income, adjusted for family size and coded into quintiles) indexed families' economic situation. Statistics Canada verified demographic variables using established criteria described elsewhere (Statistics Canada, 1999). The exact wording of the ethnicity item was, "How would you best describe [child's name]'s race or colour?" Response options included: White, Chinese, Black, and Latin American, etc. As noted above, since the time of the NLSCY, Statistics Canada ethnicity questions have been expanded to better encompass the range of races and ethnicities within the Canadian population (e.g., 2021 Canadian Census).

2.3.3.2 Perinatal variables

At baseline, PMKs provided their child's birth weight (in grams) and whether the birth mother consumed alcohol during the pregnancy. For analyses in this study, maternal alcohol consumption during pregnancy was dichotomized as 0 = no alcohol consumed, 1 = alcohol consumed once or more during pregnancy. Maternal alcohol consumption during pregnancy needed to be dichotomized in this study in accordance with Statistics Canada regulations related to cell sizes. Statistics Canada verified these perinatal variables using established criteria described elsewhere (Statistics Canada, 1999). For example, birth weight was corroborated using the agreement between birth length, prematurity, and delivery conditions (e.g., multiple birth, specialized medical care).

2.3.3.3 Child growth

PMKs provided their child's height (centimeters) and weight (kilograms) at follow-up.

2.3.3.4 Developmental milestones

Developmental milestones were calculated from the Ages and Stages Questionnaire (ASQ; (Squires et al., 2009)). The ASQ assesses five areas of development: Communication, Fine Motor, Gross Motor, Problem-Solving, and Personal-Social. The ASQ has demonstrated excellent test-retest reliability (r = .92), sensitivity (87.4%), and specificity (95.7%) for detecting developmental delay across samples and cultures, according to a recent review (Singh et al., 2017). The factor structure of the ASQ was evaluated within the NLSCY and its original factor structure was supported (Statistics Canada, 1999). Standardized ASQ scores at follow-up were used for analyses (M = 100, SD = 15). These norms were based on NLSCY Cycle 1 data (calculated by Statistics Canada analysts). To increase interpretability in the present study, standardized ASQ scores were recoded into half-standard deviation units prior to analyses. Higher scores indicated that more developmental milestones had been achieved.

2.3.3.5 Child and parent functioning

Child temperament. At baseline, PMKs rated their child's temperament on 10 items using 5-point Likert scales, based on the Infant Characteristics Questionnaire (Bates et al., 1979). A single factor was supported using NLSCY Cycle 1 data (Statistics Canada, 1999). Lower scores reflect an easier infant temperament. To increase interpretability for the present study, average temperament scores were recoded into four categories based on the original Likert scale options – Easiest (average score ranged from 1.00-1.99), Easy (2.00-2.99), Moderate (3.00-3.99), and Difficult (4.00-5.00). Supplemental Table B1 shows the percentage of cases within each of these groups at baseline.

Child health. At follow-up, PMKs reported on the frequency of which their child was in "good health" on a 5-point scale. Responses were dichotomized for the present study as 0 = "never, sometimes, or about half the time" and 1 = "often or almost all the time" to increase interpretability.

Parenting practices. PMKs reported on their parenting practices on a measure based on the Parent Practices Scale (Strayhorn & Weidman, 1988). The baseline scale contained two subscales (positive and ineffective parenting) and the follow-up scale contained three subscales

(positive, ineffective, consistent parenting); these subscales were supported by confirmatory factor analyses (Statistics Canada, 1999). The consistent parenting items were not asked of PMKs with children 0-1-years-old. Scale reliabilities ranged from $.660 \geq \alpha_c \leq .808$. Ineffective parenting scores ranged from 0-8 and higher scores reflected a greater tendency toward hostile or ineffective interactions. Positive parenting scores ranged from 0-20 and higher scores indicated a greater tendency toward positive parenting interactions. Finally, consistent parenting scores ranged from 0-20 and higher scores reflected a greater tendency toward consistent parenting.

Parental depression. PMK depression was assessed by the 20-item version of the Center for Epidemiological Studies Depression (CES-D) scale (Orme et al., 1986) and was completed at baseline. Total scores ranged from 0-36, with higher scores indicating the presence of increased depressive symptoms. Confirmatory factor analyses supported a single factor solution, which demonstrated good internal consistency ($\alpha_c = .820$; (Statistics Canada, 1999)).

2.3.3.6 Children's concurrent sleep functioning

PMKs completed four indices of children's sleep behavior at follow-up (i.e., 2-3 years old): (i) the number of times their own sleep was interrupted by their child waking over the past month (never vs. once per night or more than once per night); (ii) child's nighttime sleep duration (in hours); (iii) child's nighttime sleep onset latency (≤30 minutes vs. >30 minutes), and (iv) whether the child has an extended bedtime routine (i.e., >30 minutes) on most nights (yes vs. no). Parent reports on questionnaires using similar items are strongly associated with objective measures of sleep such as actigraphy ($r = .74$) (Sadeh, 1994, 1996).

2.3.3.7 Outcome: Napping Status

At follow-up (i.e., 2-3 years old), PMKs were asked: "In general, what is the longest time [child's name] naps during the day?". Response options were: (1) less than 1 hour; (2) from 1 hour to less than 2 hours; (3) From 2 hours to less than 3 hours; (4) From 3 hours to less than 4 hours; (5) 4 hours or more; (6) child does not nap anymore. In the NLSCY, only children who were 0-3 years old were asked this question. To index whether or not the child had ceased napping by their third birthday, responses were dichotomized. "Child does not nap anymore"

was coded as “child ceased napping” (1) and the child napping for any duration was coded as “child still napping” (0).

2.3.4 Research Design and Data Analyses

Analyses were conducted in Mplus v8 (Muthén & Muthén, 1998-2017). All analyses were unweighted, as Statistics Canada does not provide normalized weights for longitudinal NLSCY datasets and the usage of population weights would artificially increase power and bias tests of significance.

There were four steps in the analyses. Firstly, the rates of children who were napping or no longer napping were analyzed and reported with 95% confidence intervals across cohorts. Secondly, after screening for violations of statistical assumptions, multigroups logistic bivariate regression analyses (where the groups are the cohorts) in Mplus were used to assess bivariate associations between a predictor and napping status. Thirdly, Wald tests were used to identify prediction relations (i.e., regression coefficients) which differed significantly between cohorts. To model these moderated effects, the regression coefficients of predictors which differed significantly between cohorts in the bivariate models were allowed to take different values in subsequent multivariate models (i.e., moderated by cohort). Multiple groups analyses were used, due to the clustered design of the data (i.e., participants nested within cohorts). The multigroup multivariate logistic regression was conducted using a model building approach, adding predictors in steps. These steps were: (1) demographic variables, (2) perinatal variables, (3) child growth variables, (4) developmental milestones, (5) child and parent functioning variables, (6) current sleep functioning variables.

2.3.5 Approach to Missing Data

Missing data for predictor variables was low (<10% for all variables, except child’s height at follow-up [26%] and PMK highest education attained [14%]) and were assumed to be missing at random. Missing data were handled using multiple imputation, with 10 datasets imputed. Mplus uses Bayesian analyses to impute missing data. Then, parameter estimates are averaged across the results from these datasets (Muthén & Muthén, 1998-2017).

2.4 Results

2.4.1 Preliminary Analyses

The assumptions of logistic regression were tested prior to the main analyses (e.g., independence of observations, non-multicollinearity). Two continuous predictor variables were determined to have problematic skewness or kurtosis (i.e., positive parenting practices at baseline, PMK depression). As such, these variables were recoded into percentile groups based on data grouped across cycles. No predictor variables demonstrated evidence of multicollinearity and the remaining continuous predictors appeared to show linearity with the outcome.

2.4.2 Napping Cessation Prevalence

Across the three cohorts, 10.9% (± 0.8%, 95% Confidence Interval) of children (n = 602) had ceased napping by their third birthday. In the bivariate models, several predictors (unadjusted for other predictors) of nap status emerged and are summarized in Table 2.2. Bivariate Wald tests demonstrated that the effect size of the relation with nap status differed significantly between cohorts for child age, PMK employment status, and positive parenting practices at follow-up. As such, these variables were moderated by cohort in subsequent models.

2.4.3 Nap Cessation Prediction

The results of the multigroup multivariate logistic regression using a model-building approach are presented in Table 2.2. Across models, no variable that was statistically significant at a previous model became non-significant in a subsequent model, nor did any variable which was non-significant in a previous model become statistically significant at a subsequent model.

In the final model and among **demographic** predictors, children who were female (compared to males; OR = 1.29; 95% CI = [1.07-1.55]) and had at least one older sibling (compared to no older siblings; OR = 1.33, 95% CI = [1.10-1.62]) were more likely to have ceased napping by age 3. For each month of older age, children were about 1.2 times more likely to have ceased napping (moderated by cohort, ORs range from 1.15 to 1.24, all p's < .05). Children who had a non-White ethnicity (compared to children with White ethnicities; OR = 0.41, 95% CI = [0.28-0.60]) and whose PMK worked or attended school (compared to children whose PMK's did not

work or attend school; moderated by cohort, ORs range from 0.50 to 0.58, all *p*'s < .05) were less likely to have ceased napping (i.e., more likely to still nap). Among **perinatal** predictors, children with a birthweight under 2500 grams (compared to children with birthweights ≥2500 grams; OR = 0.60, 95% CI = [0.37-0.96]) and whose birth mother consumed alcohol once or more during pregnancy with the child (compared to those whose mother never consumed alcohol during pregnancy; OR = 0.56, 95% CI = [0.40-0.79]) were less likely to have ceased napping (i.e., more likely to still nap). Children's odds of having ceased napping increased with each half-unit standard deviation increase in **developmental** milestones scores (OR = 1.08, 95% CI = [1.03-1.13]). Children's current **sleep functioning** also predicted nap status at age three; each additional hour of nighttime sleep at follow-up was associated with increased odds that the child had ceased napping (OR = 1.06, 95% CI = [1.01-1.11]).

Table 2.2: Model building results for the Multiple Groups Logistic Regression Predicting Nap Status.

			Multivariate Model testing					
Predictor	Reference Category/ Units	Bivariate Models[1]	1	2	3	4	5	Final
		OR [95% CI]	OR [95% CI]	OR [95% CI]	OR [95% CI]	OR [95% CI]	OR [95% CI]	OR [95% CI]
Demographics								
Child's Sex	Female	**1.26 [1.06-1.49]**	**1.24 [1.04-1.48]**	**1.26 [1.06-1.51]**	**1.29 [1.08-1.55]**	**1.26 [1.05-1.51]**	**1.29 [1.07-1.55]**	**1.29 [1.07-1.55]**
Child age (at follow-up)	Months							
	Cohort 1	**1.15 [1.12-1.17]**	**1.15 [1.13-1.18]**	**1.15 [1.13-1.18]**	**1.14 [1.12-1.17]**	**1.15 [1.12-1.17]**	**1.15 [1.12-1.18]**	**1.15 [1.12-1.18]**
	Cohort 2	**1.20 [1.09-1.32]**	**1.19 [1.08-1.32]**	**1.20 [1.09-1.32]**	**1.19 [1.08-1.31]**	**1.19 [1.08-1.31]**	**1.19 [1.08-1.32]**	**1.19 [1.08-1.31]**
	Cohort 3	**1.22 [1.14-1.31]**	**1.23 [1.15-1.32]**	**1.24 [1.15-1.32]**	**1.23 [1.14-1.31]**	**1.22 [1.14-1.31]**	**1.23 [1.15-1.32]**	**1.24 [1.15-1.33]**
Child's Ethnicity	Non-White	**0.47 [0.33-0.68]**	**0.38 [0.26-0.55]**	**0.37 [0.25-0.54]**	**0.37 [0.25-0.54]**	**0.37 [0.25-0.54]**	**0.39 [0.27-0.58]**	**0.41 [0.28-0.6]**
Has an older sibling	Yes	**1.20 [1.01-1.43]**	**1.25 [1.04-1.51]**	**1.23 [1.02-1.49]**	**1.25 [1.03-1.51]**	**1.29 [1.07-1.57]**	**1.35 [1.12-1.64]**	**1.33 [1.10-1.62]**

Has a younger sibling	Yes	**1.30 [1.07-1.58]**	1.11 [0.89-1.38]	1.10 [0.88-1.37]	1.10 [0.88-1.37]	1.10 [0.88-1.37]	1.10 [0.88-1.38]	1.10 [0.88-1.37]
Marital Status	Divorce, Widowed, Single	1.18 [0.92-1.52]	1.00 [0.75-1.34]	1.01 [0.76-1.35]	1.01 [0.75-1.35]	0.98 [0.73-1.32]	1.01 [0.75-1.35]	1.02 [0.76-1.37]
PMK Employment Status	PMK works or attends school							
	Cohort 1	**0.60 [.47-.75]**	**0.60 [0.46-0.76]**	**0.59 [0.46-0.75]**	**0.59 [0.46-0.76]**	**0.59 [0.46-0.76]**	**0.58 [0.45-0.75]**	**0.58 [0.45-0.75]**
	Cohort 2	**0.50 [.34-.74]**	**0.52 [0.35-0.78]**	**0.52 [0.35-0.77]**	**0.51 [0.34-0.77]**	**0.51 [0.34-0.77]**	**0.52 [0.34-0.77]**	**0.53 [0.35-0.79]**
	Cohort 3	**0.53 [.36-.79]**	**0.51 [0.34-0.76]**	**0.50 [0.33-0.75]**	**0.50 [0.33-0.75]**	**0.50 [0.33-0.75]**	**0.50 [0.33-0.75]**	**0.50 [0.33-0.75]**
PMK Educational Attainment [a]	Less than High School Completed	1.21 [.93-1.58]	1.10 [0.84-1.44]	1.07 [0.80-1.44]	1.09 [0.81-1.45]	1.07 [0.80-1.41]	1.12 [0.84-1.49]	1.13 [0.84-1.52]
	Secondary School Graduate Only	1.01 [0.77-1.32]	1.02 [0.78-1.34]	0.99 [0.76-1.29]	0.97 [0.74-1.28]	0.98 [0.75-1.29]	0.98 [0.74-1.30]	1.00 [0.75-1.32]
	Some post-secondary, but less than college/university graduate	0.91 [0.71-1.17]	0.950 [0.74-1.22]	0.94 [0.73-1.22]	0.95 [0.74-1.23]	0.93 [0.72-1.20]	0.95 [0.73-1.24]	0.93 [0.72-1.2]

Income adequacy	Quintile increase	**0.89 [0.82-0.97]**	0.92 [0.83-1.02]	0.93 [0.84-1.03]	0.93 [0.84-1.03]	0.93 [0.84-1.03]	0.92 [0.83-1.02]	0.92 [0.83-1.02]
Perinatal								
Low birthweight	<2500g	**0.54 [0.34-0.86]**		**0.52 [0.32-0.83]**	**0.53 [0.33-0.85]**	**0.58 [0.36-0.94]**	**0.60 [0.37-0.96]**	**0.60 [0.37-0.96]**
Maternal alcohol consumption	Once or more during pregnancy	**0.56 [0.41-0.77]**		**0.54 [0.39-0.76]**	**0.54 [0.39-0.76]**	**0.55 [0.39-0.77]**	**0.55 [0.39-0.78]**	**0.56 [0.40-0.79]**
Child Growth								
Child Height	cm	**1.03 [1.02-1.04]**			1.01 [0.99-1.02]	1.01 [0.99-1.02]	1.01 [0.99-1.02]	1.01 [0.99-1.02]
Child Weight	kg	**1.10 [1.06-1.14]**			1.02 [0.97-1.07]	1.01 [0.97-1.06]	1.01 [0.96-1.06]	1.01 [0.97-1.06]
Child Development								
Developmental Milestones	½ SD Units	**1.11 [1.06-1.16]**				**1.09 [1.04-1.15]**	**1.08 [1.03-1.13]**	**1.08 [1.03-1.13]**
Child & Family Functioning								
Temperament [b]	"Easy"	1.09 [0.87-1.35]					1.12 [0.89-1.42]	1.14 [0.90-1.44]
	"Mid"	0.98 [0.76-1.26]					0.97 [0.74-1.29]	0.99 [0.75-1.32]
	"Difficult"	1.03 [0.68-1.54]					1.06 [0.68-1.67]	1.10 [0.70-1.74]

Child Health	Good health often/almost all the time	1.11 [0.70-1.76]		1.20 [0.74-1.94]	1.15 [0.71-1.86]
Positive Parenting Style (Baseline) [c]	<10th Percentile	0.79 [0.57-1.08]		0.98 [0.70-1.37]	0.96 [0.68-1.36]
	10th – 30th Percentile	0.84 [0.67-1.06]		0.82 [0.64-1.05]	0.81 [0.63-1.04]
	30th – 50th Percentile	1.11 [0.89-1.38]		1.04 [0.82-1.31]	1.03 [0.82-1.30]
Ineffective Parenting Style (Baseline)	Unit increase	**1.10 [1.05-1.16]**		1.00 [0.94-1.06]	1.00 [0.94-1.06]
Positive Parenting Style (Follow-Up)	Unit increase				
	Cohort 1	1.01 [0.96-1.07]		1.03 [0.98-1.10]	1.04 [0.98-1.10]
	Cohort 2	1.08 [0.98-1.20]		1.07 [0.96-1.19]	1.07 [0.96-1.19]
	Cohort 3	**1.12 [1.02-1.23]**		**1.13 [1.02-1.25]**	**1.13 [1.02-1.24]**
Ineffective Parenting Style	Unit increase	1.00 [0.98-1.03]		1.01 [0.98-1.04]	1.01 [0.98-1.04]

(Follow-up)					
Consistent Parenting Style (Follow-up)	Unit increase	1.03 [0.99-1.06]		1.01 [0.98-1.04]	1.01 [0.98-1.04]
PMK Depression [d]	50^{th} – 70^{th} Percentile	0.91 [0.71-1.16]		0.87 [0.67-1.13]	0.86 [0.66-1.12]
	70^{th} – 90^{th} Percentile	0.85 [0.66-1.09]		0.81 [0.62-1.07]	0.82 [0.62-1.07]
	>90^{th} Percentile	0.95 [0.70-1.28]		0.86 [0.62-1.21]	0.88 [0.61-1.25]
Child's Sleep					
PMK sleep is interrupted by child	Once or more	0.96 [0.80-1.16]			1.13 [0.92-1.38]
Child's nighttime sleep duration	Hours	**1.07 [1.02-1.12]**			**1.06 [1.01-1.11]**
Child's sleep onset latency	>30 minutes	**0.78 [0.62-0.98]**			0.79 [0.61-1.01]
Child has a long bedtime routine	Yes	1.01 [0.82-1.24]			1.09 [0.87-1.35]

Notes. Significant ORs ($p < .05$) are bolded. [1] Refers to preliminary bivariate models with only one predictor (i.e., unadjusted for other predictors). All models account for nesting within cohorts. Predictors with multiple effect sizes per model were moderated by cohort (i.e., Child age, PMK Employment Status, Positive Parenting Style at Follow-up).

Model 1: Demographic predictors-only.

Model 2: Demographic and perinatal predictors.

Model 3: Demographic, perinatal, and child physical growth predictors.

Model 4: Demographic, perinatal, child physical growth, and developmental milestone predictors.

Model 5: Demographic, perinatal, child physical growth, developmental milestone, and family/child functioning predictors.

Final Model (Model 6): Demographic, perinatal, child physical growth, developmental milestone, family/child functioning, and current sleep functioning predictors.

[a] PMK Education – "College or university degree or higher" is the reference group

[b] Temperament – "Easiest" is the reference group

[c] Positive Parenting (Baseline) – ">50th Percentile" is the reference group

[d] Depression – "<50th Percentile" is the reference group

2.5 Discussion

This study utilized nationally representative epidemiological data to answer basic questions about the predictors of early nap cessation, informed by the Socioecological Model. Both developmental and socio-environmental factors were found to influence nap cessation by age three. This study provides evidence that nap cessation may be a developmental marker of maturation ***and*** it is influenced by socioenvironmental factors. Several of these effects correspond to small-to-medium effect sizes including child non-White ethnicity, PMK working or attending school, low birthweight, and maternal alcohol consumption (Chen et al., 2010).

Our demonstrated rate of napping cessation was lower than the range reported in a recent meta-analysis (Staton et al., 2020). Children were 2-3 years old at follow-up in the current study and about 11% of these children had ceased napping. Staton and colleagues suggest that between 22.8% to 44.2% will cease napping at this age. However, this meta-analysis suggested rates of napping cessation in this age range may be lower in North America than Europe and our findings are consistent with other representative Canadian data, suggesting some cultural differences (Dionne et al., 2011; Touchette et al., 2013). Thus, these differences may reflect the cultural attitudes toward napping in Canada. Alternatively, these differences may be influenced by napping policies in Canada at the time of data collection. Both these explanations are speculative and require further research. For example, during the data collection period of the NLSCY, some provinces allowed parents to choose between their child attending part-time kindergarten (for children as young as 3-years-old) or full-day kindergarten through an elementary school. Children may have been in childcare (e.g., in a daycare centre or privately), or a mixture of kindergarten and childcare (Wloka, 2020). In one province (Ontario), mandatory nap policies were likely common in childcare settings and flexible nap policies were legislated in kindergartens at the time the data in the NLSCY was collected (Ministry of Education, 2016). To our knowledge, there are no complete records of the napping policies across Canada either now, or for the period when the NLSCY data were collected.

Developmental factors that positively predicted early nap cessation included older child age, the absence of perinatal risk factors (i.e., low birthweight and maternal alcohol use during pregnancy), and greater attainment of developmental milestones. Older child age is frequently

associated with shorter nap duration worldwide, and it is well-known that most preschool-age children in Western countries will cease napping before 6 years old (Dionne et al., 2011; Iglowstein et al., 2003; Staton et al., 2020). Low birthweight and having a mother who drank alcohol during pregnancy may delay development (Flensborg-Madsen et al., 2019; Flensborg-Madsen & Mortensen, 2017; Gatten et al., 1994; Nan et al., 2013). Notably, maternal alcohol consumption was indexed in this study as having used ***any*** alcohol during pregnancy. It is unlikely that one drink during pregnancy adversely impacted the child's biological maturation (i.e., likely not teratogenic effects). This variable may co-vary with other non-measured variables that may be causally related to a child giving up naps at a later age, such as maternal stress. Low birthweight was statistically significant; however, children's height and weight at follow-up were not. These findings suggest that the growth trajectory from birth to 3-years-old is not relevant for nap cessation. Instead, low birthweight may impact neural development, which in turn may influence nap cessation. These findings support a developmental trajectory of nap cessation.

The individual child factors observed in this study were largely consistent with previous research on predictors of child nighttime sleep and sleep problems, including child's sex, ethnicity, and temperament. Male children tend to nap for longer durations than female children (Cheung et al., 2017; Yu et al., 2017). We found that males are also likely to nap later into development than females. This may be related to earlier maturation for females. Females demonstrate a slight advantage in language acquisition skills during early childhood (Lange et al., 2016). Non-White children tend to nap more frequently or for longer durations than White children (Crosby et al., 2005; Nevarez et al., 2010). We provide preliminary longitudinal evidence that non-White children nap later into development than White peers, suggesting possible cultural factors in napping behaviour. Previous research suggests differences between ethnic groups in parental beliefs about child sleep behavior, including where children should sleep and the perception of sleep problems (Milan et al., 2007). Cultural factors also influence the timing of other developmental changes. For example, Black children tend to be toilet trained earlier than White children (Choby & George, 2008). In addition, temperament has been found to consistently relate to children's nighttime sleep (Newton et al., 2020). However, in the current study, temperament was not a significant predictor of early nap cessation. Others have found that temperament did not differentiate between groups of napping and non-napping 4-6-year-old children (Smith et al.,

2019). In this previous study and ours, temperament was operationalized as a unidimensional construct. This conceptualization of temperament is limited. Perhaps specific aspects of temperament are relevant to nap cessation, such as rhythmicity and adaptability. These aspects relate to parent-reported child sleep problems (Hall et al., 2007). Future research should employ more complex, multi-informant measures of temperament.

Nighttime and daytime sleep are closely linked. We found that longer nighttime sleep duration predicted early nap cessation. Multiple aspects of sleep change during the early years, including increasing nighttime sleep duration and decreased nightwakings (Newton et al., 2020). It may be that better-developed nighttime sleep practices cause early nap cessation, as the child's daily sleep needs are satisfied by nocturnal sleep. Alternatively, it may be that nap cessation is part of general developmental processes, which include the ability to self-soothe and initiate and maintain sleep during the night. This relation should be further investigated using more detailed sleep measurement, such as actigraphy or sleep diaries, and short-term longitudinal studies (i.e., 6-12 months). These studies can examine whether changes in nighttime sleep drive changes in daytime sleep, vice versa, or if both change in tandem.

Situational factors such as having an older sibling and the PMK attending work or school predicted early nap cessation, indicating that factors beyond maturation influence nap cessation. Specifically, children whose PMK attended work or school were more likely to still be napping at follow-up and children with an older sibling were more likely to have ceased napping. These findings are novel and require replication. There are several possible mechanisms involved. For example, children with older siblings may prefer to cease napping to emulate their older sibling's behavior. The presence of older siblings also changes the home environment. Young children may find it difficult to initiate sleep during the day if they hear their older siblings playing. Alternatively, parents may have distinct napping preferences for non-firstborn children. Parental nap behavior preferences were not evaluated in this study but may be a proximal process which explains these relations. Parental preferences may include reasons for encouraging or discouraging napping, or personal beliefs related to when children should stop napping. Interestingly and in contrast to the literature on nighttime sleep, parenting practices (e.g., positivity, hostility, consistency) did not predict early nap cessation in our final model. These parenting practices may be relevant for establishing new routines but may not directly relate to

nap cessation. For example, parents who show positivity and consistency may be better able to establish new routines. Finally, family factors related to socioeconomic status (i.e., income adequacy and PMK education) were not predictive of early nap cessation. It is likely that more proximal factors, such as childcare attendance and practices would be relevant to nap cessation (Staton et al., 2017; Staton, Smith, Pattinson, et al., 2015). For example, some childcare centers may have mandatory napping policies in which all children are encouraged to nap, regardless of if they are regularly napping. Current evidence suggests that these policies provide little benefit for non-habitually napping children and might even cause some difficulties for the child and family. Thorpe and colleagues found that mandatory naptimes were not related to post-nap reductions in cortisol, suggesting a lack of the stress reduction that is typically associated with napping (Thorpe et al., 2018). Observational research also suggests that nap times in childcare centers can have less positive and more negative emotional climates than non-sleep times (Pattinson et al., 2014). Further, children that nap after they are ready to cease napping are likely to have longer nighttime sleep onset latencies and shorter nighttime sleep durations, as their napping can decrease their sleep drive (Borbély et al., 2016); this may be problematic for parents and negatively impact parent-child interactions at bedtime. Finally, the use of mandatory nap time policies may be more likely to occur in lower socioeconomic areas (Staton et al., 2017), suggesting that children living in these areas may be at greater risk of potential harms from mandatory napping policies.

Our results provide evidence that parents, early childhood care providers, and related practitioners should observe and support, but not actively alter, children's individual nap cessation trajectories. Except for nighttime sleep duration, all of the nap cessation correlates identified in this study are non-malleable. The functional benefits of napping among preschool children are nuanced, domain-specific, and may depend on whether the child is a habitual napper. On the one hand, children who are no longer napping tend to perform better on receptive language and some cognitive tasks than still-napping children (Dionne et al., 2011; Lam et al., 2011; Werchan & Gomez, 2014), which may reflect nap cessation as a marker of increased maturation. On the other hand, napping has been shown to improve memory consolidation in preschoolers, although this effect tends to hold only for preschoolers who nap regularly (Kurdziel et al., 2013; Williams & Horst, 2014). Still other tasks, such as word generalization,

may be improved by napping regardless of whether the child naps regularly (Sandoval et al., 2017). However, overall, there is little evidence to suggest that encouraging preschool children to nap after they have naturally ceased provides any long-term functional benefits. However, more research on these functional outcomes is needed and should incorporate children's nap cessation timing.

Our findings may have implications for parents, childcare providers, and clinicians. This paper contributes to the literature on normative trends in napping among preschool children (e.g., (Iglowstein et al., 2003; Staton et al., 2020)). It is important for parents, childcare providers, and clinicians to be aware of normative trends in nap behavior. These groups can also benefit from understanding the developmental and socioenvironmental factors related to nap cessation, such as achieving more developmental milestones and having an older sibling. As noted above, most the identified factors are non-malleable, suggesting that parents and childcare providers should support, but not actively alter, children's transition out of daytime naps. The extant literature and our findings suggest that flexible napping policies, which respect the developmentally normative transition from biphasic to monophasic sleep among preschool-children, should be adopted. That is, children who nap habitually should have opportunities to nap and children who no longer nap should have alternate activities available (such as quiet time). This recommendation aligns with previous evidence from independent research groups (Pattinson et al., 2014; Smith et al., 2019; Thorpe et al., 2018), who have stated that there is a "need to be responsive to the individual changes in [the] need, purpose, and patterns of daytime sleep in developing children" (Smith et al., 2019, p. 33). As discussed above, children who attend childcare programs with mandatory napping policies and non-habitual nappers may experience rises in cortisol (indicating stress associated with naptime) and less positive environments, particularly in lower socioeconomic neighbourhoods (Pattinson et al., 2014; Staton et al., 2017; Thorpe et al., 2018). More research is required to solidify these recommendations, including evidence specific to the developmental timing of nap cessation and functional outcomes and further quasi-experimental or experimental studies.

2.5.1 Limitations & Future Directions

This study has several strengths including its large and nationally representative sample (at the time of data collection), longitudinal design, and inclusion of multiple cohorts to examine the stability of parameter estimates. However, our findings should be interpreted while considering several key limitations. Firstly, we employed a dichotomous definition of napping status (i.e., napping versus non-napping). Developmental trends suggest children transition from several naps per day, to a single daily nap, to irregular naps, to exclusively nighttime sleep (Mindell et al., 2016; Staton et al., 2020). These developmental trends are best captured through repeated-measures designs with short follow-up periods (e.g., 6 months), which are difficult to implement at a national scale. Future research should test our predictive model using these repeated-measures designs. Secondly, our results capture several components of the socioecological model, including child- and parent-level factors. However, the general-developmental focus of the NLSCY did not allow for interactional processes, such as sleep-specific parental attitudes or preferences, which have been demonstrated to influence nighttime sleep behavior (Sadeh et al., 2007). Therefore, there may be additional processes, such as parental beliefs about naps in their children, which further predict nap cessation (discussed in Chapter 4) Future research should examine these attitudinal factors and their unique contribution to napping cessation prediction.

Thirdly, there are key limitations to our measurement. All measures used in this study were parent-report, and thus may be affected by bias or common measurement issues. However, multi-informant designs are difficult to implement at the scale of the NLSCY. Specifically, many preschool children attend daycares. In this study, we did not measure how often children were in daycare or the napping policies within these specific care-settings. Parents may be unaware of the day-to-day variation in sleep timing and duration while their children attend daycare. Future research should implement multi-method designs, with special attention to childcare (Staton, Smith, & Thorpe, 2015).

Fourthly, our temperament variable may be oversimplified. Specific subdomains of temperament may have significant impacts on daytime sleep behavior (e.g., rhythmicity, adaptability; (Hall et al., 2007; Newton et al., 2020)). Fifthly, our sample underrepresents non-White children in Canada at present. The NLSCY sample was representative of the Canadian population at the

time of data collection (1998-2005), but Canadian demographics have since changed. While inclusion of samples that are representative of the current population may be unlikely to change our observed predictive relations, it may alter the prevalence of napping cessation.

This manuscript presents predictors of early nap cessation (i.e., before a child's third birthday). However, the predictors of late nap cessation (e.g., after a child's fourth or fifth birthday) remain untested. Future research should test the predictors of this developmental trajectory, while applying the socioecological model. As noted in the introduction, previous research has largely evaluated nap duration, rather than the developmental timing of nap cessation, in relation to functional outcomes, and the longitudinal implications of children's nap cessation timing remain untested.

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Chapter 3

3 Early nap cessation in young children as a correlate of language and psychosocial outcomes: Evidence from a Large Canadian Sample

3.1 Abstract

Objectives: Most children stop napping between 2 and 5 years old. We tested the association of early nap cessation (i.e., children who stopped before their third birthday) and language, cognition functioning and psychosocial outcomes. **Methods:** Data were from a nationally representative, longitudinal sample of Canadian children, with three timepoints. Children were 0-to-1 year old at Time 1, 2-to-3 years old at Time 2, and 4-to-5 years old at Time 3. Early nap cessation was tested as a correlate of children's behavioral functioning (cross-sectionally and longitudinally), cognitive function (longitudinally), and language functioning (longitudinally). There were 4923 children (50.9% male; 90.0% White) and their parents in this study who were included in the main analyses. Parents reported on demographics, perinatal and developmental variables, child functioning, and child sleep. Children completed direct assessments of receptive language and cognitive ability. Nap cessation, demographic, and developmental-control variables were tested as correlates of cross-sectional and longitudinal outcomes using linear regression (with a model-building approach). **Results:** Early nap cessation correlated with higher receptive language ability ($\beta = 0.059$) and lower anxiety ($\beta = -0.039$) at Time 3, after controlling for known correlates of nap cessation, nighttime sleep, and other sociodemographic correlates of functioning. Cognitive ability, hyperactivity-inattention, and aggression were not correlated with nap cessation. **Conclusions:** Early nap cessation is related to specific functional benefits (i.e., better receptive language and lower anxiety symptoms). These findings align with previous research. Future research should investigate differences associated with late nap cessation and in nap-encouraging cultures, and by ethnicity.

3.2 Introduction

Most 2-year-old children have a daytime nap, while few 5-year-old children do (Staton et al., 2020). Emerging evidence has identified correlates of nap cessation and factors which

distinguish children who nap and do not. However, how does napping relate to longitudinal outcomes? Some evidence suggests that children who stop napping earlier may have better developed behavioral and language functioning than still napping peers (Dionne et al., 2011; Knowland et al., 2022; Lam et al., 2011; Spruyt et al., 2008). Other evidence suggests that naps produce at least short-term benefits for children's learning and memory (Sandoval et al., 2017; Wang et al., 2022; Werchan & Gomez, 2014). Thus, nap cessation may have implications for specific functional outcomes. This study aimed to understand the differences in psychosocial (e.g., anxiety) and cognitive outcomes (e.g., receptive language) between children who cease napping early (i.e., before their third birthday), compared to children who nap later into development.

3.2.1 Developmental Trajectories of Nap Cessation

Most children in Western countries transition from polyphasic (many daytime naps and a nighttime sleep period) to biphasic (single daytime nap and a longer sleep period) to monophasic sleep (nighttime sleep period only) during their first 5 years. This process of sleep consolidation is gradual, with nap cessation capturing its endpoint. Meta-analytic findings demonstrate that just 1-6% of children have stopped napping by 2-years-old, 23-44% of children have ceased by 3-years-old, and almost all children (90-97%) have ceased napping by 5-years-old (Staton et al., 2020). However, nap cessation rates appear to be lower in North America (i.e., children tend to cease napping later) (Staton et al., 2020). Thus, between 2-to-3-years indicates the age where there is marked variability in nap cessation. Other researchers have argued that at about 2-years-old, children may no longer require daytime sleep to meet 24-hour sleep requirements (Staton et al., 2015). As such, we have operationalized "early nap cessation" as stopping napping before 3-years-old, in this Chapter and in Chapter 2. Early nap cessation is a relative term and longitudinal research conducted in multiple countries is needed.

Nap cessation may be a marker of general development (Schwichtenberg et al., 2011) and is likely driven by developmental and socio-environmental factors (Chapter 2; Crosby et al., 2005; Smith et al., 2019; Touchette et al., 2013). Typically developing children or those who sleep longer at nighttime are more likely to have ceased napping than non-typically developing peers or children who sleep for shorter durations at night (Schwichtenberg et al., 2011; Smith et al.,

2019; Touchette et al., 2013). Socio-environmental factors also predict nap cessation; for example, non-White children tend to cease napping at older ages than White children (Crosby et al., 2005). In Chapter 2, I presented a longitudinal study of Canadian children ages 0-1-year-old (at baseline) and 2-3-years-old (at follow-up), early nap cessation (i.e., before age 3) was associated with older child age, the child being female, having an older sibling, achieving more developmental milestones, and longer nighttime sleep duration, whereas continued napping was associated with non-White ethnicity, low birthweight (<2500 grams), the parent working/in school, and the biological mother consuming alcohol during pregnancy (Chapter 2). Thus, we have some understanding of the factors associated with nap cessation. However, how nap cessation at an earlier age may in turn influence other outcome measures is unclear. The current study examined how early nap cessation is associated receptive language, cognitive ability, and psychosocial functioning.

3.2.2 Napping and Functional Outcomes

Previous research has investigated the relation of napping frequency (e.g., number of naps per week), nap duration (e.g., minutes spent napping), and sleep consolidation (ratio of daytime to nighttime sleep) to psychosocial functioning, cognitive abilities, and language abilities (see Thorpe et al., 2015 for a review). Shorter nap durations are associated with better psychosocial functioning (e.g., lower anxious/depressive symptoms) among 4-6-year-old children (Yokomaku et al., 2008). Cross-sectional, longitudinal, and quasi-experimental evidence has also demonstrated that preschool-age non-nappers have better receptive language skills than nappers (Dionne et al., 2011; Knowland et al., 2022; Lam et al., 2011; Werchan & Gomez, 2014). A recent correlational study reported that inconsistently napping 4-6 year-old children had better general cognitive ability scores than consistently napping peers (Smith et al., 2019). In contrast, experimental studies have shown that habitually napping preschool children's learning and memory often benefits from napping after learning, in short-term testing intervals (Gomez et al., 2006; Kurdziel et al., 2013; Sandoval et al., 2017; Wang et al., 2022; Werchan et al., 2021; Williams & Horst, 2014).

Research on napping and functional outcomes has yet to test *early nap cessation* as a correlate of functioning. This aspect of napping behavior differs from alternative definitions (e.g., duration,

frequency, sleep consolidation) as it identifies the point at which children consolidate biphasic sleep into monophasic sleep. The extent to which early nap cessation is relevant for key functional outcomes can inform our understanding of the developmental importance of nap cessation. Further, previous research has inconsistently controlled for other known correlates of functioning, such as the child's age, development in general, and sociodemographic correlates (e.g., family income, parental education).

There are at least four competing hypotheses that may account for an association between early nap cessation and functional outcomes. (H1) Nap cessation may be a specific developmental marker. If so, there would be a unique and significant contribution of nap cessation on the outcome, after controlling for other correlates of the outcome, such as age and socioeconomic factors. (H2) Functional differences could be due to general development; that is, nap cessation coincides with other aspects of developmental progression, but does not uniquely contribute to outcomes. Here, nap cessation would not significantly relate to an outcome, after controlling for other general developmental variables and other known correlates of nap cessation. (H3) Functional differences and nap cessation could be due to better socio-economic circumstances, which enhance development and in turn contribute to both early nap cessation and improved functioning. Here, nap cessation would not significantly relate to functional outcomes after controlling for key socioeconomic variables, like family income and parental education. (H4) Functional differences could be due to nighttime sleep duration, rather than nap cessation specifically. Here, nap cessation would not significantly relate to an outcome after controlling for nighttime sleep duration; or nap cessation and nighttime sleep functioning would both relate to an outcome.

3.2.3 The Current Study

We investigated early nap cessation as a correlate of language, cognitive, and psychosocial outcomes in a large sample of Canadian preschool children, while controlling for previously identified correlates of nap status and demographic correlates of our outcomes, such as child age, ethnicity, and nighttime sleep duration (Chapter 2; Crosby et al., 2005; Schwichtenberg et al., 2011), in a series of models linked to the above hypotheses. This was a retrospective analysis of

an existing dataset. The original project did not have the main aims of investigating sleep or napping.

3.3 Methods

Data from Cycles 3-7 of the Canadian National Longitudinal Study of Children and Youth (NLSCY) were used. Cycle 3 was used as the starting point as it was the first cycle with the required variables. The NLSCY was a multi-year (1998-2009) study conducted by Statistics Canada, aimed to monitor the development and well-being of children from infancy to adulthood and was not specifically designed to investigate children's sleep. For more information, visit: https://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&Id=4632. Ethics approval and consent was obtained by Statistics Canada during original data collection. The Social Science and Humanities Research Council approved the present study's objectives and requested variables. Results were reviewed for maintained anonymity by Statistics Canada analysts, prior to release.

The NLSCY has multiple longitudinal cycles. A "cycle" is a data collection period (e.g., Cycle 4 data was collected between 2000-2001). Cycles occurred every 2 years. The present study constructed three longitudinal "cohorts" with three cycles of data per cohort. Each cohort includes three timepoints: Time 1 (T1): a baseline cycle reflecting the inception timepoint for the cohort and when demographic and perinatal variables were gathered; Time 2 (T2): a follow-up cycle when information on napping and cross-sectional outcomes were gathered; and Time 3 (T3): a follow-up cycle when longitudinal outcomes were gathered. Cohort 1 (the first cohort in the present study) is composed of Cycle 3 (T1; 1998-1999), Cycle 4 (T2; 2000-2001), and Cycle 5 (T3; 2002-2003). Cohort 2 is composed of Cycle 4 (T1), Cycle 5 (T2), and Cycle 6 (T3; 2004-2005). Cohort 3 is composed of Cycle 5 (T1), Cycle 6 (T2), and Cycle 7 (T3; 2006-2007).

3.3.1 Participants

The person most knowledgeable (PMK) about the child provided information (N = 4923; $n_{\text{Cohort 1}}$ = 2371, $n_{\text{Cohort 2}}$ = 1366, $n_{\text{Cohort 3}}$ = 1186). The NLSCY was representative of the Canadian population at the time of data collection. Demographic characteristics are presented in Table 3.1.

Table 3.1: Parent, Child, and Family Demographic Characteristics

Characteristic	Category	% (*n*) or *M* (*SD*)
Parent		
Age	15 to 24 years	17.3% (852)
	25 to 29 years	30.2% (1485)
	30 to 34 years	32.2% (1585)
	35 to 39 years	15.6% (769)
	40 years or older	4.7% (232)
Marital Status	Married/common-law	89.3% (4395)
	Single, widowed, separated, or divorced	10.7% (528)
Employment Status	Works or attends school	73.0% (3595)
	Does not work or attend school	27.0% (1328)
Relationship with Child	Biological mother	88.9% (4375)
	Other relationship	11.1% (548)
Education Completed	Less than secondary school or equivalent	11.8% (579)
	Secondary school or equivalent graduate	14.7% (724)
	Some post-secondary school education	18.6% (918)
	College or university graduate and above	47.2% (2325)
Family		
Income Adequacy	Lowest	2.5% (123)
	Lower-Middle	10.2% (502)
	Middle	28.4% (1398)
	Upper-Middle	39.3% (1936)
	Highest	19.6% (964)
Region of Residence	Atlantic (Newfoundland, New Brunswick, Nova Scotia, PEI)	18.7% (923)
	Quebec	18.2% (897)
	Ontario	27.1% (1334)
	Prairie (Manitoba, Saskatchewan, Alberta)	27.0% (1330)
	British Columbia	8.9% (439)
Child		
Age (months)	At T1 Cycle	10.19 (3.95)
	At T2 Cycle	30.79 (4.59)
	At T3 Cycle	53.91 (4.33)

Sex	Male	50.9% (2507)
Ethnicity [1]	White	90.0% (4429)
	Non-White	9.4% (463)
Siblings	Has an older sibling	54.6% (2688)
	Has a younger sibling	21.6% (1061)
Child Chronic Health Condition (T3) [2]	Has one or more chronic health conditions	18.9% (929)
	No chronic conditions	80.2% (3949)

Note: [1] Non-White includes Arabic, Black, Filipino, Indigenous Persons, Latin American, and Asian: Frequencies for these specific ethnicity categories could not be produced for this dataset due to Statistics Canada data vetting regulations.

[2] Chronic health conditions included any health condition lasting or expecting to last 6 months or longer. Examples included epilepsy, heart conditions/disease, bronchitis, and cerebral palsy. Frequencies for specific chronic health condition categories could not be produced for this dataset due to Statistics Canada date vetting regulations.

The complete inclusion criteria for the NLSCY are explained elsewhere (Statistics Canada, 1999). Briefly, the NLSCY included non-institutionalized children who lived in Canada's provinces and excluded children who were living in a territory, on Indian reserves or Crown lands, those living in institutions, and those whose parents were full-time members of the Canadian Armed Forces.

3.3.2 Study Criteria

In the current study, inclusion criteria were children who were (1) 0-1-years-old at baseline (T1), (2) were less than 3-years-old at T2 and had valid napping data at T2 (described below), and (3) had at least partial valid outcome data (i.e., families who were lost to T3 follow-up were excluded).

3.3.3 Procedure

Data were collected via face-to-face or telephone interviews with PMKs and direct assessments with children. For data in the current study, at T1, PMKs reported on demographic variables and perinatal variables. At T2, PMKs reported on nap status and cross-sectional outcomes. At T3, PMKs reported on longitudinal outcomes and children completed two direct assessment measures in the family's home (see Outcome Variables below).

3.3.4 Measures

The survey questions and measures used in the NLSCY were selected by an expert advisory group (Statistics Canada, 1999). These scales are established measures or short-form derivatives generated for the NLSCY. The construct validity of each scale was supported in tests by Statistics Canada (Statistics Canada, 1999). Descriptive statistics are presented in Table 3.2.

3.3.4.1 Control Variables

Demographic Variables (T1). PMKs reported on their own age, marital status, employment status, relationship with their child, and educational attainment; their child's age, sex, ethnicity, number of siblings, and whether the child had a chronic health condition (i.e., health condition lasting or expected to last 6 months or more); and their family's income adequacy and region of residence. As in Chapter 2, the exact wording of the ethnicity item was, "How would you best describe [child's name]'s race or colour?" Since the time of the NLSCY, Statistics Canada ethnicity questions have become broader and generally more inclusive (e.g., 2021 Canadian Census).

Table 3.2: Descriptive Statistics for the Independent, Control, and Outcome Variables

Variable	Category/Unit	% (*n*) or *M* (*SD*)
Independent Variable		
T2 Early Nap Cessation (Dichotomous)	1 = No Longer Napping	11.1% (546)
Control Variables		
T1 Low Birth Weight (Dichotomous)	1 = Yes	5.5% (271)
T1 Maternal Alcohol Use During Pregnancy (Dichotomous)	1 = One or more drinks	11.3% (555)
T2 Developmental Milestones	Standard Score (M = 100; SD = 15)	100.19 (15.07)
T2 Sleep Duration	Hours	9.85 (1.96)
Outcome Variables		
T2 Hyperactivity-Inattention	Units (range = 0-14)	3.64 (2.33)
T3 Hyperactivity-Inattention	Units (range = 0-14)	4.17 (2.67)
T2 Aggression	Units (range = 0-16)	4.92 (2.87)
T3 Aggression	Units (range = 0-16)	1.78 (2.00)
T2 Anxiety	Units (range = 0-12)	1.23 (1.42)
T3 Anxiety	Units (range = 0-12)	1.94 (1.88)
T3 Cognitive Ability	Units	21.15 (5.72)
T3 Receptive Language	Standard Score (M =100; SD =15)	101.49 (14.43)

Note: T1 = Time 1 (Baseline; children were 0-1 year-old); T2 = Time 2 (2-year follow-up; children were 2-3 years-old); T3 = Time 3 (4-year follow-up; children were 4-5 years-old)

Developmental Milestones = standard scores on the Ages and Stages Questionnaire.

Perinatal Variables (T1). PMKs provided their child's birth weight (reported in grams) and whether the child's biological mother consumed alcohol during the pregnancy. For analyses in this study, maternal alcohol consumption during pregnancy was dichotomized as 0 = no alcohol consumed, 1 = alcohol consumed once or more during pregnancy.

Developmental Milestones (T2). Developmental milestones were calculated from the Ages and Stages Questionnaire (ASQ; (Squires et al., 2009)) and included five areas of development (Communication, Fine Motor, Gross Motor, Problem-Solving, and Personal-Social). In a review, the ASQ demonstrated excellent test-retest reliability (r = .92), sensitivity (87.4%), and specificity (95.7%) for detecting developmental delay (Singh et al., 2017). The original factor structure of the ASQ was supported within the NLSCY (Statistics Canada, 1999). Standardized ASQ scores (M = 100, SD = 15) were constructed using NLSCY Cycle 1 data (calculated by Statistics Canada analysts); raw scores were not available. To increase interpretability in the present study, standardized ASQ scores were recoded into half-standard deviation units prior to analyses. Higher scores indicated that more developmental milestones had been achieved.

Nighttime Sleep (T1 & T2). PMKs reported on their children's nighttime sleep duration (in hours). Similar parent-report items are strongly associated with objective measures of sleep such as actigraphy (r = .74) (Sadeh, 1994, 1996).

3.3.4.2 Dependent Variable

Nap Cessation (T2). PMKs were asked: "In general, what is the longest time [child's name] naps during the day?". Response options were: (1) less than 1 hour; (2) from 1 hour to less than 2 hours; (3) From 2 hours to less than 3 hours; (4) From 3 hours to less than 4 hours; (5) 4 hours or more; (6) child does not nap anymore. Importantly, the NLSCY only asked this question of parents whose children were 0-3-years-old. Responses were dichotomized to operationalize nap cessation. "Child does not nap anymore" was coded as "child ceased napping" (1) and the child napping for any duration was coded as "child still napping" (0).

3.3.4.3 Outcome Variables

Psychosocial Functioning (T2 & T3). PMKs reported on psychosocial functioning on three separate scales: (1) anxiety (6-items; scores could range from 0-12); (2) hyperactivity-inattention (7-items; scores could range from 0-14); and (3) aggression-opposition (8-items; scores could range from 0-16). Statistics Canada derived these items primarily from the Child Behavior Checklist (Achenbach et al., 1987; Achenbach & Rescorla, 2000), with supplements from other sources to adapt to Canadians. PMKs responded about their child's recent behavior on a 3-point scale (0 = "Never or not true"; 1 = Sometimes or somewhat true"; 2 = "Often or very true"). The Child Behavior Checklist has demonstrated strong psychometrics outside of the NLSCY (Achenbach et al., 1987; Achenbach & Rescorla, 2000). The factor structure within the NLSCY was supported via confirmatory factor analyses by Statistics Canada analysts (Statistics Canada, 1999). On each scale, higher scores indicated greater psychosocial problems.

Cognitive Ability (T3). Children completed the Who Am I Cognitive Assessment (de Lemos & Doig, 2000). This nonverbal standardized measure is appropriate for preschool and early school-age children and provides early literacy and numeracy assessments through drawing and copying tasks. Performance is strongly associated with subsequent academic achievement and is valid across cultural groups (Statistics Canada, 1999). Scores could range from 10-40; higher scores indicated greater cognitive ability. Raw scores were used for analyses, as we did not want to remove the effects of age on this outcome (King et al., 2018).

Receptive Language Ability (T3). Children completed the Peabody Picture Vocabulary Test – Revised (PPVT-R (Dunn, 1981)). The PPVT-R is a standardized measure of receptive vocabulary in which the assessor states a word and the child points to the corresponding picture representing that word. In its original validation, the PPVT-R has demonstrated construct validity, using a one-parameter logistic model under an Item Response Theory (IRT) framework. Norms were created using a large, representative sample from the United States. Statistics Canada analysts replicated these IRT analyses using Cycle 4 data and found no systematic differences between the NLSCY and the original US sample. The PPVT-R has also demonstrated adequate split-half and alternate-form reliabilities (Jongsma, 1982). Standard scores were

reported for descriptive purposes and raw scores were used for analyses (King et al., 2018). Raw scores could range from 0-175. Higher scores indicated greater receptive language ability.

3.3.5 Data Analyses

Analyses were conducted in Mplus (v8; Muthén & Muthén, 1998-2017)). All analyses were unweighted. Statistics Canada does not provide normalized weights for longitudinal NLSCY datasets and the usage of population weights would increase power and bias tests of significance (Miratrix et al., 2018).

Early nap cessation was tested as a correlate of cross-sectional and longitudinal outcomes using linear regressions. Each linear regression was conducted using a model building approach, where additional control variables were added in three (cross-sectional outcomes) or four models (longitudinal outcomes) to assess the unique contribution of early nap cessation. Cross-sectional models were those in which nap cessation and the outcome was measured at the same timepoint (T2); longitudinal models were those in which nap cessation was measured at T2 and the outcome was measured at T3. These models were: (1) nap cessation; (2) previously established correlates of nap cessation (i.e., child's sex, child age, child's ethnicity, child having an older sibling, PMK working/in school, low birthweight, maternal alcohol use during pregnancy, developmental milestones, and T2 nighttime sleep duration); (3) other relevant demographic controls (i.e., parental education and income adequacy); (4) T3 nighttime sleep duration (for longitudinal outcomes only) and the T2 assessment of the outcome variable (for longitudinal psychosocial outcomes only; i.e., hyperactivity-inattention, aggression, anxiety). As the study's principal aim was to evaluate outcomes associated with early nap cessation, outcomes which did not differ by nap cessation in Model 1 (bivariate relation) were not evaluated further. This decision was made a priori to reduce the number of analyses conducted. P-values were adjusted using the False Discovery Rate (Benjamini, 2010).

Then, we conducted exploratory analyses to investigate whether the key parameter estimate (i.e., beta for early nap cessation predicting each outcome) differed significantly between White and non-White children. This was evaluated using a Wald test with a critical value of $p = .05$.

3.3.6 Approach to Missing Data

The sample sizes for T1 and T2 were N = 4923, meaning all included participants had at least partial data. An additional 11% of cases (n = 581) were lost to T3 follow-up (i.e., had no valid outcome data) and were excluded from analyses. Thus, 4923 participants with at least partial data were included. Missing data for outcome and control variables were low: <10% for all variables, except for PMK highest education attained (14%). Differences between participants who had valid outcome data and those who were lost to follow-up were analyzed using chi-squares and t-tests, as appropriate. Participants with valid outcome data differed significantly by marital status, income adequacy, PMK's educational attainment, child's birthweight, whether the child had a younger sibling, and child's ethnicity (see Supplemental Table C3). The correlates of missingness were analyzed using a logistic regression; that is, testing variables associated – "participant being lost to T3 follow-up (yes vs. no)". Missing data were handled using Full Information Maximum Likelihood (FIML). FIML is not without risk. However, the variables found to predict missingness (i.e., parental education attainment, income adequacy, ethnicity, and low birthweight) were already planned as controls in the models. Inclusion of these variables has the desirable property of rendering the missingness structure as "missing at random" (Widaman, 2006).

3.4 Results

3.4.1 Preliminary Analyses

The intercorrelations between outcome variables were assessed using Pearson Correlations. All correlations were less than 0.50 suggesting distinctiveness (see Supplemental Table C4). Multicollinearity was assessed using Variable Inflation Factors (VIFs). All VIFs were below 2, suggesting no substantial multicollinearity.

In T1 cycles, children were 0-1-years-old (*M* = 10.19 months; *SD* = 3.95 months); in T2 cycles, children were 2-3-years-old (*M* = 30.79 months; *SD* = 4.59 months); and in T3 cycles, children were 4-5-years-old (*M* = 53.91 months; *SD* = 4.33 months). Across cohorts, 10.9% (± 0.8%, 95% Confidence Interval) of children (*n* = 602) had ceased napping by their third birthday (this result was previously reported in Chapter 2 and is discussed in more detail there).

3.4.2 Psychosocial Functioning

In bivariate analyses, T2 Hyperactivity-Inattention (cross-sectional), T2 Anxiety (cross-sectional), and T2 Aggression (cross-sectional) and T3 Aggression (longitudinal) were not associated with nap cessation. Therefore, no further models were tested.

For T3 Hyperactivity-Inattention, children who ceased napping before their third birthday tended to have **lower** T3 Hyperactivity-Inattention scores than children who were still napping (β = -.038, *se* = .014, *p* = .016, R^2 = .001). However, this relation was not maintained after controlling for known correlates of nap cessation (Model 2). Full regression results are presented in Supplemental Table C2.

For T3 Anxiety, children who ceased napping before their third birthday tended to have **lower** T3 Anxiety scores than children who were still napping (β = -.053, *se* = .015, *p* < .001, R^2 = .003). This effect was maintained after controlling for known correlates of nap cessation (Model 2), other relevant demographic control variables and T2 anxiety (Model 3), and current nighttime sleep duration (Model 4; see Table 3.3). In the fully adjusted model, early nap cessation was associated with lower T3 Anxiety scores (β = -.039, *se* = .015, *p* = .007).

3.4.3 Cognitive Ability

Children who ceased napping by their third birthday tended to have **higher** T3 Cognitive Ability than children who were still napping (β = .073, *se* = .016, *p* < .001, R^2 = .005). However, this effect was not maintained after controlling for other known correlates of nap cessation (Model 2; see Supplemental Table C3).

3.4.4 Receptive Language Ability

Children who ceased napping by their third birthday tended to have **higher** T3 Receptive Language scores than children who were still napping (β = .103, *se* = .015, *p* < .001, R^2 = .011). This effect was maintained after controlling for known correlates of nap cessation (Model 2), other known demographic controls (Model 3), and current nighttime sleep duration (Model 4). In

the fully adjusted model, early nap cessation was associated with higher T3 Receptive Language scores ($\beta = .059$, $se = .015$, $p < .001$).

Table 3.3: Summary of the relations between outcomes and early nap cessation by adjustment

	Early Nap Cessation							
	Model 1 (Unadjusted Beta)		Model 2 [a]		Model 3 [b]		Model 4 [c]	
	Model R^2	β (se)	ΔR^2	β (se)	ΔR^2	β (se)	ΔR^2	β (se)
Outcomes								
T2 Hyperactivity-Inattention	0.001	-0.026 (.015)						
T3 Hyperactivity-Inattention	0.001	-0.038* (.014)	0.040	-0.013 (.015)	.016	-0.013 (0.015)	.144	-0.007 (0.013)
T2 Aggression	0.000	0.007 (0.014)						
T3 Aggression	0.000	-0.010 (0.014)						
T2 Anxiety	0.000	-0.012 (0.014)						
T3 Anxiety	0.003	-0.053*** (0.014)	0.014	-0.047** (0.015)	.008	-0.044** (0.015)	.067	-0.039* (0.014)
T3 Cognitive Ability	0.005	0.073*** (0.016)	0.161	0.006 (0.015)	0.029	0.006 (0.015)	0.002	0.006 (0.015)
T3 Receptive Language	0.011	0.103*** (0.015)	0.083	0.055*** (0.015)	0.050	0.059*** (0.015)	0.001	0.059*** (0.015)

Note. This table depicts the standardized betas and standard errors for Early Nap Cessation for each functional outcome. Full regression results are available in supplemental materials. Where Early Nap Cessation was a non-significant correlate of an outcome in Model 1 (Unadjusted), no further analyses were conducted. T2 = Time 2 (children were 2-3 years old), T2 variables are cross-

sectional; T3 = Time 3 (children were 4-5 years old), T3 variables are longitudinal. P-values were adjusted for multiple comparisons using the False Discovery Rate.

* $p < .05$; ** $p < .01$; *** $p < .001$.

Percentage of sample size with complete data for each outcome are as follows: T2 Hyperactivity-Inattention (95.0%); T3 Hyperactivity-Inattention (95.3%); T2 Aggression (95.1%); T3 Aggression (95.5%); T2 Anxiety (95.5%); T3 Anxiety (95.3%); T3 Cognitive Ability (77.6%); T3 Receptive Language (85.3%). As an FIML approach was used, information from individuals without complete data for each outcome was still utilized in the analyses to estimate the models.

[a] This model controlled for the child's cohort and known correlates of early nap cessation (i.e., child's sex, child age, child's ethnicity, child has an older sibling, Person Most Knowledgeable is working or in school, low birthweight [<2500 grams], maternal alcohol use during pregnancy [once or more], developmental milestones achieved, and T2 nighttime sleep duration).

[b] This model controlled for all Model 2 control variables and other known sociodemographic correlates of functioning (i.e., parental education and income adequacy).

[c] This model controlled for all Model 2 and 3 control variables, plus T3 nighttime sleep duration and T2 psychosocial variables for T3 psychosocial models (e.g., T2 Hyperactivity was controlled for in the T3 Hyperactivity Model 4). This control was only applied to longitudinal (i.e., T3) outcomes.

3.4.5 Exploratory Analyses of Ethnicity

These analyses are presented in Supplemental Table C7. In brief, only the parameter estimates for Cognitive Ability differed significantly. For this outcome, non-White children who had ceased napping by their third birthday tended to have **lower** cognitive ability than non-White still napping children; whereas, among White children, early nap cessation was not significantly related. This result was maintained for non-White children after controlling for variables in Models 2-4. In the fully adjusted model, early nap cessation was associated with lower T3 Cognitive Ability scores for non-White children (β = -0.121, *se* = .050, *p* = 0.045).

3.5 Discussion

This study investigated whether nap cessation was associated with psychosocial, general cognitive, and receptive language functioning, using a large, longitudinal dataset and controlling for other relevant variables. Early nap cessation was associated with higher receptive language ability and lower anxiety, longitudinally, after controlling for other relevant variables. Consistent with our hypotheses, early nap cessation appears to have a unique contribution (i.e., H1 from the Introduction) to less anxiety and better receptive language abilities, over and above any effects of simple maturation, better sociodemographic circumstances, or better overall sleep functioning. Early nap cessation was not associated with cognitive ability, aggression, or hyperactivity-inattention after controlling for other variables. These results suggest that nap cessation may coincide with other aspects of development but does not uniquely contribute to these relations (i.e., H2).

Our findings align with the extant literature that has quantified napping in various ways and found that children who nap for shorter durations, have stopped napping, or have a lower ratio of daytime-to-nighttime sleep tend to have better receptive language abilities than children who nap for longer durations (Dionne et al., 2011; Knowland et al., 2022; Lam et al., 2011; Werchan & Gomez, 2014). Our findings advance this literature by demonstrating that early nap cessation is a relevant correlate for better receptive language abilities later in development. Dionne and colleagues proposed a theoretical framework for this relation (Dionne et al., 2011). In this framework, the relation occurs due to one of three possible explanations: (1) better sleep

functioning predicts memory functioning, which in turn promotes language learning; (2) sleep processes are well-organized (i.e., consolidated), which supports higher-order cognitive organization (language and social functioning); and/or (3) common genetic or environmental influences, such as general maturation, adverse perinatal events, or sociodemographic factors, underlie both nap cessation and language development. Our results are consistent with these first two explanations, but do not support the third explanation. Recently, Knowland and colleagues proposed that consolidated sleep may lead to nocturnal sleep that is more efficient and richer in slow wave activity, which could in turn lead to greater consolidation of language (Knowland et al., 2022). Our results are consistent with this idea, as children with early nap cessation would have more years to benefit from more efficient, slow wave dense nocturnal sleep, leading to a cumulative benefit in consolidated linguistic knowledge. This hypothesis could be verified through studies incorporating polysomnography.

We provide preliminary evidence that early nap cessation is associated with lower child anxiety later in development. Greater sleep process organization may support greater higher-order cognitive organization (e.g., emotional regulation). That is, more developed sleep organization (as observed by daytime sleep consolidated into exclusively nighttime sleep) may be required for emotional regulation organization, which in turn would predict lower anxiety. Importantly, though nap cessation was significantly related to T3 anxiety, nap cessation only accounted for 0.3% of the variance in T3 anxiety. As such, more research is required to understand the connection between anxiety and nap cessation, as well as its practical significance.

Previous investigations of the relation between napping and psychosocial function vary depending on the specific outcome. Yokomaku and colleagues (2008) assessed psychosocial functioning using parental report for 4-6 year-old children. They found a significant positive correlation between nap duration and internalizing problems (i.e., anxiety- and depression-related subscales), but not with attention or aggressive problems. Others have found no relation between nap duration and parent-reported hyperactivity-inattention, or general behavioral functioning (Burnham et al., 2016; Lam et al., 2011). This is consistent with our findings. In terms of hyperactivity-inattention, it appears that delayed maturation (i.e., fewer milestones) and less favorable family circumstances contribute to both giving up naps later and hyperactivity-inattention, as opposed to of nap cessation uniquely.

3.5.1 Strengths and Limitations

Strengths of this study include the longitudinal design, inclusion of multiple cohorts to examine the stability of parameter estimates, and use of statistical control to reduce the influence of competing variables. However, this study also has important limitations. Firstly, we used a dichotomous definition of napping. This definition allows for the evaluation of the developmental importance of nap cessation but does not account for nuances in the developmental trajectory of nap cessation (i.e., polyphasic to biphasic to monophasic sleep). Instead, this research focuses on the final phase of this trajectory and defined early nap cessation to capture children who may have stopped napping after daytime sleep was no longer needed to meet 24-hour sleep requirements [20]. Future research should test longitudinal differences between non-napping, inconsistently napping, and consistently napping in 1- to 5-year-old children; this might be done using frequency questions (e.g., "in the last month, how often did your child nap?"), as has previously been applied in a cross-sectional sample (Smith et al., 2019). Secondly, we did not control for some known correlates of specific outcomes. For example, temperament, consistently associated with psychosocial functioning, was not included (Rothbart, 2007). We kept our control variables consistent across the models, as: (1) the primary focus of this study was in understanding differences associated with early nap cessation, not the predictors of the outcomes; (2) this consistency increased interpretability; (3) other possible control variables, including temperament, have ***not*** been related to nap cessation (Chapter 2; Smith et al., 2019). Thirdly, our sample was representative of the Canadian population at the time of data collection (1998-2007), but the current Canadian population has more ethnic diversity and is more educated. We were also unable to examine differences between specific ethnicity groups, due to Statistics Canada restrictions. These demographic differences would be unlikely to affect our parameter estimates but could alter the prevalence of early nap cessation, which was not a focus of this study. Fourthly, this study used a non-experimental design; as such, causation cannot be inferred. To address this limitation in our longitudinal design, we utilized temporal ordering and control of confounding variables. Finally, cases lost to follow-up at T3 differed from those with data. As is common in longitudinal studies, those lost to follow-up tended to have more adverse family situations, which may have impacted the findings.

3.5.2 Future Directions & Implications

This study demonstrated longitudinal differences by early nap cessation. However, the cross-sectional and longitudinal differences by *late* nap cessation (e.g., child stops napping after their fourth or fifth birthday) remain untested. In addition, it is unclear whether the observed differences in receptive language and anxiety would be maintained across a longer follow-up period. Future research should also evaluate differences in additional outcomes, like expressive language and executive function (e.g., inhibitory control, working memory, delayed gratification, and shifting). Previous research has tested a subset of these variables using cross-sectional and quasi-experimental designs (Kurdziel et al., 2013; Lam et al., 2011; Lukowski & Milojevich, 2013) but has not tested the effect of nap cessation. This research would expand our understanding of the trajectories related to nap cessation and would help to determine its importance.

Future research should also investigate potential mechanisms of our observed relations. There are likely more complex biopsychosocial nuances. In exploratory analyses, we identified broadly similar effects for White and non-White children; however, for cognitive ability, the effect of early nap cessation was in the opposite direction. Future research must be designed to investigate these differences. For example, there may be important differences between specific ethnicity groups, which may also depend on regional napping attitudes/practices. These future studies can benefit from longitudinal designs (e.g., sequential cohort) with multiple timepoints and short follow-up periods (e.g., monthly for 6-12 months). These studies can also seek to replicate the prevalence of early nap cessation observed in our sample.

There may be important cultural differences in the relation between nap cessation and outcomes. Data from China suggests that school-age children who nap more often and for longer durations have *higher* academic achievement and verbal abilities and *lower* internalizing problems than peers who nap less often and/or for shorter durations (Liu et al., 2019). In Western cultures, napping is typically discouraged during preschool-years, and there are few opportunities to nap after school entry. By contrast, habitual napping is encouraged across school years in China (Liu et al., 2019). Future research should investigate the impact of napping on functional outcomes in

other nap-encouraging cultures (e.g., Spain, Italy; Williams et al., 2015) and how institutional policies and practices (e.g., childcare, schools) influence napping patterns.

Our findings can inform childcare policies and parent/provider knowledge related to daytime sleep. Our results suggest that children who stop napping earlier than peers have some better functional outcomes later in development. We found no evidence that continued napping provides benefits in any of the domains we tested. However, previous research suggests short-term memory and learning benefits from daytime sleep for *consistently* napping children (Gomez et al., 2006; Kurdziel et al., 2013; Sandoval et al., 2017; Wang et al., 2022; Werchan et al., 2021; Williams & Horst, 2014). Together, these findings support flexible napping policies in which children who have stopped napping have access to alternate activities (e.g., quiet time) and children who are still napping have opportunities to sleep. This flexible nap policy recommendation aligns with other research groups (Smith et al., 2019; Staton et al., 2015).

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Chapter 4

4 Parents, Preschoolers, and Napping: The Development and Psychometric Properties of Two Nap Belief Scales in Two Independent Samples

4.1 Abstract

Most children cease napping between 2-5-years-old. Little is known about the predictors of this cessation. Parents' sleep-related beliefs aid in understanding children's night-time sleep behaviors, but few index daytime sleep beliefs. Two measures of parents' napping beliefs were developed and evaluated: (1) the Parents' Nap Beliefs Scale (14-items) and (2) the Reasons Children Nap Scale (19-items). Canadian parents of 1-5-year-old children completed these questionnaires and other sleep-related measures in independent pilot (n = 201) and replication (n = 702) samples. In the replication sample, a subsample of parents also completed 1-3 weeks of daily sleep diaries. The samples were representative of the Canadian population by ethnicity and region. In both samples, both novel measures demonstrated strong construct validity, convergent and divergent validity, and internal consistency. The Parents' Nap Beliefs Scale was comprised of two factors: (1) Positive Beliefs and (2) Negative Beliefs about napping. The Reasons Children Nap Scale was comprised of two higher order factors and five lower order factors: (1) Encouragement Reasons ([a] Child-related; [b] Parent-related) and (2) Discouragement Reasons ([a] Child prefers not to nap; [b] Child functions well without a nap; [c] Scheduling). Future research should: (1) test these scales as longitudinal determinants of children's nap behavior and cessation; and (2) evaluate parental nap beliefs in non-Western cultures.

4.2 Introduction

Virtually all 2-year-olds nap, while few 5-year-olds have a daytime nap (Staton et al., 2020). Most preschoolers will consolidate their daytime sleep into exclusively nighttime sleep during this period, but little is known about the predictors of this transition. Furthermore, children vary considerably in the frequency and duration of napping during this developmental period. Previous research has identified demographic characteristics (e.g., ethnicity, maternal age) and developmental level as predictors of nap cessation (Crosby et al., 2005; Schwichtenberg et al.,

2011). However, research to date has largely ignored proximal family influences on children's nap behavior, such as parental attitudes toward napping and parental and child preferences (Jones & Ball, 2013). Earlier nap cessation has been associated with higher levels of language development, cognitive ability, better emotional regulation, and longer night-time sleep (Dionne et al., 2011; Lam et al., 2011; Thorpe et al., 2015; Werchan & Gomez, 2014). Thus, understanding the processes that contribute to nap cessation may have implications for understanding children's development.

We conceptualized children's nap behavior with the Socioecological Model (Grandner, 2014; Jenni & O'Connor, 2005). This model posits that children's transition toward monophasic sleep is influenced by factors at the individual-level (e.g., child's development) the family/social-level (e.g., parental beliefs and preferences), the societal level (e.g., culture), and the interactions between these levels. The present study aimed to enhance the measurement of family/social-level variables. Measurements assessing parents' beliefs about sleep have improved our understanding of young children's night-time sleep behavior (Coulombe & Reid, 2012; Sadeh et al., 2007). However, no measures exist to index parents' beliefs and preferences about daytime sleep behaviors. Measuring parents' beliefs about naps may improve our understanding of children's nap behaviors. This study provides preliminary and replicated psychometric data for two scales of parents' beliefs around napping for their preschool-age children.

Some previous research can provide templates for quantitively understanding parental nap beliefs. Qualitative data has indicated that parents may have specific reasons for encouraging or discouraging their child to nap (Jones & Ball, 2013). In a British study of parents of preschoolers, naps delaying bedtime was cited as the most common reason for discouraging a nap, while preventing bad tempers/behavior was the most common reason for encouraging a nap (Jones & Ball, 2013). Parents who generally encouraged naps had children who napped for longer and more often than parents who generally discouraged naps. Nap belief measurements have been developed for young adults and reveal three key reasons for napping: (1) appetitive (napping for enjoyment or habitually), (2) restorative (napping in response to subjective fatigue), and (3) prophylactic (napping in preparation for future sleep loss; Milner & Cote, 2009). However, this framework may not link conceptually to the reasons preschoolers nap. Firstly, among preschoolers in Western cultures, it is normal for sleep to be consolidated to nighttime

only. Secondly, parents have substantial influence over preschool children's daytime sleep schedules; whereas, adults generally dictate their own sleep schedules. Nap beliefs for parents of preschoolers likely result from multilevel influences (i.e., child-, parent-, and environmentally related influences). Thirdly, parents' beliefs about napping may change as their child ages. A preschool model of nap beliefs must account for these processes. Thus, this three-component framework can inform nap belief measurement among preschoolers, but it is insufficient. We conceptualized nap beliefs among parents of preschoolers in terms of: (1) multilevel influences and (2) developmental processes.

4.2.1 Objectives

(1) Create two developmentally sensitive scales to index: (a) parents' beliefs about napping, its benefits, and its consequences for preschool-age children; and (b) reasons parents would encourage or discourage naps for their child.
(2) Evaluate the scales' psychometric properties (i.e., internal consistency; content, construct, convergent, and divergent validity).

Two scales were developed: (1) the Parents' Nap Beliefs Scale (which indexes the beliefs about children's napping that parents of preschoolers hold) and (2) the Reasons Children Nap Scale (which indexes the reasons parents would encourage or discourage naps for their child).

4.2.2 Hypothesized Scale Structure

A rational construct-oriented approach was used in the development of these scales. This approach defines hypothesized constructs a-priori (Clark & Watson, 1995). The Parents' Nap Beliefs Scale was hypothesized to contain three subscales: (1) Positive Beliefs (napping should be encouraged or has positive effects on sleep and functioning in children); (2) Negative Beliefs (napping should be discouraged or has negative effects on sleep and functioning in children); and (3) Developmental Beliefs (napping is driven primarily by development and that napping will cease on its own). To capture developmental differences, which were expected to influence napping beliefs, parents were asked to consider children about the same age as their child for this scale. This approach has been used in other sleep-related measures for preschool-age children (Coulombe & Reid, 2012; Coulombe & Reid, 2014).

The Reasons Children Nap Scale was hypothesized to contain two higher-order factors: Encouragement (reasons parents would urge their child to nap) and Discouragement (reasons parents would dissuade their child from napping). Each of these factors was expected to have two subscales: (1) Child-related influences (encourage/discourage napping based on the benefits or consequences for the child) and (2) Parent-/Schedule-related influences (encourage/discourage napping based on the benefits or consequences for the parent and family). To capture individual differences, parents were asked to consider their own child for this scale.

Both scales were expected to relate to children's nap duration, napping frequency, and age, the degree to which naps were spontaneous (i.e., child just fell asleep), and the proportion of the child's sleep during the daytime. These scales were not expected to relate to nighttime sleep problems. Specific hypothesized relations between these scales and measures of convergent and divergent validity are presented in Appendix D (Table D1).

4.3 Method

The two nap belief scales were tested and refined in a Pilot Sample. The psychometric properties were re-evaluated in a Replication Sample. The procedures and measures for both samples were very similar; any differences are noted below.

4.3.1 Participants

4.3.1.1 Pilot Sample

Participants were the primary caregivers (i.e., parents) of children (1-5-years-old; $N = 201$), residing in Canada. Included parents: (1) were knowledgeable about daytime and nighttime routines for their child; (2) were comfortable reading in English; and (3) had children without a health condition which interfered with sleep (e.g., Autism). To reduce sampling bias, recruitment was targeted to achieve an approximately equal distribution of child age in half-year increments.

The sample size for this study was based on power guidelines for Confirmatory Factor Analysis (CFA) models which suggest when $N \geq 200$ and the number of indicators per factor is greater than three, power is generally adequate (Kyriazos, 2018).

Most parents were between 30-39-years-old (58%), White (70%), and were employed full-time (62%). About 33% had a bachelors or other undergraduate degree and 75% had a family income less than $100K. About half of the children were male (52%). See Appendix D materials for detailed sample characteristics (Table D3).

4.3.1.2 Replication Sample

As in the Pilot Sample, participants were the primary caregivers (i.e., parents) of children (1-5-years-old; N = 702), residing in Canada. The inclusion criteria were identical to the Pilot Sample. To reduce sampling bias, recruitment was targeted to achieve: (1) an ethnicity distribution approximately equal to the Canadian population; and (2) a province-of-residence distribution approximately equal to the Canadian population. Population characteristics were based on the 2016 Canadian Census. This sample was gathered as part of a larger study that was interested in the variability of nap behaviors across age. As such, this sample recruited an approximately equal distribution of child age in half-year increments but with oversampling of younger children (i.e., 1-2 years old) who did not nap and older children (i.e., 4-5 years old) who were still napping (see Chapter 5 for more details). These sampling targets were achieved using the quota features on the Qualtrics Survey Management Platform and through targeted emails to potential participants from Qualtrics Panel Services.

In this sample, most parents were between 30-39-years-old (67%), White (69%), and were employed full-time (52%). About 30% had a bachelors or other undergraduate degree and 80% had a family income less than $100K. About half of the children were male (54%). See Appendix D for detailed sample characteristics (Table D3).

4.3.2 Procedure

Ethics approval for both samples was granted by the institutional Non-Medical Research Ethics Board at the University of Western Ontario. For both samples, participants were recruited using Qualtrics panel services and the survey was completed online using the Qualtrics Survey Management Platform. Participants were notified about the study via email by their panel provider. Interested parents completed the screening questionnaire. Then, eligible parents were routed to the Letter of Information, provided their informed consent, and completed a series of

questionnaires. The pilot sample survey took 15 minutes to complete. The replication sample was part of a larger study on children's napping behavior and took about 30 minutes to complete. Then, parents were debriefed by providing information on our research objectives and expected results and redirected to their panel provider for compensation. Compensation was known to the participants a-priori, was determined by Qualtrics, and was unknown to the researchers. This arrangement is standard for projects using Qualtrics Panel Services for recruitment.

In the replication sample, participants were given the option to opt-in to complete sleep diaries. Participants who consented received email instructions to complete these sleep diaries each day for up to three weeks. Participants were asked to complete at least four diaries each week. Participants completing the sleep diaries received compensation directly from the research team: gift cards worth $10 CAD for each week completed, plus a bonus incentive for consecutive weeks completed ($5 CAD bonus for 2 consecutive weeks completed, $10 CAD bonus for 3 consecutive weeks completed).

In both samples, survey quality was assured using: (1) attentional checks (e.g., "select 1 for this item"); (2) straight-lining criteria (participant completion time must be greater than half the sample's median completion time); (3) removal of participants who provided non-sense textbox responses; (4) removal of participants who provided inconsistent responses throughout the survey (e.g., reported province of residence did not match reported postal code). A complete outline of our data quality approach is available in Appendix D (Table D2).

4.3.3 Measures

As the Replication Sample was part of a larger study on children's nap behavior, only questionnaires related to this report are presented. These measures were identical in both samples, unless noted otherwise.

4.3.3.1 Demographics

Demographic questions were based on items used by Statistics Canada. These items included the parent's age, ethnicity, employment status, relation to the child, and education; the child's age, ethnicity, and sex; and the family's income.

4.3.3.2 Novel Scales

The Parents' Nap Beliefs Scale. This scale indexes parents' beliefs about napping among preschool-aged children. The finalized version contained two subscales: positive beliefs and negative beliefs about napping. Each item began with a text stem that is customized for each parent, based on the half-year age range of the child they are reporting on; for example, "Children who are 1 to 1.5 years old…". This stem guided parents to consider children who were about the same age as their child and helped to account for developmental trends. Parents responded to statements on a 5-point Likert scale from 1 "completely disagree" to 5 "completely agree". In the Pilot Sample, participants completed a preliminary, 21-item version of the questionnaire. In the Replication Sample, participants completed a refined 14-item version of the questionnaire. The development, reliability, and validity for this scale are described below.

The Reasons Children Nap Scale. This scale indexes the extent to which different factors influence parents' decisions to encourage or discourage their child to nap. It contained two higher-order factors: Encouragement Reasons and Discouragement Reasons. The stem text for Encouragement Reason items was "I would encourage my child to nap if…"., and for the Discouragement Reason items, the stem was "I would discourage my child from napping if…". Parents responded to statements on a 5-point Likert scale from 1 "Not at all true" to 5 "Completely true". In the Pilot Sample, participants completed a preliminary, 32-item version of this questionnaire. In the Replication Sample, participants completed a refined 19-item version of this questionnaire. The development, reliability, and validity for this scale are described below.

4.3.3.3 Validity Measures

Children's typical daytime sleep behavior. Parents completed a structured retrospective report of their child's typical daytime and nighttime sleep routines, schedule, and behaviors from the General Sleep Inventory (Crosby et al., 2005). The items on typical daytime sleep included: the average number of naps during the week, and timing and duration of naps. The items on typical nighttime sleep included: typical bedtime, sleep onset on weekdays and weekends; typical wake time. General parent reports are strongly associated with actigraphy (r = .74; Sadeh, 1994, 1996).

Nighttime sleep problems. The Tayside Children's Sleep Questionnaire is a 10-item retrospective parent report of child problems initiating and maintaining nighttime sleep (McGreavey et al., 2005). On the first item, parents report their child's sleep onset latency on a 5-point intensity scale ("How long after going to bed does your child usually fall asleep?") from "≤ 15 minutes" to "≥ 60 minutes". On the remaining nine items, parents report on their child's sleep behavior on a 5-point frequency scale from 0 (sleep behavior never occurs) to 4 (sleep behavior happens every night). This scale demonstrated adequate construct validity (using principal components analysis) and internal consistency ($\alpha = .85$) in its original psychometric evaluation (McGreavey et al., 2005). The total scores from this scale were used to test the divergent validity of the two nap scales.

Diary-reported daytime sleep behavior. Parents reported on their children's daily nighttime and daytime sleep duration and quality using sleep diaries. Sleep diaries were only available for the replication sample. For the present study, the sleep diaries assessed (1) average nap duration across reported days, (2) the proportion of naps that were spontaneous versus planned over the reported days, (3) proportion of days with a nap over the reported days, and (4) average proportion of sleep during daytime over the reported days. Parent reported sleep diaries are strongly correlated with other measures of sleep (e.g., actigraphy; Hall et al., 2015). Parents were asked to complete at least 4 out of 7 sleep diaries each week and could complete between 1-3 weeks of diaries.

4.3.4 Preliminary Scale Development

Item generation. In total, 58 items (26 for nap beliefs; 32 for reasons children nap) were generated from the adult and pediatric napping literature and from discussion with 8 sleep researchers, 8 graduate students, and 4 parents of children 1 to 5 years old. The three-component framework discussed in the Introduction was used to guide item generation, with adjustments to capture conceptual differences between preschoolers and adults. For example, the Reasons Children Nap Encouragement Items "I would encourage my child to nap if… my child told me they wanted a nap" and "I would encourage my child to nap if… I needed a break" are both appetitive and acknowledge that parents have influence over their children's schedules. The

Parents' Nap Beliefs Scale item "children my child's age…should have a nap as a normal part of their schedule" acknowledges that napping is normative for many children.

Content validity. Graduate students (n = 8) and pediatric sleep researchers and practitioners (n = 8) provided feedback on item clarity (from 1 "Not clear at all" to 5 "Very clear") and content validity (assignment of which of the hypothesized scales the item belonged to or "none of these"). Any items with a median item clarity rating below 4 out of 5 were dropped. One item from the Nap Beliefs Scale was dropped for poor clarity. Items were considered to have poor content validity if: (1) fewer than 50% of raters assigned the item to the hypothesized scale or (2) greater than 30% of raters assigned the item to "none of these" (Hinkin & Tracey, 1999). Four items from the Nap Beliefs Scale with poor content validity were dropped. Thus, 21 Nap Beliefs Scale items and 32 Reasons Children Nap Scale items were retained for the pilot sample.

4.3.5 Data Analytic Plan

Data analyses were conducted in EQS (v. 6.1; Confirmatory Factor Analyses [CFAs]) and SPSS (v. 27; all other analyses).

Factor structure and item reduction. In the pilot sample, two preliminary CFAs were conducted: one for the Nap Beliefs Scale and one for the Reasons Children Nap Scale. Firstly, these models were evaluated using four criteria: (1) standardized residuals below an absolute value of .30; (2) factor loadings above .70; (3) item-level r-squared values above .49; (4) adequate model fit indices (i.e., robust CFI $\geq$ .90, robust RMSEA $\leq$ .08) (Byrne, 2006). Secondly, these scales were then adjusted to increase parsimony. Items were selected for removal using four criteria: (1) low item-scale correlations (r < .30); (2) poor item shape and variability (i.e., high skewness, kurtosis, or low item-variance); (3) standardized residual values above |.30|; and (4) low factor loadings (< .70). Further, redundant items were considered for removal based on inter-item correlations and highly correlated error terms. Thirdly, two revised CFAs (one for each scale) were conducted with the reduced items and revised factor structures. The same criteria were applied to evaluate model fit. All CFAs were conducted with maximum likelihood estimation.

In the replication sample, two Confirmatory Factor Analyses (CFAs) were conducted: one for the Nap Beliefs Scale and one for the Reasons Children Nap Scale. These models tested the revised models established in the Pilot Sample and were evaluated using the four criteria outlined above.

Readability. Flesch Reading Ease and Flesch-Kincaid Grade Level statistics were generated for the revised versions of each scale, using Microsoft Word, including each scale's instructions and items. Flesch Reading Ease scores between 70-80 are considered "fairly easy" to read and scores between 80-90 are considered "easy" to read. The Flesch-Kincaid Grade Level is generally equivalent to educational grades in the United States, where grades below 6 are considered "basic" and grades below 8 are considered appropriate for the general public (Spadaro et al., 1980).

Internal Consistency. Items within identified subscales were averaged to create subscale scores. Then, Cronbach's Alphas and inter-item correlations were evaluated. Cronbach's alphas should exceed .70 and inter-scale correlations should be less than .85 (Byrne, 2006).

Convergent validity. Firstly, correlations were conducted between the napping scales and children's age (months), children's typical nap duration, and the degree to which naps were spontaneous to test convergent validity. In the replication sample, correlations were also conducted between the typical proportion of child sleep during the daytime. Effect sizes were interpreted using the benchmarks established by Cohen (i.e., $r = 0.1$ is small; $r = 0.3$ is medium; $r = 0.5$ is large; (Cohen, 1988). Secondly, four napping frequency groups were compared: (1) children who had not napped in the past month or napped less than once per week; (2) children who had napped 1-3 days/week; (3) children who had napped 4-5 days/week; and (4) children who had napped 6-7 days/week[2]. Finally, in the replication sample, correlations between the napping scales and sleep diary reported nap behavior (i.e., proportion of days with a nap, proportion of naps that were spontaneous, average nap duration, and proportion of sleep during the daytime) were assessed. All proportion variables (i.e., degree to which naps were

[2] Note: These groupings were based on preliminary analyses in which napping frequency groups from the replication survey (IV) were compared using the proportion of reported days with a nap from the sleep diaries (DV) using a one-way ANOVA (see supplemental materials).

spontaneous [retrospective reports and sleep diaries], proportion of sleep during the daytime [retrospective reports and sleep diaries], proportion of days with a nap [sleep diaries]) were adjusted using an arcsine transformation prior to analyses.

Divergent validity. In both samples, correlations between the napping scales and nighttime sleep problems were assessed. Effect sizes were interpreted using the benchmarks established by Cohen (Cohen, 1988).

4.4 Results

4.4.1 Preliminary Results

In the pilot sample, two participants were missing all items from both nap beliefs scales and were dropped from subsequent analyses. Aside from these cases, missing data were low: 97% of cases missing no data, 0.5% missing 6 values, and 2.5% were missing just 1 value. Thus, a sample of 199 was utilized for subsequent analyses.

In the replication sample, one participant was missing all items from both nap beliefs scales and was dropped from subsequent analyses. Aside from this case, missing data were low: 97% of cases missing no data, 0.28% missing 7-13 values, 0.86% missing 2 values, and 1.86% were missing just 1 value. Thus, a sample of 701 was utilized for subsequent analyses.

4.4.2 Construct Validity

Parents' Nap Beliefs Scale. In the pilot sample, the preliminary CFA was conducted with the 21-item general beliefs scale modelled as a three-factor solution – Positive Beliefs, Negative Beliefs, and Developmentally related Beliefs. This CFA demonstrated poor model fit (robust CFI = .776, robust RMSEA = .132). Inspection of the standardized residuals, factor loadings, and r-squared values suggested several items which were candidates for removal.

None of the six "Developmentally related" items had a factor loading over .70, nor R-squared values over .40. As such, the developmental subscale was dropped from subsequent analyses. However, the modification indices suggested a cross-loading of the item "…are too old to nap regularly" on the Negative Beliefs factor. As such, this item was retained and assigned to

Negative Beliefs. Additionally, one Positive Beliefs item and one Negative Beliefs items were identified as redundant and were removed.

Following this item reduction, a 14-item Parental Naps Beliefs Scale with a 2-factor solution – Positive Beliefs and Negative Beliefs about napping – was tested. This model fit the data well: robust CFI = .981, robust RMSEA = .052, 90% CI (.032, .071). This 14-item, 2-factor solution was replicated in the replication sample, robust CFI = .960, robust RMSEA = .059, 90% CI (.051, .067). Key scale statistics for both samples are summarized in Tables 4.1 and 4.2 and inter-item correlations are presented in Appendix D (Table D4).

Table 4.1: Item-level Descriptive Statistics and Internal Consistencies for the Parents' Nap Beliefs Scale and the Reasons Children Nap Scale in the Pilot and Replication Samples

	Pilot Sample		Replication Sample	
Item	***M* (*SD*)**	**α_c**	***M* (*SD*)**	**α_c**
Parents' Nap Beliefs Scale				
Positive Beliefs	**3.68 (.98)**	**.949**	**3.61 (.89)**	**.901**
1)… behave better when they nap	3.71 (1.13)		3.94 (1.15)	
2)… should have a nap when they stay up late the night before	3.62 (1.04)		3.73 (1.17)	
3)… should have a nap as a normal part of their schedule	3.58 (1.23)		3.58 (1.23)	
4)… get frustrated more easily when they don't nap	3.76 (1.22)		3.67 (1.25)	
5)… have more meltdowns/tantrums when they don't nap	3.76 (1.19)		3.53 (1.26)	
6)… are better at controlling their emotions when they nap	3.86 (1.12)		3.72 (1.13)	
7)… are more restless when they don't nap	3.69 (1.16)		3.51 (1.22)	
8)… are more easily distracted when they don't nap	3.54 (1.19)		3.29 (1.19)	
9)… listen to their parents better when they nap	3.63 (1.14)		3.54 (1.13)	
Negative Beliefs	3.07 (1.11)	**.883**	**3.04 (1.05)**	**.824**
10)… are too old to nap regularly	2.79 (1.35)		2.72 (1.42)	
11)… do not seem to enjoy napping	3.09 (1.35)		3.09 (1.38)	
12)… do not sleep well at night when they nap that day	3.16 (1.39)		3.09 (1.36)	
13)… will have trouble falling asleep at night when they nap	3.17 (1.35)		3.16 (1.38)	
14)… will resist going to bed if they nap	3.14 (1.30)		3.13 (1.34)	
Reasons Children Nap Scale				
Encouragement	**3.32 (.89)**	**.861**	**3.48 (.79)**	**.788**
Child-related	***3.80 (.95)***	***.870***	***3.75 (.84)***	***.720***
1)… I knew my child would have to stay up late tonight	3.65 (1.22)		4.1 (1.08)	
2)… my child had a poor sleep the night before	3.83 (1.12)		3.71 (1.21)	

3)… my child told me they wanted a nap	3.92 (1.21)		3.4 (1.33)	
4)… napping was part of my child's routine	3.82 (1.20)		3.71 (1.24)	
5)… my child was cranky	3.78 (1.13)		3.84 (1.23)	
Parent-related	***2.73 (1.30)***	***.949***	***3.13 (1.22)***	***.890***
6)… I needed free time	2.66 (1.39)		3.14 (1.48)	
7)… I needed time to do other things (e.g., chores, relax)	2.72 (1.38)		3.22 (1.35)	
8)… the timing was convenient for me	2.75 (1.40)		3.03 (1.39)	
9)… I needed a break			3.13 (1.41)	
Discouragement	**3.24 (.96)**	**.909**	**3.09 (1.01)**	**.906**
Child prefers not to nap	***3.30 (1.15)***	***.891***	***3.12 (1.21)***	***.856***
10)… my child did not seem to enjoy napping	3.31 (1.30)		3.04 (1.38)	
11)… my child refused to nap	3.33 (1.25)		3.18 (1.38)	
12)… my child did not want to nap	3.27 (1.23)		3.15 (1.35)	
Child functions well without a nap	***3.16 (1.11)***	***.889***	***2.96 (1.15)***	***.843***
13)… my child slept too much the night before	3.02 (1.28)		2.93 (1.53)	
14)… my child got enough sleep the night before	3.06 (1.29)		2.94 (1.37)	
15)… my child was in a good mood	3.23 (1.29)		2.94 (1.35)	
16)… my child was alert	3.33 (1.26)		3.01 (1.35)	
Scheduling	***3.29 (1.07)***	***.811***	***3.22 (1.14)***	***.783***
17)... I wanted my child to have an earlier bedtime that night	3.18 (1.32)		3.28 (1.39)	
18)... There was not enough time for a nap	3.30 (1.21)		3.04 (1.35)	
19)… napping would delay the time my child fell asleep at night	3.38 (1.24)		3.29 (1.35)	

Note. The stem text for Positive Beliefs and Negative Beliefs items is customized for each parent, based on the half-year age range of the child they are reporting on (e.g., "Children who are 1 to 1.5 years old…"). The stem text for Encouragement items is "I would encourage my child to nap if…"; the stem text for Discouragement items is "I would discourage my child from napping if…"

Table 4.2: Mean Inter-Item Correlations and Factor Loadings for the Parents' Nap Beliefs Scale and the Reasons Children Nap Scale in the Pilot and Replication Samples

	Pilot Sample		Replication Sample	
Item	**Mean Inter-Item Correlation**	**Factor Loading**	**Mean Inter-Item Correlation**	**Factor Loading**
Parents' Nap Beliefs Scale				
Positive Beliefs	**.673**		**.502**	
1)… behave better when they nap		.836		.732
2)… should have a nap when they stay up late the night before		.818		.648
3)… should have a nap as a normal part of their schedule		.763		.633
4)… get frustrated more easily when they don't nap		.806		.688
5)… have more meltdowns/tantrums when they don't nap		.825		.692
6)… are better at controlling their emotions when they nap		.851		.765
7)… are more restless when they don't nap		.787		.688
8)… are more easily distracted when they don't nap		.817		.676
9)… listen to their parents better when they nap		.803		.749
Negative Beliefs	**.602**		**.484**	
10)… are too old to nap regularly		.767		.633
11)… do not seem to enjoy napping		.739		.649
12)… do not sleep well at night when they nap that day		.763		.635
13)… will have trouble falling asleep at night when they nap		.715		.654
14)… will resist going to bed if they nap		.761		.663
Reasons Children Nap Scale				
Encouragement	**.408**		**.284**	
Child-related	**.576**		**.339**	
1)… I knew my child would have to stay up late tonight		.743		.613

2)… my child had a poor sleep the night before		.824		.607
3)… my child told me they wanted a nap		.727		.568
4)… napping was part of my child's routine		.724		.614
5)… my child was cranky		.764		.542
Parent-related	**.822**		**.669**	
6)… I needed free time		.880		.823
7)… I needed time to do other things (e.g., chores, relax)		.933		.770
8)… the timing was convenient for me		.914		.859
9)… I needed a break		.910		.864
Discouragement	**.499**		**.493**	
Child prefers not to nap	**.733**		**.665**	
10)… my child did not seem to enjoy napping		.813		.776
11)… my child refused to nap		.904		.846
12)… my child did not want to nap		.888		.853
Child functions well without a nap	**.667**		**.578**	
13)… my child slept too much the night before		.761		.675
14)… my child got enough sleep the night before		.829		.795
15)… my child was in a good mood		.863		.790
16)… my child was alert		.869		.784
Scheduling	**.591**		**.546**	
17)... I wanted my child to have an earlier bedtime that night		.741		.728
18)... There was not enough time for a nap		.769		.730
19)… napping would delay the time my child fell asleep at night		.774		.760

Note. The stem text for Positive Beliefs and Negative Beliefs items is customized for each parent, based on the half-year age range of the child they are reporting on (e.g., “Children who are 1 to 1.5 years old…”).The stem text for Encouragement items is “I would encourage my child to nap if…”; the stem text for Discouragement items is “I would discourage my child from napping if…”

The Reasons Children Nap Scale. The preliminary CFA was conducted with the 32 reasons children nap items modelled with 2 higher-order factors and 4 subscales. This CFA demonstrated poor model fit (robust CFI = .751, robust RMSEA = .117). Inspection of the standardized residuals, factor loadings, and R-squared values suggested several items which were candidates for removal. Across subscales, 13 items were identified as redundant and were removed. Inspection of the modification indices suggested the presence of two child-related discouragement subscales: (1) child-preference not to nap and (2) child-functions well without a nap-related reasons.

Following this item reduction and revision of the factor structure, a 19-item scale was tested in a 2 higher-order factor, 5 subscale model: Encourage napping (Child-related, Parent-related) and Discourage napping (Child-preference not to nap, Child-functions well without a nap, Scheduling-related). This model fit the data well: robust CFI = .930, robust RMSEA = .077, 90% CI (.066, .088). This factor structure was also replicated in the replication sample, robust CFI = .900, robust RMSEA = .076, 90% CI (.071, .082). Key scale statistics are presented in Tables 4.1 and 4.2.

4.4.3 Readability

The Parents' Nap Beliefs Scale had a Flesch Reading Ease score of 78.0 and a Flesch-Kincaid Grade Level of 5.3. The Reasons Children Nap Scale had a Flesch Reading Ease score of 85.6 and a Flesch-Kincaid Grade Level of 3.4.

4.4.4 Internal Consistency

In the pilot sample, all scales and subscales demonstrated strong internal consistency ($\alpha_c > .80$). In the replication sample, The Reasons Children Nap Scale's "Encouragement" second-order factor ($\alpha_c = .788$) and "Child-related" factor ($\alpha_c = .720$) demonstrated adequate internal consistency ($\alpha_c > .70$). All other scales and subscales demonstrated strong internal consistency ($\alpha_c > .80$; see Tables 4.1 and 4.2). In both samples, no inter-scale correlation exceeded .85 (see Table 4.3). Inter-item correlations are presented in Appendix D (Table D5).

4.4.5 Convergent Validity

Each nap beliefs subscale was correlated with children's age, typical nap duration, and the degree to which naps were spontaneous. The False Discovery Rate (FDR) was used to adjust for multiple comparisons (Benjamini, 2010). In each sample, 21 correlations were expected and attained (see Table 4.4). On the Parents' Nap Beliefs Scale, the Positive Beliefs and Negative Beliefs subscale generally correlated with the convergent validity measures in the hypothesized directions with small-to-large (pilot) and medium (replication) effect sizes.

On the Reasons Children Nap Scale, encouragement reasons generally correlated with the convergent validity measures in the hypothesized directions with small (pilot) and small-to-medium (replication) effect sizes. In the pilot sample, about half of the discouragement reasons and convergent validity measures were significantly correlated in the hypothesized direction with small or medium effect sizes. In the replication sample, all discouragement subscales correlated with the convergent validity measures in the hypothesized directions with small or medium effect sizes.

Table 4.3: Inter-scale correlations for Nap Belief Scale subscales and The Reasons Children Nap Scale subscales in the Pilot and Replication Samples

Subscales	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) NBS – Positive Beliefs	--	-.223**	.454**	.402**	-.204**	-.089*	-0.038
(2) NBS – Negative Beliefs	-.339**	--	-0.037	0.019	.445**	.468**	.448**
(3) Encourage – Child Related	.662**	-.258**	--	.241**	.126**	0.077	.203**
(4) Encourage – Parent Related	.338**	.256**	.288**	--	0.026	.294**	.282**
(5) Discourage – Child Preference	-.205**	.408**	-.185**	.080	--	.584**	.577**
(6) Discourage – Child Functioning	-.177*	.530**	-.177*	.155*	.587**	--	.710**
(7) Discourage – Scheduling	-.082	.477**	-.108	.293**	.534**	.682**	--

Note. Pilot sample correlations appear *below* the diagonal and are highlighted in grey; Replication sample correlations appear *above* the diagonal and are not highlighted. $^{**}p < .01$, $^{*}p < .05$. NBS = Nap Beliefs Scale. P-values were adjusted using the False Discovery Rate.

Table 4.4: Correlations between NBS subscales and continuous convergent validity variables in the Pilot and Replication Samples

	Nap Belief Scales						
	General Beliefs		Encourage Reasons		Discourage Reasons		
Validity Measures	Positive	Negative	Child	Parent	Child Preference	Child Functioning	Parenting/ Scheduling
Pilot Sample – Retrospective Report							
Child Age	**-.300****	**.417****	**-.301****	.009	*.153**	**.310****	*.298***
Child's Nap Duration	**.373****	-.085	**.307****	*.267***	.016	-.026	-.013
Proportion Spontaneous Naps	**-.268****	**.546****	**-.309****	**.315****	*.245***	**.441****	**.376****
Nighttime Sleep Problems	*.182**	*.203***	*.224***	**.322****	.071	*.133*	*.194***
Replication Sample – Retrospective Report							
Child Age	**-.328****	**.310****	*-.114***	-.097*	*.169***	*.208***	*.176***
Child's Typical Nap Duration	**.300****	**-.351****	*.123***	*.146***	*-.262***	*-.200***	*-.210***
Proportion Spontaneous Naps	**-.426****	**.417****	*-.219***	-.073	*.279***	**.336****	**.316****
Proportion of Sleep During Daytime	**.411****	**-.499****	*.143***	*.243***	**-.336****	*-.246***	*-.261***
Nighttime Sleep Problems	.087*	*.185***	.053	.085*	.060	.046	.086*
Replication Sample – Sleep Diaries							
Average Nap Duration	**.520****	**-.592****	*.240***	*.297***	*-.299***	**-.366****	*-.288***
Proportion of Spontaneous Naps	**-.393****	**.446****	*-.142**	*-.218***	**.379****	**.426****	**.384****

Proportion of days with naps	.**<u>501</u>****	**<u>-.618</u>****	*.218***	**.323****	**-.303****	**-.384****	-*.275***
Proportion of sleep during daytime	.**<u>528</u>****	**<u>-.601</u>****	*.260***	**.347****	-*.288***	**-.327****	-*.226***

Note: *$p < .05$, **$p < .01$. Pilot sample $n = 199$; Replication sample – retrospective report $n = 701$; Replication sample – sleep diaries $n = 235$. P-values were adjusted using the False Discovery Rate. To further aid in interpretation, large effect sizes ($r \geq |0.5|$) are **<u>bolded and underlined</u>**; medium effect sizes ($r \geq |0.3|$) are **bolded**; and small effect sizes ($r \geq |0.1|$) are *italicized*.

Five groups of children varying in napping frequency were compared using a one-way ANOVA in each sample. There were significant omnibus differences between napping groups on all subscales for both scales in both samples (p-values adjusted using FDR). The general trends were that more frequent napping was related to greater positive beliefs and encouragement reasons; whereas, less frequent napping was related to greater negative beliefs and discouragement reasons. In all cases, the "did not nap & naps <1 day/week" group differed significantly from the "naps 6-7 days/week" group at $p < .05$. These results are summarized in Figures 4.1, 4.2, and 4.3. Full post-hoc comparisons are presented in Appendix D (Table D6).

In the replication sample, each nap beliefs subscale was correlated with sleep diary-derived variables (i.e., average nap duration, the proportion of naps that were spontaneous versus planned, the proportion of reported days with a nap, and the average proportion of sleep during the daytime). The False Discovery Rate (FDR) was used to adjust for multiple comparisons (Benjamini, 2010). In total, 28 correlations were expected and attained (see Table 4.4). On the Parents' Nap Beliefs Scale, both the Positive Beliefs and Negative Beliefs subscales correlated with the convergent validity measures in the hypothesized directions with medium or large effect sizes. On the Reasons Children Nap Scale, both encouragement subscales correlated with the convergent validity measures in the hypothesized directions with small or medium effect sizes. On the Reasons Children Nap Scale, all discouragement subscales correlated with the convergent validity measures in the hypothesized directions with small or medium effect sizes.

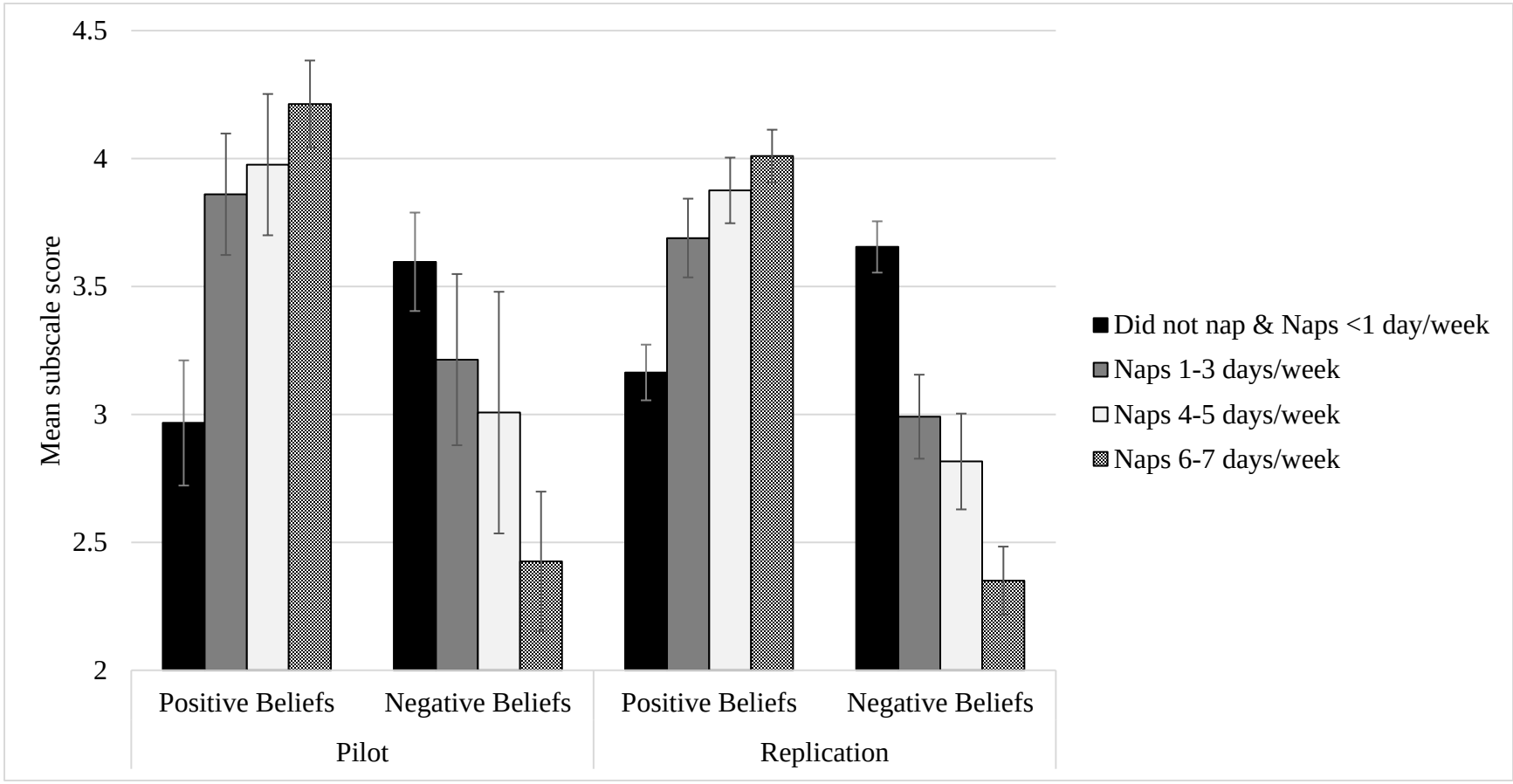

Figure 4.1: Parental Nap Beliefs and Child Napping Frequency.

This figure depicts the relation between mean subscale scores and napping frequency groups for the Positive Beliefs and Negative Beliefs subscales of the Nap Belief Scale. Error bars depict 95% Confidence Intervals. Supplementary Table D6 reports tests of significance across napping frequency subgroups.

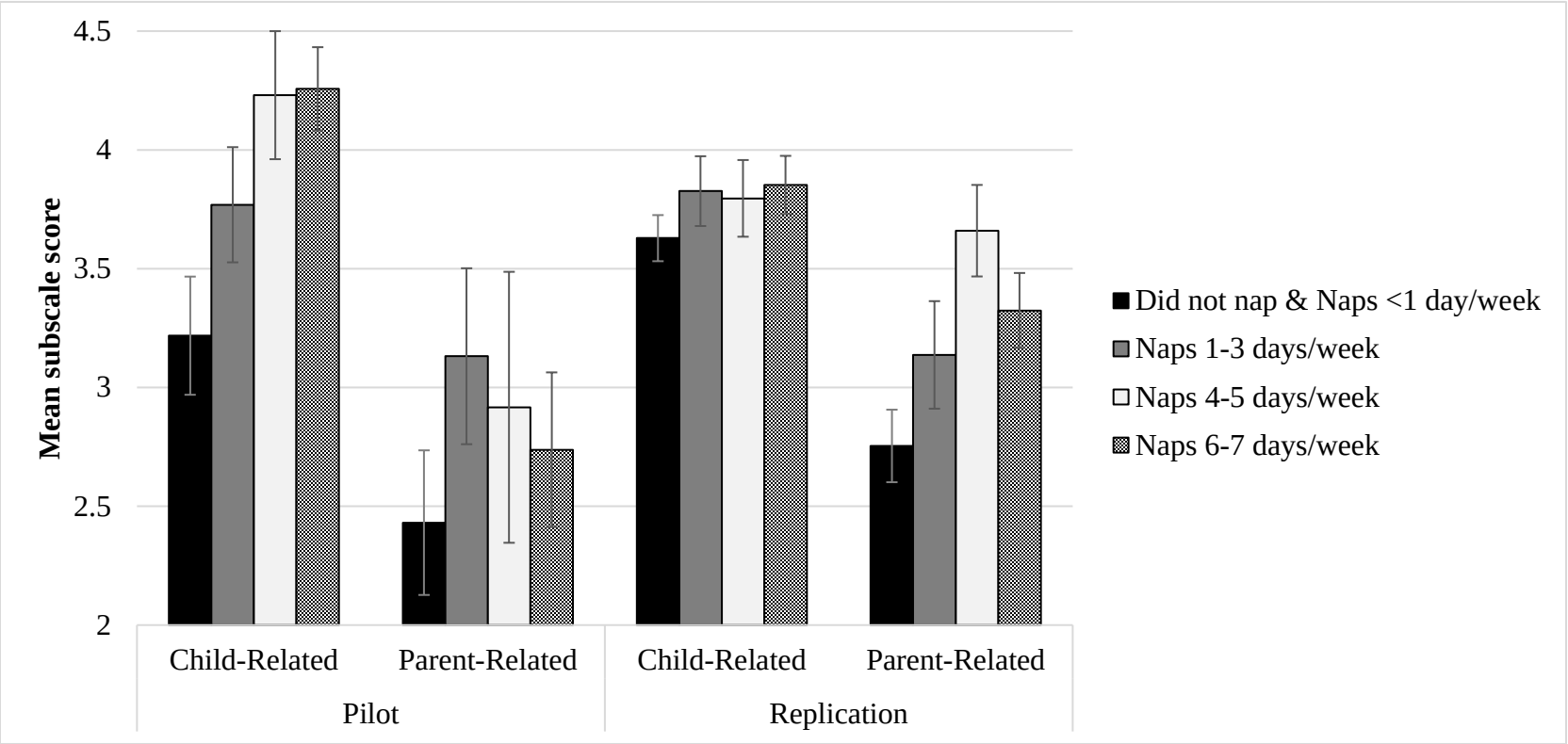

Figure 4.2: Reasons Children Nap Scale – Encouragement Beliefs and Child Napping Frequency.

This figure depicts the relation between the Reasons Children Nap Scale Child-related Encouragement and Parent-related Encouragement subscale scores and napping frequency groups.

Error bars depict 95% Confidence Intervals. Supplementary Table D6 reports tests of significance across napping frequency subgroups.

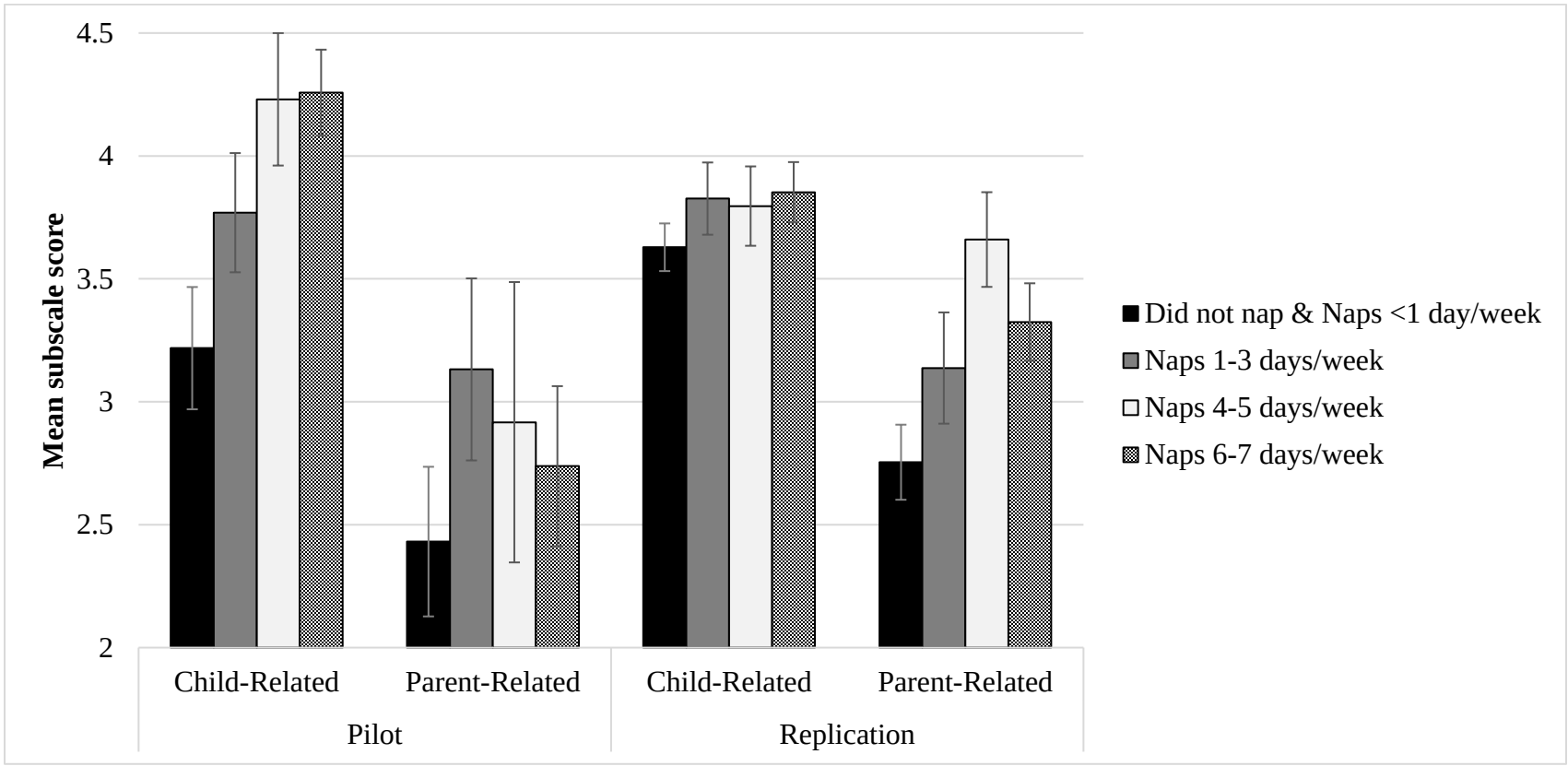

Figure 4.3: Reasons Children Nap Scale – Discouragement Beliefs and Child Napping Frequency.

This figure depicts this same relationship but with the Child Preference-related Discouragement, Child Functioning-related Discouragement, and Parenting/Scheduling-related Discouragement subscales.

Error bars depict 95% Confidence Intervals. Supplementary Table D6 reports tests of significance across napping frequency subgroup

4.4.6 Divergent Validity

Each nap beliefs subscale was correlated with parent-reported nighttime sleep problems. FDR was used to adjust for multiple comparisons. In each sample, 7 correlations were expected and attained (see Table 4.4). On the Parents' Nap Beliefs Scale, both subscales were positively correlated with nighttime problems, with small (pilot) or very small-to-small (replication) effect sizes. On the Reasons Children Nap Scale, both encouragement and the Scheduling-related discouragement subscales were positively correlated with nighttime sleep problems, with very small to medium effect sizes. The child-preference and child-functioning related discouragement subscales were not significantly correlated with nighttime sleep problems in either sample.

4.5 Discussion

Two scales were developed to index parents' beliefs about their preschool-age children's nap behavior. Data from the pilot sample provided promising evidence of the scales' psychometric properties and data from the replication sample, which is representative of the Canadian population by ethnicity, confirmed the scales psychometric structures, internal consistency, and validity. These scales appear to capture differences in parents' nap beliefs as children age and consolidate sleep.

There were two key differences between our hypothesized scale structures and our revised scales. Firstly, the "Developmental Beliefs" subscale was removed from the Parents' Nap Beliefs Scale. Developmental beliefs are likely engrained into parents' beliefs about napping. Secondly, the "discouragement of napping child-related" subscale was divided into child-preference and child-function subscales. This structure may better capture the interaction between parents and children as nap cessation occurs. Specifically, parents' decisions to dissuade their children from napping may be differentially influenced by the child's own preference and children's functioning without a nap.

Our hypothesized convergent validity relations were largely supported. Across samples (i.e., pilot and replication) and informant types (i.e., survey and diaries), higher positive beliefs about napping were related to younger child age, longer nap durations, lower proportions of

spontaneous naps, greater napping frequency, and higher proportions of sleep during daytime. Whereas, higher negative beliefs were related to older child age, shorter nap durations (except in the pilot sample), higher proportions of spontaneous naps, lower napping frequency, and lower proportions of sleep during daytime. The Parents' Nap Beliefs subscales were not strongly related to parent-reported nighttime sleep problems across samples.

These scales index the beliefs that parents of preschool-age children hold about napping. Evidence from behavioral genetics studies suggests that napping patterns are more greatly influenced by environmental factors (including parental preferences) than heritable factors, beginning at 2-years-old (Touchette et al., 2013). As children begin to consolidate sleep into exclusively nighttime sleep, naps may become increasingly inconsistent (e.g., from napping daily to napping five days per week). During this period of transition, parents' beliefs and preferences may be more impactful on children's nap behaviors than before or after the transition to monophasic sleep. The scales presented in this chapter can be used to understand these beliefs. Further, there is mixed evidence regarding the benefits of napping on behavior and functioning among preschool children (Thorpe et al., 2015). Previous research suggests the benefits of napping may only be present if children are habitual nappers (e.g., napping $\geq$ 5 days/week). Lastly, these scales integrate well within the Socioecological Model and emphasize the importance family/social-level influences on preschool children's nap behavior.

4.5.1 Limitations and Future Directions

The pilot and replication samples demonstrated strong psychometric evidence for two scales in diverse samples of Canadian parents. The Nap Beliefs Scale and Reasons Children Nap Scale can be used to understand parental nap preferences across development, across cultures, and as predictors of children's nap behaviors. No studies have examined how parents' beliefs about their children's nap behavior changes as children age. This direction can be explored using a longitudinal design. There also is evidence for differences in children's nap behaviors across cultures (Jenni & O'Connor, 2005; Liu et al., 2019). These scales may therefore be useful in exploring cross-cultural differences in beliefs about children's napping. It may also be useful to use adaptions of these scales to quantify childcare providers' beliefs about children's nap behaviors and to investigate whether these beliefs predict nap behaviors within childcare. Lastly,

parental beliefs about children's nighttime sleep predict nighttime sleep behavior (Coulombe & Reid, 2012; Sadeh et al., 2007). Parental beliefs around napping may have a similar influence on daytime sleep behavior. These relations should be investigated using longitudinal samples.

Our findings should be interpreted with key limitations. Firstly, there were some inconsistencies in our obtained convergent validity correlations, especially for the Reasons Children Nap Scale. These correlations should be replicated in additional samples. Secondly, our scales and several of our validity measures were obtained via parent-reported questionnaires. As such, some of the associations observed may be due to shared method variance. We sought to mitigate this limitation by including sleep diary measures. This limitation could be further addressed by incorporating actigraphy or videosomnography methodology in future studies. Finally, our convergent and divergent validity analyses were correlational. As such, causality cannot be inferred. Longitudinal studies can be utilized to investigate causality through temporal ordering.

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Chapter 5

5 Regular, Intermittent, and Spontaneous: Patterns of Preschool Children's Nap Behavior and their Correlates

5.1 Abstract

Background: Daytime sleep during the preschool years (i.e., 1-5-years-old) is characterized by high inter-child variability in several components of nap behavior, including nap duration, nap timing, and the proportion of sleep during daytime. However, few studies have investigated which factors are correlated with these components of nap behavior using an integrative empirical approach. **Methods:** A large, nationally representative sample (N = 702) of Canadian parents completed an online survey, including a one-month retrospective report of their 1.5 to 5 year old's daytime and nighttime sleep behavior and other questionnaires. To understand patterns of children's nap behaviors we applied Latent Profile Analysis (LPA) to typical nap duration, typical timing of naps, frequency of naps, proportion of sleep during the daytime, and the proportion of naps which were spontaneous (i.e., child just fell asleep). Then, multinominal logistic regression was used to examine correlates of profile membership. **Results:** Four profiles of children emerged: (1) regular nappers (25.4%); (2) intermittent nappers (31.8%); (3) spontaneous nappers (15.4%); and (4) non-nappers (27.5%). After controlling for demographic variables (e.g., child age, sex, ethnicity) and known correlates of napping behaviors (e.g., birthweight, nighttime sleep duration), profile membership was correlated with parents' beliefs (i.e., parental nap beliefs, parental reasons for encouraging and discouraging daytime sleep), parents' own nap behaviors, family functioning, and child nighttime sleep problems. **Conclusions:** An empirical approach aided in understanding the inter-child variability in napping among preschool-age children. Parental beliefs about napping and the home environment were shown to be critical factors influencing this variability.

5.2 Introduction

Children tend to nap less frequently and for shorter durations as they develop. Most North American children consolidate their daytime sleep into exclusively nighttime sleep by the time they are 5 years old (Dionne et al., 2011; Staton et al., 2020). However, daytime sleep during the preschool years (i.e., 1-5 years) is characterized by high intra- and inter-child variability in several components of nap behavior, including nap duration, nap timing, and the proportion of sleep during the daytime (Iglowstein et al., 2003; Staton et al., 2020). For example, a Swiss study (N = 493) demonstrated that among still-napping 3-year-old children, daily nap durations varied by over an hour between the 10^{th} and 90^{th} percentiles (Iglowstein et al., 2003). The field's understanding of the predictors of nap behaviors is also somewhat limited and has primarily focused on biological, developmental, and demographic variables (Crosby et al., 2005; Dionne et al., 2011; Schwichtenberg et al., 2011; Touchette et al., 2013; Chapter 2) – with far less attention on more proximal factors such as parental attitudes, practices, and childcare environments (e.g., home, childcare; Jones & Ball, 2013; Smith et al., 2019; Staton, Smith, Pattinson, et al., 2015; Staton, Smith, & Thorpe, 2015).

Children's nap behavior is complex and multifaceted. Nap behavior has typically been measured in terms of frequency (e.g., number of naps per week), duration (e.g., typical length of naps), and sleep consolidation (e.g., proportion of sleep during the daytime over total 24-hour sleep). Meta-analytic data suggests that, as children develop, naps occur less frequently and for shorter durations, while sleeping longer at night (Staton et al., 2020). As such, children's proportion of daytime sleep decreases. There are also additional aspects of nap behavior which have received less research attention, such as the timing of naps (Mindell et al., 2016) and the degree to which naps are planned versus spontaneous. As children age, naps tend to occur later in the day (Mindell et al., 2016). No studies (to our knowledge) have investigated the degree to which naps are planned versus spontaneous; however, we anticipate that naps may become more spontaneous as napping frequency decreases. Importantly, these multiple aspects of nap behavior are rarely considered together. Instead, research has typically focused on evaluating and predicting these behaviors separately.

Heuristic classifications of nap behaviors (i.e., simplified organizational rules) have been applied to integrate some of these components together, along with correlational analyses to examine correlates of these classifications. These classifications have included nap cessation (the age at which the child has consolidated their sleep into exclusively nighttime sleep; Chapters 2 and 3) and an approach that combined napping frequency and the child's response to a scheduled naptime (Hall et al., 2012; Smith et al., 2019). In this latter case, Smith and colleagues classified children into four groups (nappers, transitioners, resters, and problem nappers) with a heuristic based on whether the child: (1) usually napped and (2) had difficulty being quiet at naptime (Smith et al., 2019). Using discriminant analyses, Smith et al. reported that nappers had shorter nighttime sleep durations, were younger, and had lower cognitive functioning than the other three groups. Conversely, behavioral and temperament scores did not differentiate between classifications.

The present study expands on this classification approach by integrating a larger range of quantitative measures of nap behavior than previously examined. To our knowledge, no previous study has applied a data-driven, rather than a heuristic, approach to identify profiles of nap behavior among preschool children. This analysis identified distinct napping profiles based on similar patterns of nap behaviors among groups of preschool children. Correlates of these profiles of nap behavior were then evaluated. Children's sleep behavior is an interactional process involving the child, parent, and their environment, (Grandner, 2014; Newton et al., 2021; Sadeh et al., 2010) and may be understood using the socioecological model (Bronfenbrenner, 1979). In this model, behavior is viewed as being determined by multiple levels of influence including child demographic and individual variables (e.g., child's sex and ethnicity, birthweight), parenting and family variables (e.g., parental beliefs, family functioning), and broader environmental factors (e.g., being in childcare). This model has previously been applied to evaluating the determinants of early nap cessation (i.e., stopping daytime sleep before 3-years-old; Chapter 2). Previous studies investigating individual aspects of nap behavior or heuristic classifications have identified several factors that predict or correlate with continued napping, longer nap duration, and/or more frequent naps including: (1) demographic factors (i.e., younger child age, child being male, parent working/in school, having no older siblings, childcare outside the home, non-White ethnicity), (2) developmental factors (i.e., fewer developmental milestones

achieved/having a developmental disability/lower cognitive functioning, birth mother consuming alcohol during pregnancy, birthweight <2500 grams), and (3) shorter nighttime sleep duration (Crosby et al., 2005; Schwichtenberg et al., 2011; Smith et al., 2019; Zhang et al., 2020; Chapter 2). In the current study, we evaluate how these previously established correlates relate to novel nap behavior classifications. In addition, parental beliefs and behaviors, and family functioning (e.g., stability) are known to influence children's nighttime sleep behaviors (Coulombe & Reid, 2014; Sadeh et al., 2007) but their impact on nap behavior has not been investigated. Thus, we also incorporated key parenting/family components of the socioecological model, such as parental beliefs around napping, parents' own nap behavior, and family functioning, as correlates in our model. These more proximal factors are hypothesized to be more important to understanding children's nap behavior than the more distal factors (e.g., parent occupational status) identified in previous research (Crosby et al., 2005; Schwichtenberg et al., 2011; Smith et al., 2019; Zhang et al., 2020; Chapter 2).

5.2.1 Objectives and Hypotheses

1) Determine nap behavior profiles using an empirical approach, based on key indicator variables (i.e., typical nap duration, proportion of spontaneous naps, typical nap timing, proportion of sleep during the daytime, typical frequency of napping during the week).
    a. We expected at least two profiles to emerge: a profile of largely consistently napping children with mostly planned naps of regular durations, and at least one profile of inconsistently napping children with variable nap behaviors.
2) Assess the correlates of nap behavior profiles (identified in Objective 1), using the Socioecological Model to inform variable selection.
    a. We hypothesized that parental nap beliefs and behaviors and family functioning would be correlates of children's nap behavior profiles. Specifically, more positive parental beliefs about napping were expected to correlate with membership in still-napping profiles. More stable family functioning was expected to correlate with membership in inconsistently napping profiles, as more family stability may increase parents' ability to be flexible to their children's sleep needs. These regression analyses will also control for previously established correlates of children's nap behaviors.

5.3 Materials and Methods

5.3.1 Participants

Participants were the primary caregivers (i.e., parents) of children (1.5-5 years old, $N = 702$), living in Canada. Eligible parents: (1) were knowledgeable about daytime and nighttime routines for their child; (2) were comfortable reading in English; and (3) had children without a health condition which would be likely to interfere with sleep (e.g., autism, cancer). To reduce sampling bias, recruitment was targeted to achieve: (1) an ethnicity distribution approximately equal to the Canadian population and (2) a province-of-residence distribution approximately equal to the Canadian population. Population characteristics were based on the 2016 Canadian Census. As this study was primarily interested in the variability of nap behaviors across age, we aimed to recruit an approximately equal distribution of child age in half-year increments but with oversampling of younger children (i.e., 1-2 years old) who did not nap and older children (i.e., 4-5 years old) who were still napping. These sampling targets were achieved using the quota features on the Qualtrics Survey Management Platform and through targeted emails to potential participants from Qualtrics Panel Services.

5.3.2 Procedure

Ethics approval was granted by the University of Western Ontario's Non-Medical Research Ethics Board. Participants were recruited using Qualtrics Panel Services and the survey was completed online using the Qualtrics Survey Management Platform. Participants were informed about the study via email from their panel provider. Interested parents completed a screening questionnaire. Next, eligible parents were routed to the Letter of Information and provided their informed consent. Then, parents completed a series of questionnaires which took about 30 minutes to complete. Afterward, parents were provided with an electronic debriefing letter and redirected to their panel provider for compensation. Compensation was determined by Qualtrics, known to the participants a priori, but unknown to the researchers. Compensation included gift cards and travel reward points, as per the standard arrangement for projects using Qualtrics Panel Services. Several strategies were employed to assure data quality (e.g., attentional checks, straight-lining criteria, data inconsistency). This study was part of a larger project and as such,

these approaches are detailed elsewhere (see Chapter 4). See Appendix D (Figure D1b) for the participant flowchart.

5.3.3 Impact of the COVID-19 Pandemic on Sampling

This sample was collected during a time in which COVID-19 Pandemic restrictions were in effect in Canada (i.e., November 2020 to July 2021); restrictions and lockdown policies varied across provinces and over time. The pandemic may have influenced reported childcare arrangements in this study. At the time of survey data collection, 41.6% of parents (n = 292) reported using some form of childcare arrangement provided by someone other than a parent or guardian in or outside of the home (e.g., kindergarten, relative/nanny inside or outside the home, childcare centre) and 30.2% of parents (n = 212) reported using a childcare arrangement outside of the home. Prior to the pandemic (i.e., 2019), a national survey by Statistics Canada reported that 60% of Canadian children 0-5-years-old were in some form of childcare that did not involve a parent/guardian (Statistics Canada, 2021). Childcare arrangements are known to influence nap behavior (Staton et al., 2017; Staton, Smith, & Thorpe, 2015). As such, this sample may have more limited generalizability to children who regularly attend childcare outside of the home. Relative to pre-pandemic years, parents in this sample may have spent more time directly caring for their child.

5.3.4 Measures

Only measures relevant to the current study are described below. Measures are divided into two sections: (1) indicator variables which were used to determine nap behavior patterns in Latent Profile Analyses (LPA) and (2) correlates which were used in multinomial logistic regression analyses to evaluate the profiles generated in the LPA.

5.3.4.1 Indicator Variables (Latent Profile Analysis)

Parents completed a structured one-month retrospective report of their child's typical daytime and nighttime sleep routines, schedule, and behaviors based on the General Sleep Inventory (Crosby et al., 2005). Five indicator variables were derived from this retrospective report. In general, parent reports are strongly associated with more objective measures of sleep such as

actigraphy (r = .74; Sadeh, 1994, 1996). To further assess validity, each indicator variable was compared to similar variables collected in sleep diaries, completed by a subset of parents, over 1-3 weeks following the survey. As these analyses are complementary but not central to this chapter, the methodology and results for the sleep diaries are summarized below and are presented in more detail in Appendix E.

Typical weekly napping frequency. Parents were asked "did your child have at least one nap over the past month?" Children with parents who responded "no" were coded as "0 = does not nap". Parents who responded "yes" were asked, "how many days each week does your child usually nap?" with 8 response options ranging from less than once per week to 7 days per week. For this chapter, typical weekly napping frequency was coded as 0 = does not nap, 1 = naps less than one day per week, 2 = naps 1-3 days per week, 3 = naps 4-5 days per week and 4 = naps 6-7 days per week. These reduced groupings were based on a one-way ANOVA comparing the reduced napping frequency groups on the proportion of days with a nap from the sleep diaries (see Appendix E).

Typical nap duration. Parents who indicated that their child napped at least once over the past month reported on their child's typical nap duration. Parents who indicated that their child did not nap in the past month had their child's typical nap duration coded as "0". Parents were also asked "does your child usually nap twice or more in a day?" If they responded "yes", they also reported on the typical duration of this second nap. Very few children typically napped more than once per day (4.1%, n = 29). For children who typically napped twice, nap duration was computed as the sum of both naps. Typical nap duration correlated strongly with the average nap duration on the sleep diaries, r = .569, p < .001 (see Appendix E).

Typical nap timing. Parents who indicated that their child napped at least once over the past month reported on the typical start time of their child's nap(s). Parents who reported their child did not nap had their child's typical nap timing coded as missing. Typical nap timing for a child's second nap was not used for analyses, given the low prevalence of children who had napped twice a day and having a high degree of valid missing data (i.e., among non-nappers and children who only napped once) would tend to strongly influence LPA. For analyses, typical nap timing was coded as minutes from midnight (i.e., 1:00 PM = 780 minutes). Typical nap timing

correlated strongly with average nap timing on the sleep diaries, $r = .742$, $p < .001$ (see Appendix E).

Proportion of sleep during the daytime. This variable was derived using typical nap and nighttime sleep duration in five steps. (1) The typical nap duration on weekends was multiplied by the number of weekend days the child napped on. (2) The typical nap duration on weekdays was multiplied by the number of weekdays the child napped on. (3) The values obtained in Steps 1 and 2 were summed to give a weekly daytime sleep duration value. (4) The child's typical nighttime sleep duration on weekend-nights was multiplied by two and typical nighttime sleep duration on weeknights was multiplied by five (as defined under "Correlates"). (5) These nighttime sleep duration values were then summed. (6) The value obtained in Step 3 was divided by the sum of the values obtained in Steps 3 and 5 to give a proportion of sleep during the daytime value For analyses, this proportion was transformed using an arcsine transformation (Warton & Hui, 2011). For descriptive purposes, this variable is presented as either a proportion or a percentage. Proportion of sleep during the daytime on the retrospective report was highly correlated with the equivalent measure on the sleep diaries, $r = .826$, $p < .001$ (see Appendix E).

Proportion of spontaneous naps. Parents were asked, "over the past month, how many of your child's naps had been planned versus spontaneous (child just fell asleep and nap was not planned?)". Parents responded on a visual-analogue scale anchored with "all naps were planned" (left side, corresponded to 0), "about equal" (middle, corresponded to 50), and "all naps spontaneous" (right side, corresponded to 100). Higher numbers indicated that more naps were spontaneous. Parents who reported their child did not nap had their child's proportion of spontaneous naps coded as missing. For analyses, this proportion was transformed using an arcsine transformation. For descriptive purposes, this variable is presented as either a proportion or a percentage. The proportion of spontaneous naps on the retrospective report were highly correlated with the proportion of spontaneous naps on the sleep diaries $r = .707$, $p < .001$ (see Appendix E).

5.3.4.2 Correlates

Demographic control variables. Parents reported on their child's sex, ethnicity, and whether the child had an older sibling. They reported on their own employment status, relation to their child and reported on their family's income and highest education in the household. Finally, parents reported on their child's current care arrangements. These items were based on questions used by Statistics Canada (Statistics Canada, 1999, 2021).

Perinatal variables. Parents reported on their child's birthweight and the amount of alcohol the child's birth mother used during pregnancy (response options were: [1] "never", [2] "less than once a month", [3] "one-to-three times a month", [4] "once a week", [5] "two-to-three times a week", [6] "four-to-six times a week", [7] "everyday", [8] "don't know", [9] "prefer not to answer"). For analyses, birthweight was dichotomized as 0 = normal birthweight (≥ 2500 grams) and 1 = low birthweight (< 2500 grams). Alcohol use was dichotomized as 0 = no alcohol consumed and 1 = alcohol consumed once or more during pregnancy. "don't know" and "prefer not to answer" responses were coded as missing.

Developmental milestones. The Survey of Well-being of Young Children's Milestones scale was used to index children's developmental milestones (Sheldrick & Perrin, 2013). This 10-item parent-report measure has age-specific forms, with eight forms applicable to children in the present study. For example, parents whose children were 29-to-34 months old answered whether their child "Names at least one colour" on a 3-point scale (0 = "not yet", 1 = "somewhat", 2 = "very much"). Items are summed to yield a score ranging from 0 to 20. This scale has adequate psychometrics and is appropriate for use with children from 2-months to 5-years-old (Sheldrick & Perrin, 2013). This scale has convergent validity with the Ages and Stages Questionnaire (correlations ranged from $.40 \geq r \leq .70$ across ages; Squires et al., 2009). The age-standardized z-scores were used for regression analyses. Z-scores were computed, using the *M* and *SD* from the current sample.

Nighttime sleep problems. The Tayside Children's Sleep Questionnaire is a 10-item, 3-month retrospective, parent-report questionnaire of child problems initiating and maintaining sleep (McGreavey et al., 2005). On the first item, parents report their child's sleep onset latency on a

5-point intensity scale ("how long after going to bed does your child usually fall asleep?") from 0 = "≤ 15 minutes" to 4 = "≥ 60 minutes". On the remaining 9 items, parents reported on their child's sleep behavior on a 5-point frequency scale from 0 (sleep behavior never occurs) to 4 (sleep behavior happens every night). This measure demonstrated adequate construct validity (using principal components analysis) and internal consistency ($\alpha = .85$) in its original psychometric evaluation (McGreavey et al., 2005). To aid interpretability, the total scores were recoded into half-standard deviation units for regression analyses, based on the current sample.

Nighttime sleep duration. In the structured one-month retrospective report of their child's sleep behavior (see Indicator variables), parents reported on their child's typical fall asleep time, waketime, and nightwakings on weeknights and weekends, respectively. This information was used to calculate children's typical nighttime sleep duration. Nighttime sleep duration on weekends was multiplied by two and nighttime sleep duration on weekdays was multiplied by five. These values were then summed and divided by seven. This value was used as the typical nighttime sleep duration.. Retrospective parental reports are strongly associated with actigraphy ($r = .74$; Sadeh, 1994, 1996). Nighttime sleep duration was coded in hours for analyses.

Environmental confusion and family functioning. The Family Confusion Hubbub and Order Scale (Family CHAOS) is a 15-item self-report measure of environmental confusion and family functioning (Matheny et al., 1995). Parents respond to statements about their own home (e.g., "there is often a fuss going on at our home") on a 4-point Likert scale from 1 ("not at all like your own home") to 4 ("very much like your own home"). This measure has adequate internal consistency and test-retest reliability and has shown convergent validity with other measures of family environment and parenting behaviors (Matheny et al., 1995). The average of the 15 items was used for analyses.

Parents' nap beliefs. Parents' beliefs about napping were measured using two scales: (1) the Parents' Nap Beliefs Scale (14-items) and (2) the Reasons Children Nap Scale (19-items; Chapter 4). On both questionnaires, parents responded on a 5-point Likert scale. The Parents' Nap Beliefs Scale indexes parents' beliefs about napping among preschool children in general, rather than beliefs about their own child. However, each item began with a text stem that is customized and based on the half-year age range of the target child; for example, "Children who

are 2 to 2.5 years old…". This stem guided parents to consider children who were about the same age as their child and account for developmental trends. It has two subscales: (1) Positive beliefs about napping (e.g., "Children who are [stem] years old …behave better when they nap") and (2) Negative beliefs about napping (e.g., "Children who are [stem] years old… are too old to nap regularly"). This scale demonstrated excellent construct validity (i.e., robust CFI = .960, robust RMSEA = .059), internal consistency (i.e., all $\alpha_c > .80$), and convergent validity (Chapter 4). The average scores for Parents' Nap Beliefs subscales were used for analyses.

The Reasons Children Nap Scale indexes the extent to which different factors influence parents' decisions to encourage or discourage their own child's nap behavior. This scale has two higher-order factors and five lower-order factors: (1) Encouragement reasons ([a] Child-related; [b] Parent-related) and (2) Discouragement Reasons ([c] Child prefers not to nap; [d] Child functions well without a nap; [e] Scheduling-related). This scale demonstrated excellent construct validity (i.e., robust CFI = .900, robust RMSEA = .076), internal consistency (i.e., most subscales $\alpha_c > .80$, all $\alpha_c > .70$), and convergent validity (Chapter 4). The average scores of the five lower-order factors were used for analyses.

Parents' nap behavior. Parents reported on their own typical nap behavior during a typical week. This inventory identified how often parents themselves nap during a week (0 = "never"; 6 = "six-to-seven times per week") and how long these naps typically last (0 = "never nap"; 5 = "more than 60 minutes"). For analyses, responses were recoded into two categories 0 = parent typically naps never to less than once per week; 1 = parent typically naps once to 7 days per week. These recoded categories were selected based on a one-way ANOVA comparing parents' sleep diary data on the proportion of days when the parent napped (see Appendix E).

5.3.5 Research Design and Data Analyses

Preliminary analyses were conducted to understand the general relationships between the indicator variables and to make preliminary decisions about profiles, including whether to separate children who did not nap (i.e., non-nappers) and/or children who napped 6-7 days per week (i.e., consistent nappers) as known classes. These preliminary analyses included frequency analyses, Pearson correlations, and one-way ANOVAs and were conducted in SPSS v27.

Latent profile analyses (LPA) were conducted to determine underlying groups with different patterns of nap behavior using five indicator variables (described above). LPA was well-suited for this objective as it does not assume a homogenous sample and it can consider several continuous and categorical variables simultaneously in pattern identification, unlike discriminant function analysis (Spurk et al., 2020; Stanley et al., 2017). LPA was conducted in Mplus v8 using full information maximum likelihood (Muthén & Muthén, 1998-2017). Models were built successively by increasing the number of profiles beginning with one and assessing model fit. Five criteria were used to determine the optimal number of profiles to retain: (1) lower Bayesian information criterion (BIC) and sample-size adjusted Bayesian information criterion (ABIC); (2) a statistically significant parametric bootstrapped likelihood ratio test and a statistically significant Lo-Mendell-Rubin (LMR) likelihood ratio test, both indicating the additional profile resulted in improved model fit; (3) high posterior probabilities for each profile (≥ 0.70), (4) no less than 1% of the sample in a given profile and no less than 25 cases in a given profile; an entropy value > .80; and (5) the parsimony and theoretical interpretability of the profiles (Lui et al., 2022; Spurk et al., 2020). To interpret the best-fitting model, the indicator variables for each profile were summarized with z-scores.

A multinominal logistic regression was used to examine differences in the patterns of nap behavior identified in the LPA in MPlus v8 using maximum likelihood estimation with robust standard errors. Firstly, non-nappers were used as the comparison group. A model-building approach was applied. Secondly, we used the "intermittent napping" profile to further explore differences between still-napping profiles. The correlates did not change between these analyses, only the comparison group.

Missing data were handled using multiple imputation, with 10 datasets imputed. Mplus uses Bayesian analyses to impute missing data. Then, parameter estimates are averaged across the results from these datasets (Muthén & Muthén, 1998-2017). Missing data was low for most variables ($\leq 5.0\%$), except for child's birthweight (20.7%).

5.4 Results

5.4.1 Sample Description

Child, parent, and family demographic statistics are presented in Table 5.1.

Table 5.1: Child, Parent, and Family Demographic Statistics

Characteristic	Category	% (*n*) or *M* (*SD*)
Child		
Age	1.5 to 2.0 years old	15% (105)
	2.0 to 2.5 years old	10.4% (73)
	2.5 to 3.0 years old	10.3% (72)
	3.0 to 3.5 years old	9.1% (64)
	3.5 to 4.0 years old	8.7% (61)
	4.0 to 4.5 years old	10.4% (73)
	4.5 to 5.0 years old	10.4% (73)
	5.0 to 5.5 years old	13.7% (96)
	5.5. to 6.0 years old	12.1% (85)
Sex	Male	53.8% (378)
	Female	45.6% (320)
	Prefer not to answer	0.5% (4)
Parent		
Age	Under 21 years	0.7% (5)
	21-24 years	3.0% (21)
	25-29 years	12.3% (86)
	30-34 years	32.2% (226)
	35-39 years	35.0% (246)
	40-44 years	11.1% (78)
	45-49 years	3.4% (24)
	50 years or older	2.1% (15)

Employment status	Employed full-time	51.6% (362)
	Employed part-time	9.8% (69)
	On parental leave	3.1% (22)
	At-home parent	23.2% (163)
	Student	1.1% (8)
	Unemployed	7.5% (53)
	Other (e.g., student with part-time job)	3.5% (25)
Relation to child	Birth mother	67.5% (474)
	Birth father	28.5% (200)
	Other relation (e.g., grandparent, adoptive parents)	4% (28)
Ethnicity[1]	White	68.7% (482)
	Chinese	6.1% (43)
	South Asian (e.g., Punjabi, Sri Lankan)	1.7% (12)
	Indigenous Persons (e.g., First Nations)	2.8% (20)
	Black	5.4% (38)
	Southeast Asian (e.g., Cambodian)	
	Arab/West Asian (e.g., Armenian, Iranian)	1.9% (13)
	Filipino	3.1% (22)
	Latin American	3.6% (25)
	Korean	0.4% (3)
	Japanese	1.3% (9)
	Other ethnicities	2.0% (14)
Education level	Some high-school or lower	3.1% (22)
	High school graduate/GED	12.3% (86)
	Some post-secondary	18.3% (128)
	Diploma from college/nursing school	18.0% (127)
	Undergraduate degree	29.6% (208)

	Masters, professional degree (e.g., MD), or earned doctorate (e.g., PhD)	18.3% (129)
	Prefer not to answer	0.0% (0)
Province/Region of Residence	Atlantic (i.e., Nova Scotia, New Brunswick, Prince Edward Island, Newfoundland & Labrador)	5.8% (41)
	Quebec	15.1% (106)
	Ontario	48.1% (338)
	Prairies (i.e., Manitoba, Saskatchewan, Alberta)	19.2% (135)
	British Columbia	11.7% (82)
Family		
Income	< $40,000	19.1% (134)
	$40,000 to $59,999	11.7% (82)
	$60,000 to $79,999	15.7% (110)
	$80,000 to $99,999	29.7% (209)
	≥ $100,000	20.4% (143)
	Prefer not to answer	3.4% (24)

Note: [1] Ethnicity does not sum to 100% as parents could report multiple ethnicities.

5.4.2 Preliminary Analyses

Parents who reported their child did not nap in the past month were not asked nap behavior questions. The absence of daytime sleep also represents the endpoint of the consolidation of daytime and nighttime sleep (Staton et al., 2020; Chapter 1 and 2). Non-napping children can be assumed to have some uniform nap behaviors (i.e., typical nap duration = 0 minutes, percentage of daytime sleep = 0.0%). As such, these non-napping children were considered a "known class" and were excluded from LPAs. We also considered whether consistently napping children (i.e., those who napped 6-7 days per week) were an additional known class. We evaluated whether these children were reported to have uniform nap behaviors using descriptive analyses. These consistently napping children varied considerably in their proportion of daytime sleep (*SD* = .07), typical nap duration (*SD* = 56.42 minutes), typical timing of their first nap (*SD* = 78.90 minutes), and proportion of spontaneous naps (*SD* = .33). This variation suggested the absence of

a known class of consistent nappers and as such consistently napping children were included in LPAs.

5.4.3 Latent Profile Analyses

LPA models specifying 1 to 4 profiles were conducted. AIC, BIC, and ABIC decreased as additional profiles were added and both the parametric bootstrapped and LMR likelihood ratio tests indicated that each additional profile significantly improved fit (see Table 5.2). All LPA models generated posterior probabilities >.90 and entropy values >.80. However, the four-profile solution generated a profile with <25 cases, thus limiting interpretability. As such, the 3-profile solution was retained. When combined with the known class of non-nappers, this yielded 4 nap behavior profiles.

Table 5.2: Fit Indices for Latent Profile Analysis Models

Number of Profiles	Loglikelihood	AIC	BIC	ABIC	Entropy	BLRT p-value	LMR LRT p-value	Posterior Probabilities	Class Membership %
1	-7043.475	14108.950	14155.507	14120.592	n/a	n/a	n/a	n/a	100%
2	-6757.130	13552.261	13632.677	13572.369	0.829	< .0001	< .0001		
A								93.9%	38.3%
B								96.3%	61.7%
3	-6643.616	13341.232	13455.508	13369.807	.844	0.0002	< .0001		
A								93.5%	35.0%
B								93.3%	22.0%
C								93.2%	43.0%
4	-6532.846	13135.692	13283.828	13172.733	.882	< .0001	0.0029		

A	94.3%	21.0%
B	94.0%	42.0%
C	92.2%	3.9%
D	92.8%	33.0%

Notes: Profiles = the number of profiles/subgroups generated, with letters indicating the subgroups. AIC = Akaike Information Criteria; BIC = Bayesian Information Criteria; ABIC = Adjusted Bayesian Information Criteria; BLRT = Bootstrap Likelihood Ratio Test; LMR LRT = Lo-Mendell-Rubin Adjusted Likelihood Ratio Test. The posterior probabilities are the average likelihood that observations are classified in a given class; Class Membership % are the percentage of the sample that is classified into each given class.

To aid in the interpretation of this best-fitting model, indicator scores were converted to z-scores. According to the criteria outlined by Ekblom-Bak and colleagues, Z-scores > 0.5 were considered "high", scores < -0.5 were considered "low," and intermittent scores were considered "average" (Ekblom-Bak et al., 2020). Figure 5.1 illustrated the z-score distributions for each indicator variable for each profile and Table 5.3 presented the means and standard deviations of the indicator variables. **Profile A** was characterized by a very high nap duration (*M* = 138.25 minutes, *SD* = 60.42 minutes) and proportion of sleep during the daytime (*M* = 15.99%, *SD* = 5.78%) and a low proportion of spontaneous naps (*M* = 25.47%, *SD* = 28.20%). The majority of children in this profile napped 6-7 days per week (84%) or 3-5 days per week (11%). Thus, this profile was labelled "Regular Nappers". **Profile B** was characterized by average scores across indicator variables. The majority of children in this profile napped 1-2 days per week (41%) or 3-5 days per week (35%). Thus, this profile was labelled "Intermittent Nappers". **Profile C** was characterized by a high proportion of spontaneous naps (*M* = 86.56%, *SD* = 23.24%) and relatively later nap timings (*M* = 14:28, *SD* = 90.62 minutes) and a low proportion of sleep during the daytime (*M* = 1.15%, *SD* = 3.53%). The majority of children in this profile napped less than 1 day per week (75%) or 1-2 days per week (15%). Thus, this profile was labelled "Spontaneous Nappers". Recall, non-nappers were excluded as a known class. For interpretation and regression analyses, "non-nappers" were coded as their own profile, **Profile D**. As expected and coded, the profile was characterized as having a very low typical nap duration (*M* = 0.00, *SD* = 0.00 minutes) and a low proportion of sleep during the daytime (*M* = 0.00%, *SD* = 0.00%).

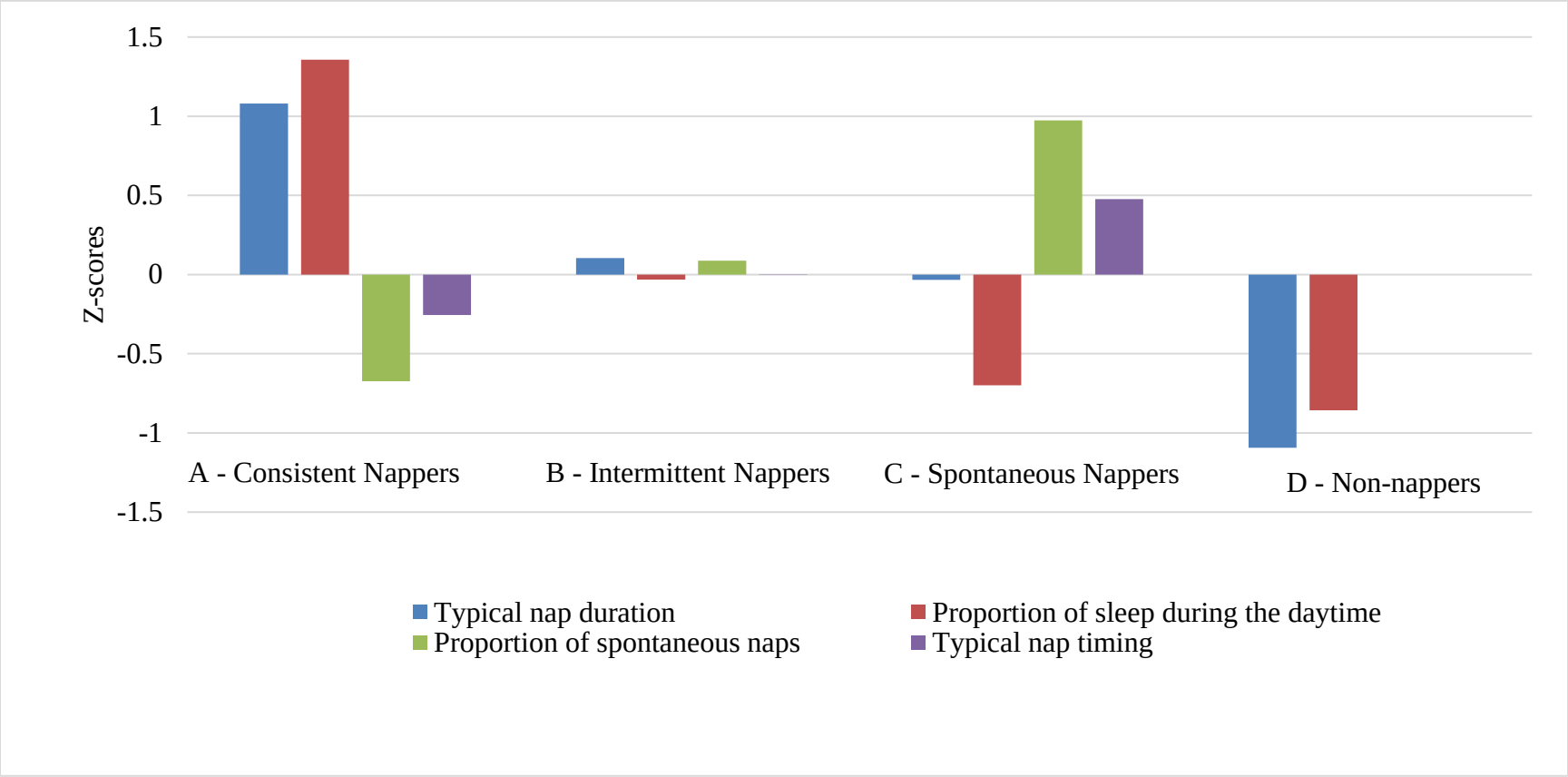

Figure 5.1: Z-score distributions of nap behaviors by profile.

This figure presented z-score distributions of typical nap duration, proportion of spontaneous naps, proportion of sleep during the daytime, typical nap timing, and difference between typical weekend and weekday nap duration for the four profiles of nap behavior are presented. Note, Profile D is comprised of the non-nappers (a known profile). Non-nappers have no data for proportion of spontaneous naps and typical nap timing as there are no logical values to represent zero. Intermittent Nappers (Profile B) have a typical nap timing z-score of approximately zero.

Table 5.3: Descriptive Statistics for the four nap behavior classes

	Profile A	**Profile B**	**Profile C**	**Profile D**
	Regular nappers	***Intermittent nappers***	***Spontaneous nappers***	***Non-nappers***
	Longer napping duration, high daytime sleep proportion, low spontaneity, and early timing	*Moderate napping frequency, spontaneity, duration, and timing*	*High napping spontaneity, late timing, and low frequency and daytime sleep proportion*	
N	**178 (25.4%)**	**223 (31.8%)**	**108 (15.4%)**	**193 (27.5%)**
Indicator Variables (weekly)	***M* (*SD*) or %**	***M* (*SD*) or %**	***M* (*SD*) or %**	***M* (*SD*) or %**
Typical nap duration [1]	138.25 (60.42)	76.19 (32.19)	67.39 (36.00)	0.00 (0.00)
Percentage of sleep during the daytime [1]	15.99% (5.78%)	5.96% (2.89%)	1.15% (3.53%)	0.00% (0.00%)
Percentage of spontaneous naps [1]	25.47% (28.20%)	53.70% (33.48%)	86.56% (23.24%)	--
Typical nap timing [1,2]	799.24 (99.70 mins) 13:19 (99.70 mins)	823.03 (83.22 mins) 13:43 (83.22 mins)	867.88 (90.62 mins) 14:28 (90.62 mins)	--

Typical napping frequency				
Does not nap	0.0%	0.0%	0.0%	100%
Naps < 1 day/week	0.6%	0.9%	74.7%	0.0%
Naps 1-2 days/week	4.5%	41.0%	14.7%	0.0%
Naps 3-5 days/week	11.0%	34.7%	3.2%	0.0%
Naps 6-7 days/week	83.6%	23.4%	7.4%	0.0%

Notes: All variables are based on retrospective reports of the previous month and calculated per week. Variables correlate strongly to analogous variables on the prospective sleep diaries (see supplemental materials).

[1] Non-nappers could not have data on typical nap timing or frequency; Nap duration and percentage of daytime sleep were set at zero.

[2] Typical nap timing is present as minutes from midnight (first line) and 24-hour time (second line).

5.4.4 Correlates of Nap Behavior Profiles

Comparing nappers and non-nappers. The proportions of each age group (in 6 months blocks) of children within each napping profile are presented in Figure 5.2. The results of the final model of the multinominal logistic regression are presented in Table 5.4. The Reasons Parents Discourage Napping – Scheduling related variable was found to have a non-linear association with the outcome variable, as such it was recoded into quartiles. Descriptive statistics for the correlates by profile are presented in Appendix E (Table E6). The complete model-building approach is presented in Appendix E (Table E7). The final model controlled for child age and other known correlates of nap behavior. The significant findings from this model are described below with odds ratios (OR) and 95% Confidence Intervals (CI); results focus on the novel correlates. Non-nappers (Profile D) was used as the comparison group for the dependent variable.

It was more likely that children were ***Regular Nappers*** (Profile A) than Non-nappers, as child age decreased (OR = 0.93, 95% CI = 0.91-0.95; *M* age = 31.74 months), as child nighttime sleep duration decreased (OR = 0.71, 95% CI = 0.51-1.00), parents' positive beliefs about naps increased (OR = 2.64, 95% CI = 1.78-3.91), parents' negative beliefs about naps decreased (OR = 0.34, 95% CI = 0.25-0.48), parent-related reasons (OR = 1.71, 95% CI = 1.20-2.43) and child-related reasons (OR = 1.62, 95% CI = 1.02-2.56) to encourage napping increased, scheduling-related reasons to discourage napping decreased (multiple ORs, see Table 5.4), and if the reporting parent napped at least once per week (compared to parent not napping or napping less than once per week (OR = 4.36, 95% CI = 2.24-8.46).

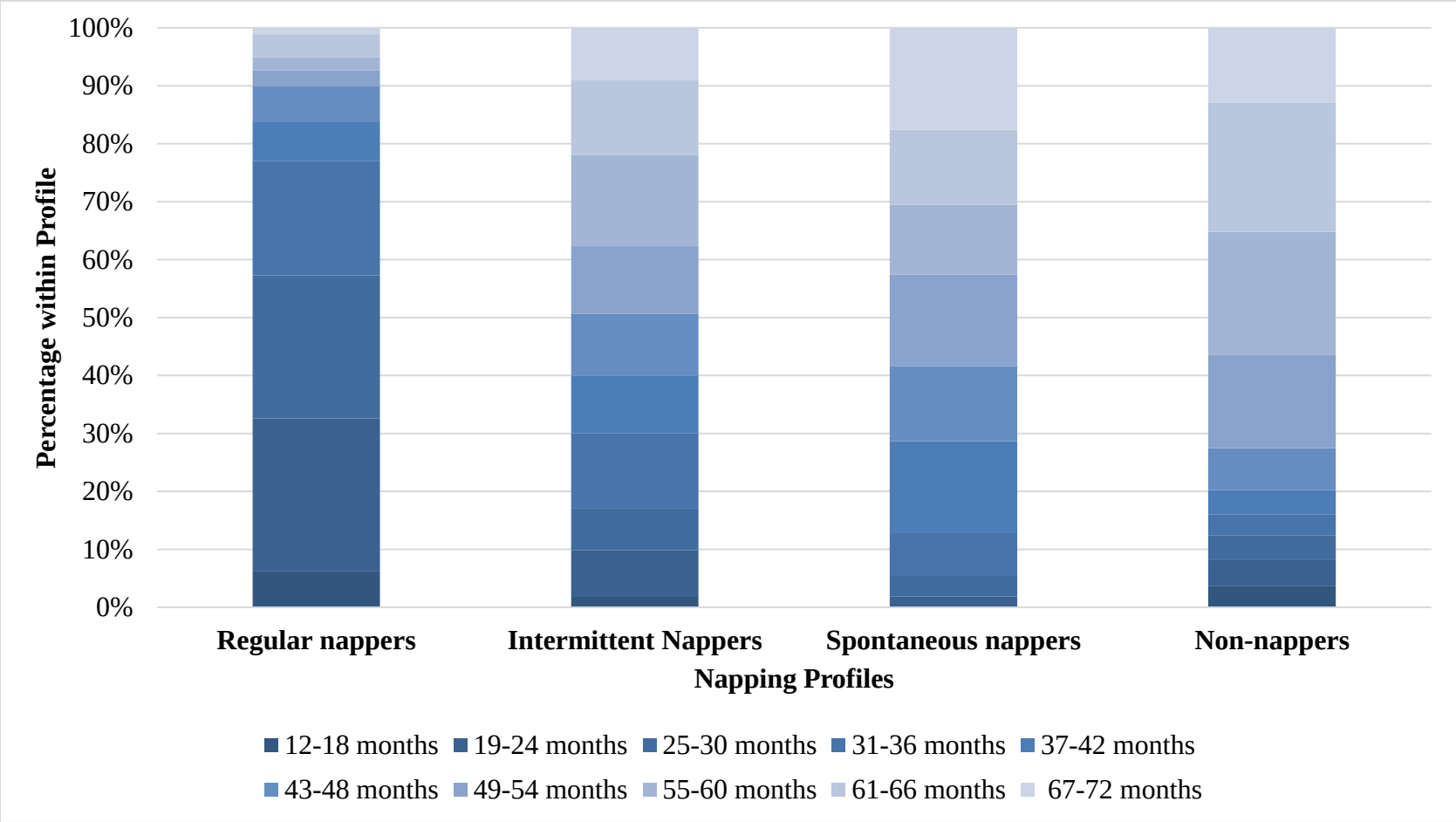

Figure 5.2. Distribution of child age within each napping profile.

This figure shows the percentage of children in 6-month age increments within each profile.

Table 5.4: Full final model multinominal logistic regression predicting napping profile

Variable	Category/Units	Profile A	Profile B	Profile C
		Regular nappers	Intermittent nappers	Spontaneous nappers
		OR [95% CI]	OR [95% CI]	OR [95% CI]
Child's Nighttime Sleep				
Child Nighttime Sleep Problems	Half SDs	1.18 [0.99 - 1.41]	**1.22 [1.06 - 1.40]**	1.04 [0.91 - 1.19]
Nighttime sleep duration	Hours	**0.71 [0.51 - 0.99]**	0.92 [0.71 - 1.21]	0.86 [0.64 - 1.16]
Parental Nap Beliefs				
Parents' Nap Beliefs – Positive Beliefs	Units	**3.53 [2.09 - 5.95]**	**2.65 [1.79 - 3.92]**	1.18 [0.81 - 1.71]
Parents' Nap Beliefs – Negative Beliefs	Units	**0.24 [0.15 - 0.37]**	**0.34 [0.25 - 0.48]**	**0.63 [0.45 - 0.87]**
Reasons Parents Discourage Napping – Child functions well without a nap	Units	0.71 [0.47 - 1.07]	1.10 [0.80 - 1.52]	0.87 [0.62 - 1.22]
Reasons Parents Discourage Napping –	25^{th} – 50^{th} Percentile	**0.87 [0.37 - 2.04]**	1.94 [0.94 - 3.98]	1.21 [0.55 - 2.70]

Scheduling related [1]				
	50th – 75th Percentile	**0.29**	1.15	1.11
		[0.11 - 0.76]	[0.52 - 2.51]	[0.47 - 2.64]
	>75th Percentile	**0.15**	1.27	1.57
		[0.05 - 0.50]	[0.51 - 3.20]	[0.61 - 4.02]
Reasons Parents Discourage Napping – Child prefers not to nap	Units	0.95	0.79	1.04
		[0.66 - 1.37]	[0.60 - 1.05]	[0.78 - 1.38]
Reasons Parents Encourage Napping – Child-related	Units	1.63	0.98	1.33
		[1.03 - 2.59]	[0.68 - 1.40]	[0.93 - 1.91]
Reasons Parents Encourage Napping – Parent-related	Units	**1.69**	**1.43**	0.88
		[1.19 - 2.41]	**[1.08 - 1.89]**	[0.66 - 1.18]
Family and parent variables				
Environmental confusion	Units	0.51	**0.19**	0.57
		[0.23 - 1.09]	**[0.11 - 0.35]**	[0.30 - 1.08]
Parent naps [2]	≥ 1 nap/week	**4.38**	**1.94**	0.78
		[2.26 - 8.48]	**[1.12 - 3.34]**	[0.43 - 1.40]
Socio-demographics				
Child age	Months	**0.93**	0.99	0.99

		[0.90 - 0.95]	[0.97 - 1.01]	[0.97 - 1.02]
Child's sex [5]	Male	**2.29**	0.93	**1.69**
		[1.18 - 4.48]	[0.56 - 1.54]	**[1.00 - 2.87]**
Child's ethnicity [6]	White	0.61	0.73	1.00
		[0.30 - 1.24]	[0.41 - 1.30]	[0.55 - 1.82]
Child has older sibling(s) [7]	≥ 1	1.11	1.17	0.84
		[0.57 - 2.15]	[0.69 – 2.00]	[0.48 - 1.46]
Highest education in the household [3]	High school & below	1.59	2.04	1.51
		[0.57 - 4.44]	[0.86 - 4.82]	[0.59 - 3.84]
	Above high school & below university/ college graduate	1.40	0.81	0.56
		[0.56 - 3.5]	[0.39 - 1.68]	[0.26 - 1.22]
Family Income [4]	<$40K	1.30	0.90	1.13
		[0.45 - 3.73]	[0.38 - 2.12]	[0.49 - 2.59]
	$40K - $100K	1.55	1.21	1.05
		[0.68 - 3.53]	[0.65 - 2.27]	[0.54 - 2.02]
Parent's occupational status [8]	At-home parent or on parental leave	1.56	1.13	0.96
		[0.74 - 3.29]	[0.56 - 2.27]	[0.44 - 2.07]
	Working parttime,	1.17	1.11	1.30
		[0.50 - 2.75]	[0.55 - 2.21]	[0.64 - 2.62]

	unemployed, & other			
Other child-related variables				
Developmental Milestones	Z-score	0.75 [0.55 - 1.02]	0.78 [0.61 - 1.01]	1.10 [0.8 - 1.50]
Birthweight [9]	< 2500 grams	0.42 [0.13 - 1.31]	0.44 [0.18 - 1.11]	0.31 [0.09 - 1.03]
Maternal alcohol use during pregnancy [10]	Once or more	0.33 [0.11 – 1.01]	**0.28 [0.09 - 0.82]**	0.81 [0.30 - 2.16]
Childcare arrangement [11]	In kindergarten	0.47 [0.16 - 1.40]	0.91 [0.46 - 1.78]	0.99 [0.49 - 2.01]
	Care by non-parent/guardian or center	1.33 [0.60 - 2.92]	1.07 [0.54 - 2.13]	1.32 [0.64 - 2.73]

Notes. Dependent variable outcome reference category is Profile D (non-nappers). Significant Odds Ratios are bolded. Units refers to the original coding of scale. That is, for Positive and Negative Parental Nap Beliefs, parents responded on 5-point Likert scale from "completely disagree" to "completely agree"; for Reasons parents encourage or discourage napping, parents responded on a 5-point Likert scale from "not at all true" to "completely true"; for environmental confusion, parents responded on a 4-point Likert scale from "not at all like your own home" to "very much like your own home".

Appendix E (Table E6) presented the descriptive statistics for the predictor variables by napping profile. Table E7 presented the full model building approach.

[1] Reference category is <25th percentile

[2] Reference category is parent does not nap or naps <1/week

[3] Reference category is university or college graduate and above

[4] Reference category is >$100K

[5] Reference category is female

[6] Reference category is non-White ethnicity

[7] Reference category is child has no older siblings

[8] Reference category is parent working full-time

[9] Reference category is birthweight ≥ 2500 grams

[10] Reference category is birth mother did not use alcohol during pregnancy

[11] Reference category is childcare exclusively by parents/guardians

It was more likely that children were ***Intermittent Nappers*** (Profile B) than Non-nappers, as nighttime sleep problems increased (OR = 1.21, 95% CI = 1.06-1.39), parents' positive beliefs about naps increased (OR = 2.64, 95% CI = 1.78-3.91), parents' negative beliefs about naps decreased (OR = 0.34, 95% CI = 0.25-0.48), parent-related reasons to encourage napping increased (OR = 1.44, 95% CI = 1.09-1.90), environmental confusion decreased (OR = 0.20, 95% CI = 0.11-0.36), and if the reporting parent napped at least once per week (compared to parent not napping or napping less than once per week; OR = 1.92, 95% CI = 1.12-3.31).

Finally, it was more likely that children were ***Spontaneous Nappers*** (Profile C) than Non-nappers, as parents' negative beliefs about naps decreased (OR = 0.63, 95% CI = 0.45-0.86). Of note, children's childcare arrangements were not associated with profile membership.

Exploring differences between napping patterns. The Intermittent Napping profile (Profile B) was used as the comparison group to further investigate the correlates of profile membership between this profile and Regular and Spontaneous Nappers. The results of this regression are presented in Appendix E (Table E8). Briefly, it was more likely that children were ***Regular Nappers*** than Intermittent Nappers as parent-related reasons to discourage napping decreased (multiple ORs, see Table B3), child-related reasons to encourage napping increased (OR = 1.68, 95% CI = 1.16 - 2.43), environmental confusion increased (OR = 2.66, 95% CI = 1.46 - 4.87), child age decreased (OR = 0.94, 95% CI = 0.92 - 0.96), and when children were male (OR = 2.45, 95% CI = 1.43 - 4.21).

It was more likely that children were ***Spontaneous Nappers*** than Intermittent Nappers as child nighttime sleep problems decreased (OR = 0.86, 95% CI = 0.75 - 0.99), parents' positive beliefs about napping decreased (OR = 0.45, 95% CI = 0.30 - 0.67), parents' negative beliefs about napping increased (OR = 1.81, 95% CI = 1.31 - 2.51), environmental confusion increased (OR = 2.90, 95% CI = 1.43 - 5.89), parents napped at least once per week (OR = 0.41, 95% CI = 0.22 - 0.76), children were male (OR = 1.83, 95% CI = 1.07 - 3.15), and developmental milestone z-scores increased (OR = 1.40, 95% CI = 1.02 - 1.93).

5.5 Discussion

Four profiles of children's nap behavior were identified based on five indicators related to napping among preschool-age children: typical nap duration, proportion of spontaneous naps, typical nap timing, proportion of sleep during the daytime, and typical weekly napping frequency. Two novel profiles identified subgroups of children we labelled as Intermittent and Spontaneous Nappers. These two profiles reflect the diversity of inter- and intra-child napping behaviors of children. We expect that these are children who are transitioning from being Regular Nappers to non-nappers (the other two profiles). Parents' beliefs about napping and their own napping behaviors were the key variables that differentiated the napping profile that children belonged to, after controlling for sociodemographic factors and previously established correlates of children's nap behaviors. These findings provide support for the application of the socioecological model (Bronfenbrenner, 1979) to our understanding of factors influencing the children's transition to monophasic sleep.

The profiles we observed in this study have some similarities to previously applied classifications. Like previous research, we observed a non-napping group and a regularly napping group (Hall et al., 2012; Smith et al., 2019; Chapter 2). However, we identified multiple "transitional" napping groups, whereas previous classifications have either combined this group with other napping children (Chapter 2) or identified one transitional napping group (Smith et al., 2019). More broadly, the napping frequency and the proportion of sleep during daytime values we observed are consistent with what would be expected from previous research – children nap less often and for a lesser percentage of their total sleep as they transition into consolidated sleep (Iglowstein et al., 2003; Mindell et al., 2016; Staton et al., 2020).

We then used regression modeling to examine correlates of profile membership, with variables selected based on the socioecological model. As hypothesized, we observed a profile of children with low spontaneity and high napping frequency (i.e., Regular Nappers; Profile A). Not surprisingly, children in this profile tended to be younger than other profiles. It is likely that children within this profile still require a daytime nap to meet their 24-hour sleep needs, as children were more likely to be in this profile as nighttime sleep duration decreased (compared to non-nappers). Of note, nighttime sleep problems did not correlate with membership in this profile, suggesting that when children still require naps, daytime sleep does not interfere with nighttime sleep onset and maintenance. It also appears that parents of these children value and prioritize daytime sleep. Parents cited fewer scheduling-related reasons to discourage napping (compared to non-nappers) and higher child-related reasons to encourage napping. Further, they generally held high positive and low negative beliefs about napping for children near the same age as their child. Parents of these children may themselves also directly benefit from their child's consistent, predictable napping by enjoying a break from childcare duties. Higher parent-related reasons to encourage napping was associated with higher odds of being in this profile (compared to non-nappers). This scale includes items such as, "I would encourage my child to nap if…" "…I needed a break" and "…I needed time to do other things (e.g., chores, relax)". These parents may also use children's nap time to nap themselves.

We identified two profiles of inconsistently napping children. The first of these was characterized by moderate napping frequency, spontaneity, duration, and timing (i.e., Intermittent Nappers; Profile B). Interestingly, the likelihood of being in this profile was not related to age. Children in this profile may have their sleep needs met without a nap. As such, on days they do nap, they may experience lower sleep drive at their typical bedtime, which may contribute to greater sleep onset latency, night-waking, or early morning waking problems. Still, parents of these children may continue to value naps, albeit occasionally. Conversely, more nighttime sleep problems may lead parents to respond with encouraging a naptime for their child the next day (or allowing their child to continue napping in the case of a spontaneous nap). Higher positive beliefs and lower negative beliefs about napping were associated with profile membership (compared to non-nappers). Perhaps this is due to the benefits parents observe for themselves from napping. Again, parent-related reasons for encouraging napping and parents

napping themselves was associated with group membership. These parents may favour a responsive and flexible approach to napping. This may be achievable for these parents as this profile was related to lower environmental confusion (e.g., more stable, less chaotic homes).

The second of these napping profiles – Spontaneous Nappers (Profile C) – was characterized by high spontaneity, low frequency, and low typical nap durations. Again, child age was not associated with membership in this profile. Parents of these children believe there are fewer negative aspects associated with occasional naps, compared to parents of non-nappers. Further, parental nap beliefs and behaviors were also significant correlates differentiating between Spontaneous Nappers and Intermittent Nappers. Spontaneous Nappers tended to have lower nighttime sleep problems than Intermittent Nappers. Naps may still delay and/or shorten nighttime sleep within this profile, but naps may not occur frequently enough to make nighttime sleep a problem. Age was not a significant correlate between these profiles, but developmental milestones were. This suggests a possible role of maturation.

These results provide strong support for our hypothesis that parents' nap beliefs and behaviors are important correlates of their preschool-age children's nap behaviors. This is consistent with the limited previous research on the association between parental nap-related attitudes and children's nap behaviors (Jones & Ball, 2013). For example, in a qualitative study of parents of preschool children, three groups of parents were identified: (1) parents who actively discouraged naps (n = 29), (2) parents who actively encouraged naps (n = 7), and (3) parents who neither encouraged nor discouraged naps but viewed children's naps as opportunistic (n = 18). Children with parents who viewed naps as opportunistic or encouraged naps slept for longer during the day than parents who discouraged naps (Jones & Ball, 2013). The attitudes expressed by this opportunistic group of parents appear similar to the flexible, responsive approach which may be used by parents of Intermittent Nappers.

The correlates discussed above remained significant when controlling for demographic factors and other known correlates, such as developmental milestones achieved, of preschool children's nap behaviors. As noted, child age differentiated Regular Nappers from Non-nappers; however, it did not differentiate Non-nappers from either Intermittent or Spontaneous Nappers. This suggests factors beyond simple maturation need to be considered when understanding changes in

children's nap behavior. Surprisingly, childcare arrangement was not related to profile membership. The percentage of children who were cared for exclusively by their parents was slightly higher across profiles than pre-pandemic national averages (see Section 5.3.3). It may be that these parents could respond more flexibly to their children's needs or that they had more opportunity to influence nap behaviors. Future studies should consider how variations in childcare nap environments interact with children's nap behaviors. Together, our findings support the socioecological model and suggest the importance of further investigations of the reciprocal relation between children and parents' sleep behaviors, with special attention on parental beliefs.

5.5.1 Strengths, Limitations, and Future Directions

This study is the first, to our knowledge, to apply an empirical approach to categorize the variation in children's nap behavior. This study was also one of the first to apply parental beliefs, parents' own nap behavior, and family functioning to understand preschool-age children's nap behavior. Further, this study utilized a large sample of Canadian parents that was diverse and reflective of the Canadian population in terms of ethnicity, family income, and parents' educational attainment. However, this study should be interpreted with key limitations. Firstly, this study was cross-sectional. As such, causation cannot be inferred. Future research should apply longitudinal methodologies to evaluate how children within specific profiles of nap behavior change in their presentations over time. For example, do children transition from planned, long, and frequent naps (Regular Nappers; Profile A) to fewer planned and less frequent shorter naps (Intermittent Nappers; Profile B) and then move on to having a few short largely unplanned naps (Spontaneous Nappers; Profile C) as they transition to non-napping (Non-nappers; Profile D); and if so, what predicts the rate at which children progress through this transition? Previous research has clearly documented the trend of decreasing nap frequency and duration as children age but has yet to incorporate napping spontaneity (Iglowstein et al., 2003; Staton et al., 2020). In fact, there is little research on the developmental sequence of spontaneous versus planned naps and on intra-child variability in nap behaviors.

Secondly, our primary measures were obtained via parent-reported questionnaires. A such, some of the observed associations may be attributable to shared method variance. This limitation is

somewhat mitigated by validating the indicator measures used in the LPA with sleep diary data and that all indicator variables were strongly related to the equivalent sleep diary measure. Future studies may employ actigraphy or videosomnography as more objective measures of sleep duration and timing. However, these methods may decrease generalizability and ecological validity, as it would be much more difficult to implement a large-scale national study using these methods. Further, napping spontaneity could not be indexed by actigraphy and videosomnography alone, but would additionally require either complementary sleep diaries in home and childcare settings or direct observation. Thirdly, the profiles produced in this study are novel and should be replicated. Fourthly, this study was conducted in Canada. It is unclear whether the findings of this study would generalize to children and parents within other countries or cultures (particularly countries which encourage more frequent napping, e.g., China, Italy). A similar clustering approach could be applied to napping behaviors in children from these countries. It is important to note that we purposefully oversampled younger children (i.e., 1-2 years old) who did not nap and older children (i.e., 4-5 years old) who were still napping. The population prevalence of the identified patterns of napping would need to be researched using a sampling strategy designed to provide the best estimates of prevalence (Schmidt et al., 2010).

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Chapter 6

6 The Developmental Importance of Napping: Themes, Directions, and Conclusions

Preschool children's nap behavior is complex and multifaceted. Further, this behavior is marked by high inter- and intra-child variability (Iglowstein et al., 2003; Staton et al., 2020). This dissertation aimed to increase our understanding of the developmental importance of napping among young children by: (1) investigating predictors of early nap cessation; (2) evaluating outcomes related to early nap cessation; (3) developing measurements for parental nap beliefs; and (4) evaluating an empirical method of characterizing children's nap behaviors. This chapter discusses the main themes, linkages with theory, implications, strengths, limitations, and future directions of this dissertation.

6.1 Key Findings and Themes

The chapters in this dissertation were ordered intentionally to build our understanding of nap behavior and cessation in preschool children. As identified in the General Introduction (Chapter 1), the preschool-age period is when nap cessation occurs for nearly all children in North America. Study 1 (Chapter 2) tested the demographic, perinatal, growth-related, developmental, and functional predictors of early nap cessation in a large, national sample. The results of this study spurred two additional research questions: (1) does early nap cessation relate to functional outcomes later in childhood (e.g., language, behavior, cognition)? and (2) are there more proximal predictors of nap cessation, such as parental beliefs and behaviors related to napping and childcare arrangements? Study 2 (Chapter 3) addressed this first question and demonstrated that early nap cessation was indeed related to relevant outcomes later in childhood (i.e., higher receptive language and lower anxiety scores at the 4-to-5-year-old follow-up). Study 3 (Chapter 4) identified and addressed a clear gap in the literature – parental beliefs about children's nap behaviors were expected to relate to children's nap behaviors, but no psychometrically sound measurements of this construct existed. So, two measures of parental nap beliefs were developed and evaluated. These two psychometrically sound measures were then applied to predicting nap behavior in Study 4 (Chapter 5). Study 4 also presented a more complex classification of nap behavior (based on multiple indicators) and investigated the predictors of this classification.

There are several themes that emerge from these studies. These themes include the nature of nap behaviors, the appropriateness of the socioecological model, the relation of nap behaviors to functional outcomes, and emerging policy recommendations.

6.1.1 The Multifaceted Nature of Nap Behavior

Nap behavior is multifaceted. It includes components such as duration, frequency, timing, and spontaneity. This dissertation has shown that several components of nap behavior (i.e., duration, timing, frequency, spontaneity, proportion of sleep during the daytime) can be integrated using an empirical classification approach and that there appear to be important differences between identified profiles of children (Chapter 5). These components are related, but each component provides additional insights into nap behavior. For example, spontaneity appears to increase as napping frequency decreases. As such, it may be valuable to consider nap behavior using these multiple components together, rather than discretely (as in previous research, e.g., Lam et al., 2011). These profiles emerged from analyzing between-child differences of typical nap behaviors. However, within-child differences were not investigated. Intermittent and spontaneous nappers may have particularly variable nap behaviors. But more research is needed to understand normative variations within children. Specifically, representative studies are needed to establish norms for within-child standard deviations in nap duration and differences between weekend and weekday sleep.

Nap cessation is a developmental process where children transition from poly- to bi- to mono-phasic sleep, with nap cessation capturing the transition's endpoint. When nap cessation occurs may have important developmental implications. This dissertation defined early nap cessation as children stopping their daytime nap by their third birthday. There were significant predictors (Chapter 2) and outcomes (Chapter 3) associated with early nap cessation. Fully consolidated, monophasic nocturnal sleep may be richer in slow wave sleep, which could increase language functioning (Knowland et al., 2022; Lokhandwala & Spencer, 2022; Spencer, 2021). Children who achieve nap cessation at younger ages would have longer to benefit from this richer sleep (Knowland et al., 2022). This leads to a major practical question – can children cease napping too early? Others have argued that daytime sleep is required until at least 2-years-old for children to meet 24-hour sleep requirements (Staton et al., 2015). The National Sleep Foundation

recommends that 2-year-old children sleep 11-to-14 hours per day. Logistically, this sleep duration would be very difficult for many working families to achieve. For example, an 8PM bedtime with a 14-hour sleep duration would correspond to a 10AM waketime. Biologically, this long monophasic sleep schedule is unlikely to align with toddlers' circadian rhythms. This dissertation has provided no evidence that encouraging children to stop napping before they are developmentally ready will provide any benefits. Instead, ceasing naps when children are too young is likely to reduce 24-hour sleep, leading to fatigue and possible impacts on cognition (Spencer, 2021). Longitudinal studies with multiple short-term follow-ups are needed to understand whether children who cease napping before 2-years-old demonstrate lower language, memory, or behavioral functioning than still napping peers.

6.1.2 Napping cessation and the Socioecological Model

The socioecological model is appropriate for understanding nap cessation. Nap cessation does not appear to be driven exclusively by maturation or environmental factors, rather a combination (i.e., Chapters 2 and 5). The results of this dissertation can be used to revise the application of the socioecological model to nap behavior, first presented in Chapter 1. This revised figure is presented in Figure 6.1. At the individual-level, factors related to development (e.g., developmental milestones achieved), maturation (e.g., child age), child's sex, neonatal variables (e.g., birthweight, maternal alcohol use during pregnancy), and child-oriented napping preferences (e.g., child-related reasons to encourage or discourage napping) were related to nap behavior. At the social-level, parental nap-related beliefs, parents' own nap behaviors, parental nap practices, situational factors (e.g., parental employment, child's siblings), and family functioning were related to nap behavior. This dissertation did not directly assess societal-level factors, however, cultural attitudes toward napping and regional or national childcare policies are expected to influence nap behavior. For example and as discussed in Chapter 3, habitual napping is encouraged across school years in China. School-age Chinese children who nap more often and for longer durations have *higher* verbal and academic abilities and *lower* internalizing difficulties than peers who nap for shorter durations or less often (Liu et al., 2019). As such, the "nap culture" (cultural attitudes toward napping) in which a child is nested may have important influences on what determines nap cessation and how nap behavior is related to outcomes. This

cross-cultural research is an intriguing area of study that may advance our understanding of the function of naps.

The interplays between the levels of this model are also important to consider. Societal-level factors would influence social-level factors. Many of these interplays were beyond the scope of this dissertation, but should be investigated in future studies. For example, cultural attitudes toward napping are likely to influence parents' own nap-related beliefs. In another example, regional or national childcare policies about napping could establish a framework for the local implementation of these policies, but this local implementation would likely vary from centre to centre. Parents' own nap beliefs may also interact with the napping policies at a childcare centre. For example, some conflict may arise if a parent believes their child should no longer be napping and the childcare centre universally encourages napping. However, more research is required to understand the influence of societal-level nap-related beliefs or policies on parental nap-related beliefs and behaviors. Finally, there is likely a reciprocal relation between parents' beliefs and practices and their child's nap behaviors; that is, an interplay between the individual- and social-levels. Perhaps children who appear to enjoy naps reinforce parents' positive beliefs about napping. These interplays were not empirically tested in this dissertation but should be researched further through longitudinal designs and studies incorporating childcare settings (see Future Directions, Section 6.3).

6.1.3 Contributions to Understanding Napping and Functional Outcomes

This dissertation provides additional data on the relation between nap behaviors and functional outcomes (e.g., behavior, language, other cognitive abilities). Early nap cessation predicted higher receptive language and lower anxiety levels, after controlling for age, other demographic predictors, and other known predictors of nap cessation (Chapter 3). Other studies have similar findings – that napping less frequently or for shorter durations predicts better functioning in cross-sectional, longitudinal, and quasi-experimental research (Dionne et al., 2011; Knowland et al., 2022; Lam et al., 2011; Smith et al., 2019; Werchan & Gomez, 2014; Yokomaku et al., 2008). However, other experimental studies have demonstrated that habitually napping children (e.g., napping at least 5 days per week) show short-term improvements in memory and learning after a nap (Gomez et al., 2006; Kurdziel et al., 2013; Sandoval et al., 2017; Wang et al., 2022;

Werchan et al., 2021; Williams & Horst, 2014). Further, there appear to be other tasks, such as word generalization, for which napping may improve functioning regardless of how often a child typically naps (Sandoval et al., 2017). Together, this previous research suggests an interaction between napping frequency and task. Overall, this research suggests that napping in preschool can contribute to short-term improvements in some aspects of cognitive and behavioral functioning, especially for regularly napping children. But using a developmental lens, greater sleep consolidation at a younger age appears to predict better longitudinal cognitive and behavioral functioning.

Recently, two brain maturational theories have been proposed to account for this interaction. Firstly, Spencer and colleagues proposed that non-habitual nappers have a more developed hippocampus and thus sufficient memory capacity to hold onto learning without needing to consolidate learning into memories during a midday nap (Kurdziel et al., 2013; Spencer, 2021). In this model, maturation would be the primary causal factor giving rise to earlier nap cessation and better learning. Secondly, Knowland and colleagues (2022) hypothesized that consolidated, monophasic sleep may lead to nocturnal sleep that is more efficient and richer in slow wave activity. Slow wave sleep can improve learning (Lokhandwala & Spencer, 2021). Thus, children who cease napping at younger ages have more years to benefit from this more efficient sleep. In this model, maturation is still the primary causal factor but change in sleep architecture at night is a mediator of the relationship between early nap cessation and learning outcomes. The evaluation of these theories was outside the scope of this dissertation. Longitudinal and experimental studies with repeated measures and a series of follow-up periods in short succession (e.g., follow-up at 6-month intervals) are needed to further understand these relations. This research could test longitudinal associations between brain maturation and nap behavior to further test the two brain maturational theories (Knowland et al., 2022; Kurdziel et al., 2013; Spencer, 2021). Further, more longitudinal studies incorporating polysomnography and electroencephalography (EEG), and brain imaging technology (e.g., fMRI) may be required to further understand how changes in nap behavior and sleep architecture relate to changes in neural functioning and/or brain structure (e.g., Iwata et al., 2012; Kurth et al., 2016).

6.1.4 Emerging Policy Recommendations

There are emerging policy implications that stem from this dissertation and the previous literature. Specifically, the findings of this dissertation support a flexible approach to childcare napping policies, which can support children's individual nap cessation trajectories. Two recommendations emerge. Firstly, children who continue to nap habitually should have opportunities to nap and children who no longer nap should have alternate quiet activities available to them. This recommendation is also given by other research groups (e.g., Smith et al., 2019; Staton et al., 2015). Australian data suggests that most parents of preschoolers do not want their children napping regularly (Sinclair et al., 2016), that mandatory naptimes can reduce nighttime sleep (Staton et al., 2015), and that mandatory naptimes can increase negativity of child-caregiver interactions in the childcare environment (Pattinson et al., 2014; Staton et al., 2017). Further, emerging evidence suggests that children attending childcare in lower socioeconomic neighbourhoods are more likely to experience mandatory naptimes and thus may be at greater risk for the potential negative effects of these policies (Pattinson et al., 2014).

Secondly, there may be a need for increased communication between parents and childcare providers regarding nap practices across settings, given that parent-related nap beliefs are strongly related to children's nap behavior (Chapters 4 and 5) and that most parents seem not to want their child to nap regularly while in childcare (Sinclair et al., 2016). However, further investigations are required to solidify these recommendations. Qualitative studies with early childhood educators and parents could investigate individual and group variations in nap-related beliefs, practices, and the perceived benefits and consequences of naps. These perspectives are important to understand prior to developing policy as important barriers may be identified. For example, childcare centres in Ontario often use naptimes for staff breaks, as ratios can be lowered (Government of Ontario, 2019).

To illustrate the potential implications of policy recommendations, consider two contrasting examples. First, consider a 4-year-old child who does not appear developmentally ready to cease napping (e.g., child does not function well without a nap) that attends an educational program without a scheduled naptime (e.g., kindergarten in Ontario; Ministry of Education, 2016). It is possible that this child requires naps to consolidate learning or to regulate emotions (e.g.,

Sandoval et al., 2017; Werchan et al., 2021), but the child's environment would not support this. Thus, this child might have poorer achievement on learning tasks compared to their peers. According to the model proposed by Spencer and colleagues (Kurdziel et al., 2013; Spencer, 2021), children in this situation may have a lowered capacity to hold onto information learned in the morning and require a midday nap to consolidate their learning.

Now, consider a 2.5-year-old child who may be developmentally ready to cease napping but have parents who value the rest that accompanies the child's nap. Despite the child's developmental stage, the parent may strongly encourage their child to nap, leading to resistance from the child. If the child does eventually nap, this nap can reduce sleep drive and lead to a longer nocturnal sleep onset latency and a shorter nocturnal sleep duration. This shorter nocturnal sleep duration could increase child fatigue and parental stress. In both cases, misalignment between the children's daytime sleep needs and social- and societal-level factors could contribute to problematic functional outcomes. Though these relations are speculative and require further investigation, the socioecological model has value in designing future studies testing the relation between nap behaviors and functional outcomes.

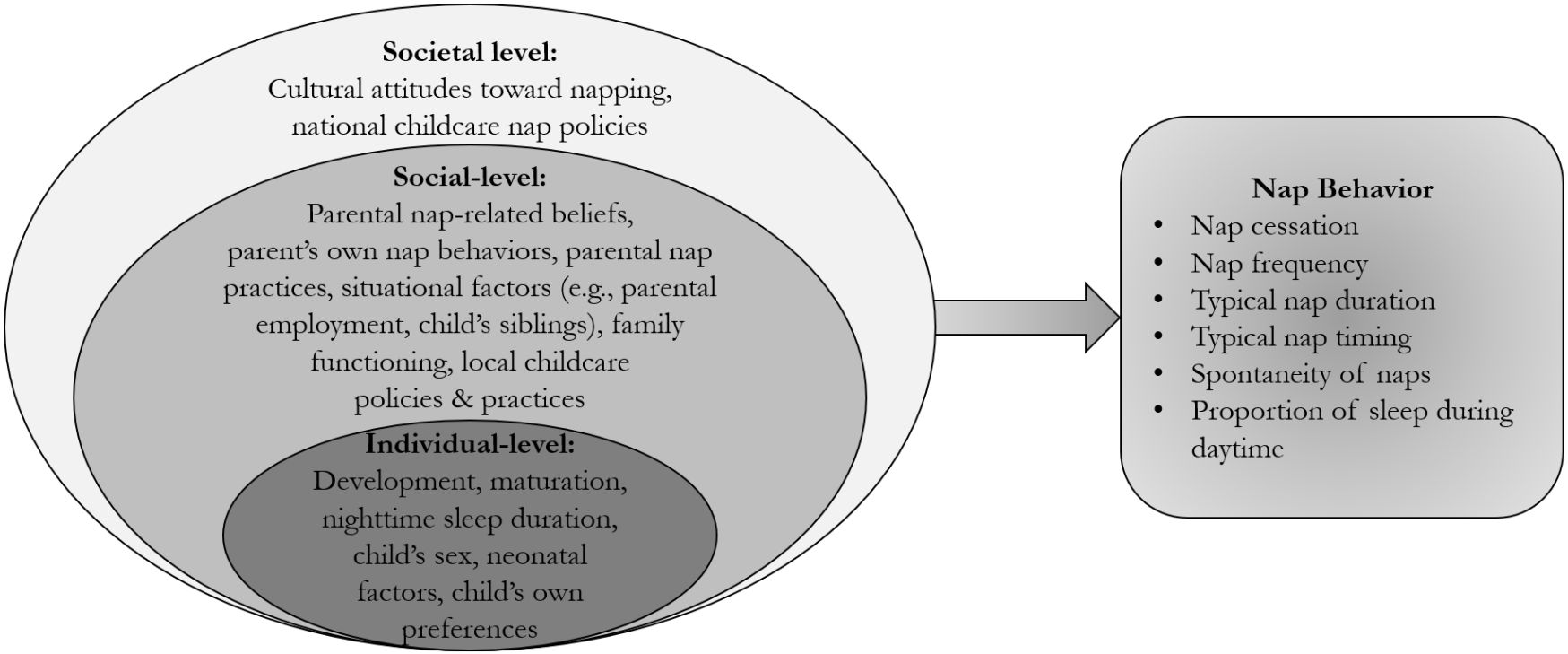

Figure 6.1: Socioecological Model of Preschool Children's Nap Behavior.

This model has been revised from the version presented in Chapter 1 to show the relevant constructs identified across this dissertation.

6.2 Limitations

The findings presented in this dissertation should be interpreted with several key limitations. Firstly, retrospective parent-reports were the primary measurement of children's sleep behavior and other variables across studies. As such, some of the variance observed across studies could be attributable to common measurement issues. Further, parents may have some degree of bias in their retrospective reports. Parental reports may slightly overestimate total sleep time, compared to more objective measures, such as actigraphy (Mazza et al., 2020; Quante et al., 2021). As such, using more objective measures may slightly alter the magnitude of parameter estimations in this dissertation's studies, but not the direction. However, retrospective parental reports of children's sleep functioning correlate strongly with other measures of sleep, as demonstrated within this dissertation (see Chapter 5) and in previous research (Sadeh, 1996; Tétreault et al., 2018). More objective measures of sleep (e.g., actigraphy, polysomnography) are difficult to implement at the scale of this dissertation's studies. Still, future research would benefit from applying these more objective sleep measurements to understanding children's nap behavior to address questions related to more specific sleep functions (e.g., sleep onset latency, sleep efficacy). For example, how do children's daily variations in nap duration predict nighttime sleep onset latency and sleep efficacy?

Secondly, the studies conducted using the NLSCY sample (i.e., Chapters 2 and 3) were representative of the Canadian population at the time of data collection but are not representative of the current Canadian population. Since data collection, Canada's population has become more ethnically diverse and more highly educated (Statistics Canada, 2022). This change is unlikely to affect the direction of the reported associations, but may influence the prevalence of nap cessation, as children who emigrate from some non-North American countries may be more likely to nap until older ages (Staton et al., 2020). Further, studies of children's sleep more commonly investigate race/ethnicity differences than cultural differences (e.g., Crosby et al., 2005).

Thirdly, the studies conducted using the cross-sectional Qualtrics samples (i.e., Chapters 4 and 5) were conducted during a restrictive phase of the COVID-19 pandemic. On average, children in this sample were more often cared for exclusively by their parents (~58%) than pre-pandemic

national averages (~40%; Chapter 5; Statistics Canada, 2021). This sample characteristic may have inflated the accuracy of parents' reporting on their children's nap behaviors; because when children are in childcare, parents' knowledge of their child's day-to-day experiences related to naps is reduced.

Fourthly, correlational methods were applied in each of this dissertation's studies. As such, causality cannot be inferred. Chapters 2 and 3 utilized longitudinal designs to allow for some degree of temporal ordering and all studies utilized some statistical control to account for the influences of competing explanations. Additional longitudinal studies with adequate statistical control should seek to replicate the results demonstrated in this dissertation to further increase the confidence in these findings (Lamal, 1990; Rosenthal, 1990).

6.3 Future Directions

As first identified in Staton and colleagues' meta-analysis (2020), we understand the normative trends of many nap behaviors well, especially among children living in North American and European countries. Yet, our understanding of why children transition to monophasic sleep at different rates and the meaning of this transition is an emerging field with many unanswered questions. I have discussed specific future directions in the previous chapters. Here, I will discuss major themes of future research.

Firstly, more cross-cultural nap behavior research is required. There are emerging inter-country differences related to nap behaviors and outcomes, especially between China and North America (Liu et al., 2019; Mindell et al., 2013; Mindell et al., 2010). Further, basic prevalence data are lacking from Asian-Pacific countries and non-existent from African and South American countries (Staton et al., 2020). Previous research has also shown differences in nighttime sleep duration and parental perceptions of sleep problems between Predominately Caucasian and Predominately Asian countries (e.g., Mindell et al., 2013; Mindell et al., 2010). It is unclear whether the main findings of this dissertation would replicate in non-North American countries. As noted in Chapter 1, race and ethnicity are social constructs and our understanding of these constructs have changed over time. There may also be regional or ethnicity-related differences within countries. Further, and as discussed in Chapter 3, there may be important differences in

the relation between nap cessation and functional outcomes between more specific ethnicity groups. However, these differences could not be investigated in this dissertation. Future research should seek to attain adequate sample sizes of specific ethnicity groups, rather than simply "White" vs. "non-White" participants. There also appear to be differences in childcare policies by the socioeconomic status of the neighbour a childcare center is nested within (Pattinson et al., 2014). There are unanswered questions about differences in parental and childcare provider beliefs about preschool children's nap behavior by both ethnicity and socioeconomic status.

It may be particularly interesting to design replication studies in countries that have napping as a part of their cultures, like siestas (e.g., Italy, Spain, China). There are at least three cross-cultural research questions which stem from this dissertation: (1) do the predictors and outcomes related to early nap cessation replicate in other countries? (2) Are the scale structures of the Parents' Nap Beliefs and Reasons Children Nap Scales valid in other countries and if so, how do parental nap beliefs differ between countries? (3) Do the profiles of nap behavior identified in this dissertation replicate to other countries? This research would be best achieved through collaborations between research labs across countries.

Secondly, within-child variability in nap behaviors should be investigated further. Children who are intermittent or spontaneous nappers are likely to have day-to-day variations in nap duration, timing, and frequency. As an initial step, the normative variations within children should be explored, such as within-child standard deviations in nap duration and timing and differences between weekend and weekday daytime-to-nighttime sleep ratios. As a secondary step, the patterns and correlations of these variations should be investigated. For example, are there distinct groups of children with high and low day-to-day variability in their nap duration and timing? And, if so, what factors differentiate these children?

Thirdly, nap behavior research should be extended to preschool-age populations with specific neurodevelopmental conditions (e.g., Autism, Attention Deficit/Hyperactivity Disorder, Developmental Delay). There are very few studies evaluating nap behavior among non-typically developing samples (Humphreys et al., 2014; Schwichtenberg et al., 2011; Young et al., 2007). Nonetheless, key differences between typically and non-typically developing children have emerged. Children with developmental delays have similar nap behaviors as typically developing

children who were 6-months younger, while children with autism may sleep less during the day (Schwichtenberg et al., 2011). Children with neurodevelopmental conditions were not excluded in Studies 1 and 2, but analyses of these subgroups were not conducted. It is also possible that parents of children with neurodevelopmental conditions have different nap beliefs than parents of typically developing children. One possibility is that these parents may hold stronger beliefs that children's naps allow parents to rest.

Fourthly, qualitative studies can provide rich information about parent and childcare provider nap beliefs and practices. In-depth interviews with parents and childcare providers can aid in our understanding of when and how families decided to end a preschool child's daytime nap. Specifically, topics with parents could include: (1) the timing of this decision; (2) the contributing factors (such as how the parents knew the child was ready to give up napping, how attending or not attending childcare contributed to this decision); (3) the implementation of this decision (what parents did to transition their child away from naps); (4) communication with childcare providers about sleep (if and how parents discussed naps with care providers); and (5) resources parents consulted during this process (e.g., books, websites, other parents). Topics with childcare providers could include: (1) perceived benefits and consequences of naps in childcare; (2) communication with parents; (3) napping policies within their childcare setting (e.g., timing of naps, flexibility).

Fifthly, longitudinal studies with detailed sleep measurement and frequent follow-ups are needed. Detailed sleep measurement would include monitoring of daytime and nighttime sleep over multiple days (i.e., 1-2 weeks) using sleep diaries, actigraphy, and observation in childcare settings. Frequent follow-ups might involve assessing children at 4-6 month intervals over a 1-2 year period. As child age has a robust relation with nap behavior, any longitudinal study should recruit either a narrow age range or adequately sample by age (e.g., cohorts of 2-, 3-, and 4-year-old children). Longitudinal studies would allow for a detailed understanding of the day-to-day variations in nap behavior and the day-to-night-to-day relations between day- and nighttime sleep. This aim could be achieved by applying the latent group methodology (e.g., the approach used in Chapter 5) to a longitudinal design. Further, these studies could investigate the relations between nap behavior and functional outcomes over time, using statistical techniques such as cross-lagged correlations.

Finally, provincial and/or national recommendations regarding childcare nap policies should be developed as more research is published. At present, it is premature to develop a regional or national childcare nap policy. However, evidence-based recommendations on how childcare centres could schedule naptime, support children who are napping versus not napping, and communicate with parents regarding nap practices are likely to benefit children's health and development (Lokhandwala & Spencer, 2022; Spencer, 2021).

6.4 Conclusions

This dissertation added to our fairly limited understanding of the developmental importance of napping among young children. Nap behavior in this age group appears to be driven by both developmental and environmental factors and can be understood using the socioecological model. As such, there is strong evidence that nap cessation is a developmental milestone; however, it is dependent on socioenvironmental factors. Parents, childcare providers, and practitioners should support, but not actively alter, children's transition to monophasic sleep. Parental nap-related beliefs appear to be particularly important to understanding this behavior. The novel classifications of nap behavior identified in this dissertation (e.g., early nap cessation and profiles of nap behavior) hold potential for continuing to understand children's nap behavior. Relative to the literature on children's nighttime sleep, little is known about children's daytime sleep. There are numerous future directions that stem from this dissertation, including cross-cultural studies, extensions to non-typically developing populations, and qualitative studies of parents and childcare providers. This dissertation, combined with the existent literature and future studies, can greatly increase the knowledge of researchers, childcare providers and practitioners, and parents to bolster children's development.

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Appendices

Appendix A: Research Ethics Approval Forms

Date: 5 August 2020

To: Dr. Graham Reid

Project ID: 115888

Study Title: The Preschool Napping Study: Psychosocial Predictors of Continued Napping among Preschoolers

Short Title: The Preschool Napping Study

Application Type: NMREB Initial Application

Review Type: Full Board

Meeting Date: 05/Jun/2020

Date Approval Issued: 05/Aug/2020

REB Approval Expiry Date: 05/Aug/2021

Dear Dr. Graham Reid

The Western University Non-Medical Research Ethics Board (NMREB) has reviewed and approved the WREM application form for the above mentioned study, as of the date noted above. NMREB approval for this study remains valid until the expiry date noted above, conditional to timely submission and acceptance of NMREB Continuing Ethics Review.

This research study is to be conducted by the investigator noted above. All other required institutional approvals must also be obtained prior to the conduct of the study.

Documents Approved:

Document Name	Document Type	Document Date	Document Version
Naps-Ethics AS1.2 Debrief Pilot.2020.05.12	Debriefing document	12/May/2020	1
Naps-Ethics Study 1 All Measures.2020.07.03	Online Survey	03/Jul/2020	July 3
Naps-Ethics Study 2&3 All Measures.2020.07.03	Online Survey	03/Jul/2020	July 3
Naps-Ethics A18 Sleep Diary.2020.07.03	Online Survey	03/Jul/2020	July 3
Naps-Ethics Research Protocol.2020.06.26	Protocol	26/Jun/2020	June 26
Naps-Ethics AS2.2 Debrief Sample 2.2020.06.22	Debriefing document	22/Jun/2020	June 22
Naps-Ethics AS3.2 Debrief.2020.06.22	Debriefing document	22/Jun/2020	June 22
Naps-Email Tem 2-Initial Invite Diaries.2020.06.22	Recruitment Materials	22/Jun/2020	June 22
Naps-Ethics Email Tem 3-Diary Daily.2020.06.22	Recruitment Materials	22/Jun/2020	June 22
Naps-Ethics Email Tem 4-Invite Week 2 Diaries.2020.06.22	Recruitment Materials	22/Jun/2020	June 22

Naps-Ethics Email Tem 5 Invite Week 3 Diaries.2020.07.03	Recruitment Materials	03/Jul/2020	July 3
Naps-Ethics Email Tem 6-Sleep diary comp.2020.07.03	Recruitment Materials	03/Jul/2020	July 3
Naps-Ethics Email Tem 7-Survey replication comp.2020.06.22	Recruitment Materials	22/Jun/2020	June 22
Naps-Ethics Email Tem 8-Survey rep invite.2020.06.22	Recruitment Materials	22/Jun/2020	June 22
Naps-Ethics Email Tem 9-Invite to Part 4 Sleep diaries.2020.06.22	Recruitment Materials	22/Jun/2020	June 22
NAPS-E~1	Recruitment Materials	12/May/2020	May 12
Naps-Ethics AS1.1 LOI Pilot.2020.07.29	Implied Consent/Assent	29/Jul/2020	July 29
Naps-Ethics AS2.1 LOI Sample 2.2020.07.29	Implied Consent/Assent	29/Jul/2020	July 29
Naps-Ethics AS3.1 LOI Sample 3.2020.07.29	Implied Consent/Assent	29/Jul/2020	July 29

Documents Acknowledged:

Document Name	Document Type	Document Date	Document Version
Naps-Ethics A1 Project Timeline.2020.05.12	Supplementary Tables/Figures	12/May/2020	1
Naps-Ethics AS1.3 Participant Timeline Pilot.2020.05.14	Supplementary Tables/Figures	14/May/2020	May 14
Naps-AS2.3 Participant Timeline Sample 2.2020.06.22	Supplementary Tables/Figures	22/Jun/2020	June 22
Naps-AS3.3 Sample 3 Participant Timeline.2020.06.22	Supplementary Tables/Figures	22/Jun/2020	June 22
Naps-Ethics A2.1 Screener.2020.06.24	Screening Form/Questionnaire	24/Jun/2020	June 24
Naps-Ethics A2.2 Screener.2020.06.24	Screening Form/Questionnaire	24/Jun/2020	June 24

No deviations from, or changes to the protocol should be initiated without prior written approval from the NMREB, except when necessary to eliminate immediate hazard(s) to study participants or when the change(s) involves only administrative or logistical aspects of the trial.

The Western University NMREB operates in compliance with the Tri-Council Policy Statement Ethical Conduct for Research Involving Humans (TCPS2), the Ontario
Personal Health Information Protection Act (PHIPA, 2004), and the applicable laws and regulations of Ontario. Members of the NMREB who are named as Investigators in research studies do not participate in discussions related to, nor vote on such studies when they are presented to the REB. The NMREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 00000941.

Please do not hesitate to contact us if you have any questions.

Sincerely,

Katelyn Harris, Research Ethics Officer on behalf of Dr. Randal Graham, NMREB Chair

Appendix B: Chapter 2 Supplemental Materials

Table B1. Descriptive Statistics for non-demographic Predictor Variables

Characteristic	**Category**	**% (*n*) or *M* (*SD*)**
Parent		
Maternal alcohol use during pregnancy	Never	77.1% (4241)
	Once or more	11.0% (607)
Depression	< 50th Percentile	54.2% (2981)
	50th-70th Percentile	15.1% (832)
	70th-90th Percentile	16.4% (905)
	>90th Percentile	8.6% (471)
Ineffective parenting	At baseline	1.56 (1.62)
Positive parenting	<10th Percentile	9.6% (528)
	10th-30th Percentile	21.7% (1195)

(Baseline)	30^{th}-50^{th} Percentile	20.1% (1105)
	$>50^{th}$ Percentile	46.6% (2566)
Positive Parenting	At follow-up	17.15 (2.09)
Ineffective parenting	At follow-up	8.66 (3.30)
Consistent parenting	At follow-up	15.06 (3.11)
Child		
Birthweight	Low (<2500 grams)	5.7% (315)
	Normal (≥ 2500 grams)	92.0% (5063)
Developmental Milestones	Standard score	100.21 (14.66)
Height (cm)	At follow-up	89.88 (7.03)

Weight (kg)	At follow-up	14.34 (2.18)
Temperament	Easiest	23.5% (1293)
	Easy	46.6% (2563)
	Moderate	22.9% (1262)
	Difficult	5.2% (284)
In good health	About half the time, sometimes, or almost never	3.9% (212)
	Almost all the time or often	96.1% (5292)
Times/night PMK sleep was interrupted	Never	27.3% (1504)
	Once or more	72.6% (3995)
Sleep onset latency	≤ 30 minutes	81.1% (4465)
	> 30 minutes	18.7% (1029)
Nighttime sleep duration (hours)	Follow-up	9.85 (1.96)

Has a long bedtime routine	Yes	21.6% (1189)
	No	78.3% (4309)

Note. Variables in which percentages do not sum to 100 indicate missing data.

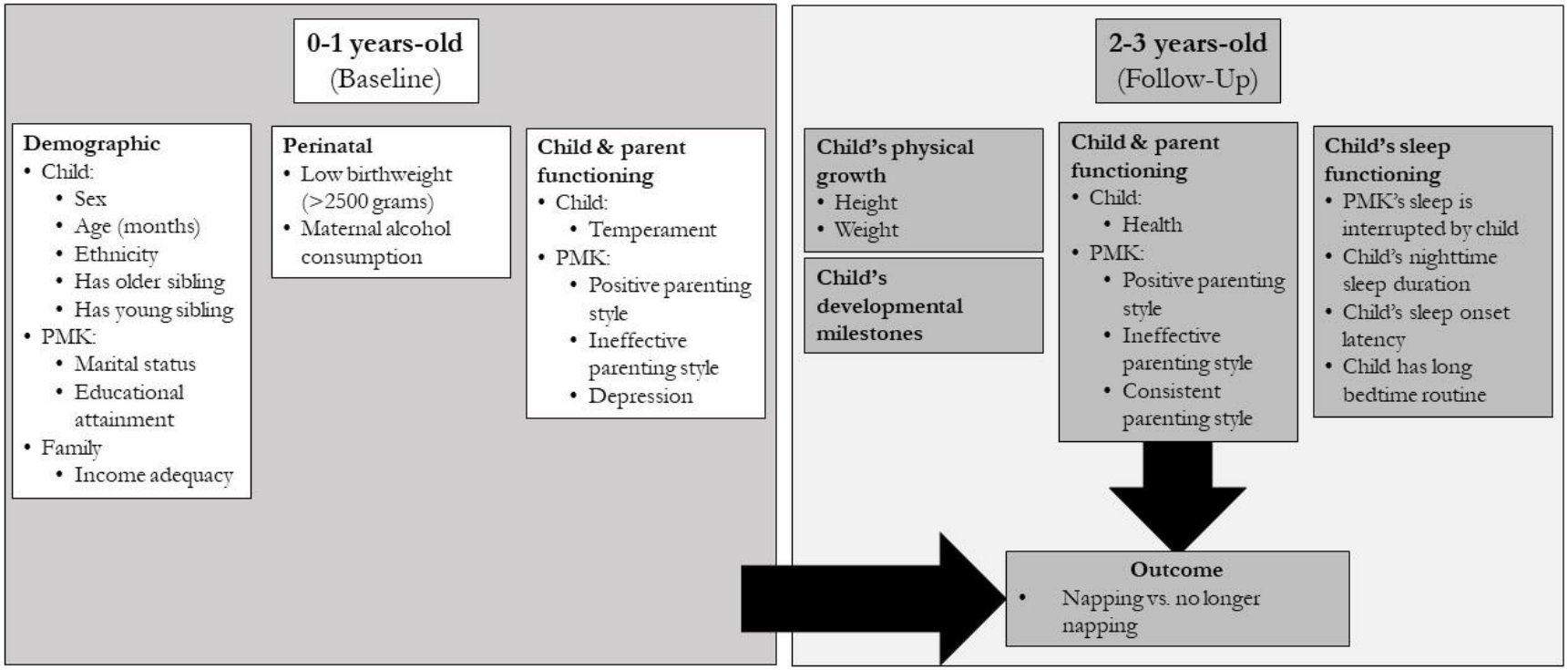


Figure B1. Visual representation of predictor and outcome variables by timepoint. PMK = Person Most Knowledgeable.

Appendix C: Chapter 3 Supplemental Materials

Supplemental Tables

Table C1. Variables used in testing competing hypotheses.

	Hypotheses			
Variables/Blocks	**H1**	**H2**	**H3**	**H4**
Nap cessation	✓	✓	✓	✓
Correlates of outcomes				
Child Age	✓			
Child's Ethnicity	✓			
Child has an older sibling	✓			
PMK working or in school	✓			
Socio-economic Status				
Income Adequacy	✓		✓	
Parental Education	✓		✓	
Correlates of general development				
Low birthweight	✓	✓		
Maternal alcohol use during pregnancy	✓	✓		
Developmental milestones	✓	✓		
Child has a chronic health condition	✓	✓		
Nighttime Sleep Duration				✓

Notes. Checkmarks indicate variables that are relevant to the hypotheses.

(H1) Nap cessation may be a specific developmental marker. Nap cessation remains significant, even after controlling for other variables.

(H2) Functional differences could be due to general development; nap cessation coincides with other aspects of developmental progression. Nap cessation is not a significant predictor of the outcome, after controlling for other variables indexing general development.

(H3) Functional differences and nap cessation could be due to better socio-economic circumstances, which enhance development and in turn lead to early nap cessation and improved functioning. Nap cessation is not a significant predictor of the outcome, after controlling for other variables indexing socioeconomic status.

(H4) Functional differences could be due to sleep functioning in general, rather than nap cessation specifically – nap cessation is an observable behavior that illustrates an improvement in sleep functioning. Nap cessation is not a significant predictor of the outcome, after controlling for nighttime sleep duration; or both nap cessation and nighttime sleep duration are significant predictors of the outcome.

Complete regression results

Psychosocial outcomes and their relation to early nap cessation

Table C2a. Hyperactivity-Inattention (T2) – Cross-sectional

Variables	Reference Category/ Units	Model 1		Model 2		Model 3		Model 4	
		R^2	β (se)	R^2	β (se)	R^2	β (se)	R^2	β (se)
Model 1									
Nap Cessation	Ceased Napping	.001	-0.026 (.015)						

Note. No further analyses conducted.

Table C2b. Hyperactivity-Inattention (T3) – Longitudinal

Variables	Reference Category/ Units	Model 1		Model 2		Model 3		Model 4		
		R^2	β (se)	ΔR^2	β (se)	ΔR^2	β (se)	ΔR^2	β (se)	
Model 1										
Nap Cessation	Ceased Napping	0.001	-0.038* (.014)	0.040	-0.013 (.015)	.016	-0.013 (0.015)	.144	-0.007	(0.013)
Model 2										
Child Sex	Female				-0.155*** (.014)		-0.153*** (0.014)		-0.122*** (0.013)	
Child Age	Months				-0.050** (.016)		-0.05** (0.016)		-0.048** (0.015)	
Child's Ethnicity	Non-White				0.011 (.015)		-0.001 (0.015)		-0.009 (0.013)	
Child has an older sibling	Yes				-0.063*** (.014)		-0.060*** (0.014)		-0.056*** (0.013)	
PMK working or in school	Yes				-0.025 (.014)		-0.008 (0.015)		-0.004 (0.013)	
Low birthweight	<2500g				-0.016 (.015)		-0.018 (0.015)		-0.012 (0.014)	
Maternal alcohol use during pregnancy	Once or more				0.005 (.015)		0.014 (0.015)		0.005 (0.014)	
Developmental Milestones	½ SD Units				-0.057*** (.015)		-0.059*** (0.015)		-0.046** (0.014)	

T2 Nighttime Sleep Duration	Hours	-0.055*** (.014)	-0.058*** (0.014)	-0.016 (0.014)
Cohort [a]	Cohort 2	0.008 (.017)	0.022 (0.017)	0.007 (0.015)
	Cohort 3	0.015 (.017)	0.035 (0.017)	0.028 (0.015)
Model 3				
Child has a Chronic Health Condition [b]	Yes			0.065*** (0.013)
Parental Education [c]	Less than High School Completed		0.067*** (0.016)	0.039* (0.015)
	Secondary School Graduate Only		0.037* (0.016)	0.02 (0.014)
	Some post-secondary, but less than college/ university		0.05** (0.016)	0.029 (0.015)
Income Adequacy	Quintile increase		-0.059*** (0.015)	-0.027 (0.014)
Model 4				

T2 Hyperactivity-Inattention	Unit Increase	0.384*** (0.012)
T3 Nighttime Sleep Duration	Hours	-0.043** (0.014)

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

[a] Cohort – "Cohort 1" is the reference group

[b] Child has a Chronic Health Condition – "No" is the reference group

[c] PMK Education – "College or university degree or higher" is the reference group

Table C2c. Anxiety (T2) – Cross-sectional

Variables	Reference Category/ Units	Model 1		Model 2		Model 3		Model 4	
		R^2	β (se)	R^2	β (se)	R^2	β (se)	R^2	β (se)
Model 1									
Nap Cessation	Ceased Napping	.000	-0.012 (0.014)						

Note. No further analyses conducted.

Table C2d. Anxiety (T3) – Longitudinal

Variables	Reference Category/ Units	Model 1		Model 2		Model 3		Model 4	
		R^2	β (se)	ΔR^2	β (se)	ΔR^2	β (se)	ΔR^2	β (se)
Model 1									
Nap Cessation	Ceased Napping	0.003	-0.053*** (0.014)	0.014	-0.047** (0.015)	.008	-0.044** (0.015)	.067	-0.039* (0.014)
Model 2									
Child Sex	Female				0.004 (0.015)		0.009 (0.014)		0.007 (0.014)
Child Age	Months				0.002 (0.017)		0.002 (0.017)		-0.021 (0.016)
Child's Ethnicity	Non-White				-0.006 (0.015)		-0.005 (0.015)		-0.022 (0.014)
Child has an older sibling	Yes				-0.089*** (0.015)		-0.087*** (0.015)		-0.07*** (0.014)
PMK working or in school	Yes				-0.022 (0.015)		-0.02 (0.015)		-0.014 (0.014)
Low birthweight	<2500g				-0.034 (0.015)		-0.036* (0.015)		-0.031 (0.014)

Maternal alcohol use during pregnancy	Once or more	0.040* (0.016)	0.04* (0.016)	0.031 (0.015)
Developmental Milestones	½ SD Units	-0.066*** (0.015)	-0.062*** (0.015)	-0.062*** (0.015)
T2 Nighttime Sleep Duration	Hours	-0.035* (0.015)	-0.033* (0.014)	-0.011 (0.014)
Cohort [a]	Cohort 2	-0.012 (0.017)	-0.013 (0.017)	-0.036 (0.016)
	Cohort 3	0.006 (0.017)	0.003 (0.017)	-0.009 (0.016)
Model 3				
Child has a Chronic Health Condition	Yes		0.081*** (0.014)	0.074*** (0.014)
Parental Education [b]	Less than High School Completed		-0.025 (0.016)	-0.029 (0.016)
	Secondary School Graduate Only		-0.038* (0.016)	-0.037 (0.015)
	Some post-		-0.022 (0.016)	-0.023 (0.015)

	secondary, but less than college/ university		
Income Adequacy	Quintile increase	-0.005 (0.016)	0.002 (0.015)
Model 4			
T2 Anxiety	Unit Increase		0.261*** (0.014)
T3 Nighttime Sleep Duration	Hours		-0.025 (0.015)

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

[a] Cohort – "Cohort 1" is the reference group

[b] PMK Education – "College or university degree or higher" is the reference group

Table C2e. Aggression (T2) – Cross-sectional

Variables	Reference Category/ Units	Model 1		Model 2		Model 3		Model 4	
		R^2	β (se)	R^2	β (se)	R^2	β (se)	R^2	β (se)
Model 1									
Nap Cessation	Ceased Napping	.000	0.007 (0.014)						

Note. No further analyses conducted.

Table C2f. Aggression (T3) – Longitudinal

Variables	Reference Category/ Units	Model 1		Model 2		Model 3		Model 4	
		R^2	β (se)	R^2	β (se)	R^2	β (se)	R^2	β (se)
Model 1									
Nap Cessation	Ceased Napping	.000	-0.010 (0.014)						

Note. No further analyses conducted.

Table C3. T3 Cognitive Ability (Longitudinal) and its relation to early nap cessation.

Variables	Reference Category/ Units	Model 1		Model 2		Model 3		Model 4	
		R^2	β (se)	ΔR^2	β (se)	ΔR^2	β (se)	ΔR^2	β (se)
Model 1									
Nap Cessation	Ceased Napping	0.005	0.073*** (0.016)	0.161	0.006 (0.015)	0.029	0.006 (0.015)	0.002	0.006 (0.015)
Model 2									
Child Sex	Female				0.248*** (0.014)		0.249*** (0.014)		0.249*** (0.014)
Child Age	Months				0.219*** (0.017)		0.218*** (0.017)		0.218*** (0.017)
Child's Ethnicity	Non-White				0.053** (0.016)		0.073*** (0.015)		0.073*** (0.015)
Child has an older sibling	Yes				0.004 (0.015)		0.002 (0.015)		0.001 (0.015)
PMK working or in school	Yes				0.068*** (0.015)		0.04** (0.015)		0.041** (0.015)
Low birthweight	<2500g				-0.046** (0.016)		-0.046** (0.016)		-0.046** (0.016)

Maternal alcohol use during pregnancy	Once or more	0.005 (0.016)	-0.008 (0.015)	-0.008 (0.015)
Developmental Milestones	½ SD Units	0.056*** (0.016)	0.064*** (0.016)	0.064*** (0.016)
T2 Nighttime Sleep Duration	Hours	-0.003 (0.015)	-0.003 (0.015)	-0.003 (0.015)
Cohort [a]	Cohort 2	-0.034 (0.017)	-0.053** (0.017)	-0.053** (0.017)
	Cohort 3	-0.131*** (0.017)	-0.160*** (0.017)	-0.160*** (0.017)
Model 3				
Child has a Chronic Health Condition	Yes		-0.036* (0.015)	-0.036* (0.015)
Parental Education [b]	Less than High School Completed		-0.098*** (0.017)	-0.098*** (0.017)
	Secondary School Graduate Only		-0.044** (0.016)	-0.044** (0.016)
	Some post-		-0.06*** (0.016)	-0.06*** (0.016)

	secondary, but less than college/ university		
Income Adequacy	Quintile increase	0.117*** (0.016)	0.116*** (0.016)
Model 4			
T3 Nighttime Sleep Duration	Hours		0.013 (0.015)

Table C4. T3 Receptive Language (Longitudinal) and its relation to early nap cessation

Variables	Reference Category/ Units	Model 1		Model 2		Model 3		Model 4	
		R^2	β (se)	ΔR^2	β (se)	ΔR^2	β (se)	ΔR^2	β (se)
Model 1									
Nap Cessation	Ceased Napping	0.011	0.103*** (0.015)	0.083	0.055*** (0.015)	0.050	0.059*** (0.015)	0.001	0.059*** (0.015)
Model 2									
Child Sex	Female				0.062*** (0.015)		0.064*** (0.014)		0.063*** (0.014)
Child Age	Months				0.111*** (0.017)		0.109*** (0.016)		0.110*** (0.016)
Child's Ethnicity	Non-White				-0.203*** (0.015)		-0.180*** (0.015)		-0.180*** (0.015)
Child has an older sibling	Yes				-0.067*** (0.015)		-0.069*** (0.014)		-0.069*** (0.014)
PMK working or in school	Yes				0.062*** (0.015)		0.031* (0.015)		0.032* (0.015)
Low birthweight	<2500g				-0.023 (0.015)		-0.023 (0.015)		-0.023 (0.015)

Maternal alcohol use during pregnancy	Once or more	0.024 (0.016)	0.011 (0.015)	0.011 (0.015)
Developmental Milestones	½ SD Units	0.106*** (0.015)	0.112*** (0.015)	0.112*** (0.015)
T2 Nighttime Sleep Duration	Hours	0.006 (0.015)	0.012 (0.014)	0.009 (0.015)
Cohort [a]	Cohort 2	-0.057** (0.017)	-0.081*** (0.017)	-0.081*** (0.017)
	Cohort 3	-0.076*** (0.017)	-0.111*** (0.017)	-0.111*** (0.017)
Model 3				
Child has a chronic health condition	Yes		-0.033* (0.014)	-0.033* (0.014)
Parental Education [b]	Less than High School Completed		-0.123*** (0.017)	-0.123*** (0.017)
	Secondary School Graduate Only		-0.082*** (0.016)	-0.082*** (0.016)
	Some post-		-0.066*** (0.016)	-0.066*** (0.016)

	secondary, but less than college/ university		
Income Adequacy	Quintile increase	0.117*** (0.016)	0.117*** (0.016)
Model 4			
T3 Nighttime Sleep Duration	Hours		0.012 (0.015)

Table C5. Demographic Differences Between Participants with Valid Outcome Data and Those Lost to Follow-Up.

Variable	Statistical Test	Summary of Difference
Parent (PMK)		
Martial Status	$\chi(1) = 34.16$, $p < .001$	Those with valid outcome data were more often married/living common-law than those lost to follow-up
Employment status	$\chi(1) = .11$, *ns*	No differences
Educational attainment	$\chi(3) = 11.68$, $p = .009$	Those with valid outcome data more often had higher educational attainment than those lost to follow-up
Mother used alcohol during pregnancy	$\chi(1) = 2.00$, *ns*	No differences
Family		
Income adequacy	$\chi(4) = 38.57$, $p < .001$	Those with valid outcome data more often had higher income adequacy than those lost to follow-up
Child		
Age	$t(5502) = 1.725$, *ns*	No differences
Sex	$\chi(1) = .91$, *ns*	No differences
Ethnicity	$\chi(1) = 29.50$, $p < .001$	Those with valid outcome data were more often White than those lost to follow-up
Has a younger sibling	$\chi(1) = 8.47$, $p = .004$	Those with valid outcome data more often had children with a younger sibling than those lost to follow-up
Has an older sibling	$\chi(1) = .02$, *ns*	No differences
Nap Cessation	$\chi(1) = 1.13$, *ns*	No differences
Low birthweight	$\chi(1) = 4.37$, $p = .037$	Those with valid outcome data less often had children born at low birthweight than those lost to follow-up

Table C6. Intercorrelations between outcome variables.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) T2 Hyperactivity-Inattention							
(2) T2 Aggression	**.471**						
(3) T2 Anxiety	**.337**	**.312**					
(4) T3 Hyperactivity-Inattention	**.409**	**.261**	**.126**				
(5) T3 Anxiety	**.148**	**.184**	**.266**	**.359**			
(6) T3 Aggression	**.175**	**.358**	**.100**	**.389**	**.339**		
(7) T3 Cognitive Ability	**.120**	**.071**	0.009	**.214**	0.021	**.094**	
(8) T3 Receptive Language Ability	**.085**	**.074**	0.016	**.109**	0.009	**.085**	**.341**

Note: *r* values above |.071| are statistically significant at $p < .001$ and are bolded.

Table C7. Summary of ethnicity multiple groups analyses of relations between outcomes and early nap cessation

		Early Nap Cessation											
		Model 1 (Unadjusted Beta)			Model 2 [a]			Model 3 [b]			Model 4 [c]		
		Wald χ^2 (1)	Model R^2	β (se)	Wald χ^2 (1)	ΔR^2	β (se)	Wald χ^2 (1)	ΔR^2	β (se)	Wald χ^2 (1)	ΔR^2	β (se)
Outcomes	**Ethnicity**												
T2 Hyperactivity-Inattention [d]	White	0.13 *ns*	0.001	-0.026 (0.015)									
	Non-White		0.000	-0.001 (0.048)									
T3 Hyperactivity-Inattention	White	1.147 *ns*	0.002	-0.042** (0.015)	1.038 *ns*	0.039	-0.016 (0.016)	1.083 *ns*	0.012	-0.018 (0.015)	0.640 *ns*	0.161	-0.009 (0.014)
	Non-White		0.000	0.022 (0.048)		0.055	0.038 (0.048)		0.021	0.038 (0.048)		0.073	0.031 (0.046)
T2 Aggression [d]	White	0.501 *ns*	0.000	0.012 (0.015)									
	Non-White		0.001	-0.027 (0.048)									
T3 Aggression [d]	White	1.147 *ns*	0.000	-0.007 (0.015)									
	Non-White		0.003	-0.058 (0.047)									
T2 Anxiety [d]	White	0.586	0.000	-0.006									

		ns		(0.015)									
	Non-White		0.002	-0.040 (0.047)									
T3 Anxiety	White	0.150 *ns*	0.003	-0.053*** (0.015)	0.257 *ns*	0.016	-0.045** (0.016)	0.180 *ns*	0.010	-0.042** (0.016)	0.062 *ns*	0.072	-0.037* (0.015)
	Non-White		0.004	-0.06 (0.047)		0.041	-0.06 (0.047)		0.09	-0.053 (0.047)		0.037	-0.041 (0.046)
T3 Cognitive Ability	White	4.141 *	0.007	0.086 (0.017)	7.059 **	0.160	0.016 (0.016)	7.000 **	0.029	0.016 (0.016)	6.450 *	0.000	0.016 (0.016)
	Non-White		0.003	-0.057 (0.056)		0.198	-0.129* (.051)		0.037	-0.127* (0.050)		0.006	-0.121* (0.050)
T3 Receptive Language	White	0.533 *ns*	0.009	0.095*** (0.016)	0.173 *ns*	0.060	0.057*** (0.016)	0.339 *ns*	0.038	0.060*** (0.016)	0.381 *ns*	0.000	0.060*** (0.016)
	Non-White		0.011	0.103* (0.052)		0.064	0.060 (0.052)		0.089	0.07 (0.049)		0.002	0.072 (0.049)

Notes. This table depicts the standardized betas and standard errors for Early Nap Cessation for each functional outcome. A multiple groups (White vs. non-White ethnicity) approach was applied to test whether the key parameter estimate (i.e., beta for early nap cessation) differed between White and non-White ethnicity groups. This test is conducted using a Wald test. Wald tests produce a chi-square statistic and a p-value. P-values < .05 are considered statistically significant and suggest that the parameters differ significantly between groups.

Where Early Nap Cessation was a non-significant correlate of an outcome in Model 1 (Unadjusted), no further analyses were conducted.

T2 = Time 2 (children were 2-3 years old), T2 variables are cross-sectional; T3 = Time 3 (children were 4-5 years old), T3 variables are longitudinal.

P-values were adjusted for multiple comparisons using the False Discovery Rate.

* $p < .05$; ** $p < .01$; *** $p < .001$.

[a] This model controlled for the child's cohort and known correlates of early nap cessation (i.e., child's sex, child age, child's ethnicity, child has an older sibling, Person Most Knowledgeable is working or in school, low birthweight [<2500 grams], maternal alcohol use during pregnancy [once or more], developmental milestones achieved, and T2 nighttime sleep duration).

[b] This model controlled for all Model 2 control variables and other known sociodemographic correlates of functioning (i.e., parental education and income adequacy).

[c] This model controlled for all Model 2 and 3 control variables, plus T3 nighttime sleep duration and T2 psychosocial variables for T3 psychosocial models (e.g., T2 Hyperactivity was controlled for in the T3 Hyperactivity Model 4). This control was only applied to longitudinal (i.e., T3) outcomes.

[d] No additional models were run as per the criteria outlined under "Data Analyses".

Appendix D: Chapter 4 Supplemental Materials

Table D1. Hypothesized Relations between Napping Subscales and Convergent Validity Variables

	Nap Belief Scales						
	General Beliefs		**Encourage Reasons**		**Discourage Reasons**		
Validity Measures	Positive	Negative	Child	Parent	Child Preference	Child Function	Scheduling
Retrospective Reports							
Child Age	-	+	-	-	+	+	+
Child's Nap Duration	+	-	+	+	-	-	-
Proportion Spontaneous Naps	-	+	-	-	+	+	+
Proportion of Sleep During Daytime	+	-	+	+	-	-	-
Nighttime Sleep Problems	NR	NR	NR	NR	NR	NR	NR
Sleep Diaries							
Average Nap Duration	+	-	+	+	-	-	-
Proportion of Spontaneous Naps	-	+	-	-	+	+	+

Proportion of days with naps	+	-	+	+	-	-	-
Proportion of sleep during daytime	+	-	+	+	-	-	-

Note. "+" represents a predicted positive relation; "-" represents a predicted negative relation; "NR" represents that no relation is predicted.

Table D2. Full description of data quality checks applied to the online surveys

Criteria	Description	Action
Attentional Checks	3 attentional checks throughout the survey e.g., "Select 1 for this item". Failure is the participant did not select the requested response	Participants who failed 2/3 or more attentional checks were removed from the sample.
Straight-lining	Completion time must be greater than half the median completion time	All participants who failed this criterion were removed from the sample.
Providing non-sense textbox responses	Participant provides non-sensical textbox responses. Note: participants had the option to skip all textbox responses	All participants who failed this criterion were removed from the sample.
Inconsistent location	Participant-provided postal code is outside of participant-provided province	All participants who failed this criterion were removed from the sample.
Inconsistent Information	There were 6 inconsistency checks within this criterion: 1. Birthweight well-outside normative ranges for Canadian live births (i.e., low end = 3rd Percentile weight for 31 weeks gestation; high end = 97th percentile for 43 weeks gestation) 2. Height well-outside of normative range for Canadian children 1-5 years (i.e. low end = 3rd percentile for 18 months old and high end = 97th percentile for 6.5 year olds)	Participants who failed 3/6 or more of these checks were removed rom the sample.

	3. Weight well-outside of normative range for Canadian children 1-5 years (i.e. low end = 3rd percentile for 18 months old and high end = 97th percentile for 6.5 year olds) 4. Reported “child birth year” does not align with reported “child years old” 5. Reported “child age range” (e.g., 1.5-2 years old) does not grossly aligns with reported “child months old” (+/- 6 months) 6. Sum of reported “older/younger/twin siblings” does not aligns with reported “total number of children” in home

Table D3. Parent, Child, and Family Demographic Characteristics for the Pilot and Replication Samples

		Pilot	**Replication**
Characteristic	Category	% (*n*) or *M* (*SD*)	% (*n*) or *M* (*SD*)
Parent			
Age (years)	Under 21 years	1.0% (2)	0.7% (5)
	21-24 years	2.0% (4)	3.0% (21)
	25-29 years	11.9% (24)	12.3% (86)
	30-34 years	24.4% (49)	32.2% (226)
	35-39 years	33.8% (68)	35.0% (246)
	40-44 years	17.9% (36)	11.1% (78)
	45-49 years	5.0% (10)	3.4% (24)
	50 years or older	4.0% (8)	2.1% (15)
Employment status	Employed full-time	62.2% (125)	51.6% (362)
	Employed part-time	13.9% (28)	9.8% (69)
	On parental leave	1.0% (2)	3.1% (22)
	At-home parent	15.9% (32)	23.2% (163)
	Student	1.5% (3)	1.1% (8)
	Unemployed	3.5% (7)	7.5% (53)
	Other (e.g., student with part-time job)	2.0% (4)	3.5% (25)

Relation to child	Birth mother	66.7% (134)	67.5% (474)
	Birth father	30.8% (62)	28.5% (200)
	Other relation (e.g., grandparent)	2.5% (5)	4% (28)
Ethnicity[1]	White	70.1% (141)	68.7% (482)
	Chinese	7.5% (15)	6.1% (43)
	South Asian (e.g., Punjabi, Sri Lankan)	5.5% (11)	1.7% (12)
	Indigenous Persons (e.g., First Nations)	4.0% (8)	2.8% (20)
	Black	3.5% (7)	5.4% (38)
	Southeast Asian (e.g., Cambodian)	3.5% (7)	
	Arab/West Asian (e.g., Armenian, Iranian)	2.5% (5)	1.9% (13)
	Filipino	2.5% (5)	3.1% (22)
	Latin American	2.0% (4)	3.6% (25)
	Korean	1.5% (3)	0.4% (3)
	Japanese	1.0% (2)	1.3% (9)
	Other ethnicities	1.0% (2)	2.0% (14)
Education level	Some high-school or lower	1.5% (3)	3.1% (22)
	High school graduate/GED	15.4% (31)	12.3% (86)
	Some post-secondary	12.4% (25)	18.3% (128)

	Diploma from college/nursing school	20.9% (42)	18.0% (127)
	Undergraduate degree	32.3% (65)	29.6% (208)
	Masters, professional degree (e.g., MD), or earned doctorate (e.g., PhD)	16.9% (34)	18.3% (129)
	Prefer not to answer	0.5% (1)	0.0% (0)
Child			
Age	1-year-old	18.9% (38)	15.0% (105)
	2-years-old	22.4% (45)	20.7% (145)
	3-years-old	21.4% (43)	17.8% (125)
	4-years-old	20.4% (41)	20.8% (146)
	5-years-old	16.9% (34)	25.8% (181)
Sex	Male	52.5% (105)	53.8% (378)
	Female	47.3% (95)	45.6% (320)
	Prefer not to answer	0.0% (0)	0.5% (4)
Family			
Income	< $40,000	15.4% (31)	19.1% (134)
	$40,000 to $59,999	14.9% (30)	11.7% (82)
	$60,000 to $79,999	14.9% (30)	15.7% (110)
	$80,000 to $99,999	22.9% (46)	29.7% (209)
	≥ $100,000	26.9% (54)	20.4% (143)
	Prefer not to answer	5.0% (10)	3.4% (24)

Note. [1] Participants could select more than one category.

Table D4a. Inter-item Pearson correlations for the Parents' Nap Beliefs Scale in the Pilot Sample

	Positive Beliefs Items									Negative Beliefs Items				
	(1) behave better when they nap	**(2)** should have a nap when they stay up late the night before	**(3)** should have a nap as a normal part of their schedule	**(4)** get frustrated more easily when they don-t nap	**(5)** have more meltdowns tantrums when they don't nap	**(6)** are better at controlling their emotions when they nap	**(7)** are more restless when they don't nap	**(8)** are more easily distracted when they don't nap	**(9)** listen to their parents better when they nap	**(10)** are too old to nap regularly	**(11)** do not seem to enjoy napping	**(12)** do not sleep well at night when they nap that day	**(13)** will have trouble falling asleep at night when they nap	**(14)** will resist going to bed if they nap
(1)		.66***	.59***	.69***	.69***	.75***	.64***	.69***	.82***	-0.32***	.23**	-.28***	-.24***	-.25***
(2)			.60***	.64***	.67***	.63***	.62***	.66***	.63***	-.23**	-.17*	-.16*	-.16*	-.22**
(3)				.70***	.68***	.63***	.59***	.65***	.55***	-.40***	-.29***	-.40***	.39***	-.35***
(4)					.80***	.71***	.70***	.75***	.63***	.29***	-.20**	-.24***	-.25***	-.28***
(5)						.74***	.75***	.78***	.65***	-.25***	.25***	.23**	-.27***	-.27***
(6)							.66***	.72***	.72***	-.27***	-.17**	-.23**	-.26***	-.26***

(7)	.71***	.60***	-.22**	-.11	-.13	-.19**	-.18**
(8)		.66***	-.24***	-.11	-.21**	-.20**	-.19**
(9)			-.25***	-.13	-.21**	-.16*	-.17*
(10)				.58***	.65***	.51***	.55***
(11)					.56***	.46***	.54***
(12)						.68***	.66***
(13)							.80***

**Note*. The stem text for these items is "Children of my child's age"; * $p < .05$, ** $p < .01$, *** $p < .001$. *R*'s above |.16| are significant at $p < .05$.

Table D4b. Inter-item Pearson correlations for the Parents' Nap Beliefs Scale in the Replication Sample

	Positive Beliefs Items									Negative Beliefs Items				
	(1) behave better when they nap	**(2)** should have a nap when they stay up late the night before	**(3)** should have a nap as a normal part of their schedule	**(4)** get frustrated more easily when they don-t nap	**(5)** have more meltdowns tantrums when they don't nap	**(6)** are better at controlling their emotions when they nap	**(7)** are more restless when they don't nap	**(8)** are more easily distracted when they don't nap	**(9)** listen to their parents better when they nap	**(10)** are too old to nap regularly	**(11)** do not seem to enjoy napping	**(12)** do not sleep well at night when they nap that day	**(13)** will have trouble falling asleep at night when they nap	**(14)** will resist going to bed if they nap
(1)		0.46***	0.52***	0.50***	0.48***	0.55***	0.42***	0.41***	0.55***	-0.24***	-0.20***	-0.07	-0.21***	-0.19***
(2)			0.45***	0.38***	0.37***	0.37***	0.34***	0.31***	0.39***	-0.21***	-0.16***	-0.09*	-0.15***	-0.19***
(3)				0.49***	0.48***	0.53***	0.49***	0.42***	0.48***	-0.32***	-0.20***	-0.15***	-0.26***	-0.23***
(4)					0.67***	0.58***	0.58***	0.51***	0.54***	-0.24***	-0.10*	-0.08*	-0.16***	-0.18***
(5)						0.61***	0.61***	0.56***	0.56***	-0.19***	-0.10*	-0.06	-0.14***	-0.10*
(6)							0.55***	0.52***	0.64***	-0.21***	-0.12**	-0.06	-0.18***	-0.11**
(7)								0.54***	0.53***	-0.14***	-0.07	-0.03	-0.09*	-0.06

(8)	0.50***	-0.08*	-0.03	0.09*	0.01	0.04
(9)		-0.14***	-0.07	-0.03	-0.12**	-0.08*
(10)			0.43***	0.38***	0.44***	0.42***
(11)				0.39***	0.44***	0.44***
(12)					0.63***	0.58***
(13)						0.68***

**Note.* The stem text for these items is "Children of my child's age"; * $p < .05$, ** $p < .01$, *** $p < .001$. *R*'s above |.075| are significant at $p < .05$.

Table D5a. Inter-item Pearson correlations for the Reasons Children Nap Scale in the Pilot Sample

	Encouragement Reasons									**Discouragement Reasons**									
	Child-related					***Parent-related***				***Child-Preference***			***Child-Function***				***Scheduling***		
	(1) I knew my child would have to stay up late tonight	**(2)** My child had poor sleep the night before	**(3)** My child told me they wanted a nap	**(4)** Napping was part of my child's routine	**(5)** My child was cranky	**(6)** I needed free time	**(7)** I needed time to do other things e.g., chores, relax	**(8)** The timing worked for me	**(9)** I needed a break	**(10)** My child did not seem to enjoy napping	**(11)** My child refused to nap	**(12)** My child did not want to nap	**(13)** My child slept too much the night before	**(14)** My child got enough sleep the night before	**(15)** My child was in a good mood	**(16)** My child was alert	**(17)** I wanted my child to have an earlier bedtime that night	**(18)** There was not enough time for a nap	**(19)** Napping would delay the time my child fell asleep at night
(1)		.71***	.50***	.53***	.51***	.15*	.24***	.24***	.25***	-.12	-.16*	-.15	.01	-.13	-.12	-.06	.03	-.01	-.04
(2)			.60***	.56***	.60***	.19**	.27***	.27***	.28***	-.09	-.17*	-.12	-.01	-.09	-.12	-.09	-.10	-.12	-.07
(3)				.50***	.60***	.08	.16*	.13	.12	-.07	-.08	-.03	-.10	-.13	-.09	.09	-.05	-.05	-.07
(4)					.56***	.19**	.244***	.26***	.24***	-.20**	-.21**	-.18*	-.29***	-.21**	.23**	.18*	-.24***	-.20**	-.21**
(5)						.17*	.28***	.26***	.29***	-.13	-.16*	-.11	-.16*	-.11	-.18*	-.14	-.05	-.09	-.05

(6)		.83***	.79***	.78***	.10	.06	.04	.05	.17*	.15*	.08	.26***	.25***	.15*
(7)			.85***	.85***	.09	.08	.07	.11	18*	.13	.09	.31***	.31***	.13
(8)				.84***	.06	.06	.06	07	.17*	.18*	.11	.29***	.23**	.15*
(9)					.03	.02	.05	.07	.13	.14	.08	.27***	.25***	.15*
(10)						.72***	.67***	0.570	.44***	.47***	.43***	.35***	.41***	.50***
(11)							.82***	.45***	.43***	.49***	.41***	.35***	.41***	.44***
(12)								.53***	.44***	.42***	.40***	.36***	.41***	.50***
(13)									.65***	.54***	.58***	.49***	.46***	.54***
(14)										.70***	.71***	.55***	.49***	.45***
(15)											.83***	.56***	.49***	.55***
(16)												.49***	.46***	.48***
(17)													.62***	.53***
(18)														.63***

Notes. The item stem for items 1-9 is "I would encourage my child to nap if…" and the stem for items 10-19 is "I would discourage my child from napping if…"; * $p < .05$, ** $p < .01$, *** $p < .001$. *R*'s above |.16| are significant at $p < .05$.

Table D5b. Inter-item Pearson correlations for the Reasons Children Nap Scale in the Replication Sample

	Encouragement Reasons									**Discouragement Reasons**									
	Child-related					***Parent-related***				***Child-Preference***			***Child-Function***				***Scheduling***		
	(1) I knew my child would have to stay up late tonight	**(2)** My child had poor sleep the night before	**(3)** My child told me they wanted a nap	**(4)** Napping was part of my child's routine	**(5)** My child was cranky	**(6)** I needed free time	**(7)** I needed time to do other things e.g., chores, relax	**(8)** The timing worked for me	**(9)** I needed a break	**(10)** My child did not seem to enjoy napping	**(11)** My child refused to nap	**(12)** My child did not want to nap	**(13)** My child slept too much the night before	**(14)** My child got enough sleep the night before	**(15)** My child was in a good mood	**(16)** My child was alert	**(17)** I wanted my child to have an earlier bedtime that night	**(18)** There was not enough time for a nap	**(19)** Napping would delay the time my child fell asleep at night
(1)		.52***	.30***	.19***	.44***	.19***	.20***	.30***	.21***	.15**	.17***	.14**	.23***	.20***	.10*	.27***	.24***	.30***	.27***
(2)			.35***	.23***	.49***	.13**	.13**	.22***	.17***	.12**	.13**	.10*	.17***	.08*	-.01	.14**	.16***	.21***	.15**
(3)				.30***	.29***	-.08*	-.02	.09*	-.03	.09*	.11*	.10*	.02	.02	-.07	.05	.01	.07	.04
(4)					.27***	.09*	.17***	.20***	.21***	-.02	-.06	-.08*	-.01	-.10*	-.15**	-.03	-.03	.04	-.06
(5)						.10*	.15**	.27***	.11*	.06	.09*	.03	.03	-.02	-.13**	.10*	.06	.14**	.09*
(6)							.74***	.57***	.74***	.04	.02	.00	.23***	.20***	.30***	.15**	.27***	.21***	.18***

(7)			.62***	.76***	.04	-.02	-.03	.19***	.21***	.25***	.16***	.23***	.17***	.16***
(8)				.59***	.06	.02	.02	.19***	.24***	.19***	.19***	.26***	.19***	.19***
(9)					.08	.02	-.01	.22***	.19***	.29***	.18***	.25***	.21***	.15**
(10)						.62***	.61***	.49***	.47***	.42***	.54***	.36***	.44***	.49***
(11)							.77***	.41***	.39***	.30***	.49***	.32***	.45***	.48***
(12)								.44***	.42***	.29***	.49***	.32***	.44***	.52***
(13)									.64***	.53***	.62***	.59***	.53***	.56***
(14)										.55***	.62***	.57***	.47***	.51***
(15)											.50***	.44***	.33***	.39***
(16)												.50***	.51***	.52***
(17)													.49***	.58***
(18)														.57***

Notes. The item stem for items 1-9 is "I would encourage my child to nap if…" and the stem for items 10-19 is "I would discourage my child from napping if…"; * $p < .05$, ** $p < .01$, *** $p < .001$. *R*'s above |.075| are significant at $p < .05$.

Table D6a. Post-hoc differences between Parent's Nap Beliefs Scale, Reasons Children Nap Scale, and Napping Frequency Groups in the Pilot Sample

Napping Frequency	Did not nap in past month & Naps <1 day/week	Naps 1-3 days/week	Naps 4-5 days/week	Naps 6-7 days/week
	n = 69	*n* = 39	*n* = 28	*n* = 63
Subscale	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)
Parents' Nap Beliefs				
Positive Beliefs	2.97 (1.02) [B, C, D]	3.86 (0.73) [A, D]	3.98 (0.71) [A]	4.21 (0.67) [A, B]
Negative Beliefs	3.60 (0.80) [C, D]	3.21 (1.03) [B]	3.01 (1.22) [A, D]	2.43 (1.08) [A, B, C]
Reasons Children Nap				
Encouragement				
Child-Related	3.22 (1.04) [B, C, D]	3.77 (0.75) [A, D]	4.23 (0.7) [A]	4.26 (0.7) [A, B]
Parent-Related	2.43 (1.27) [B]	3.13 (1.13) [A]	2.92 (1.47)	2.74 (1.29)
Discouragement				

Child-Preference	3.58 (1.05) [D]	3.13 (1.1)	3.48 (1.05)	3.02 (1.25) [A]
Child-Function	3.49 (1.08) [D]	3.46 (0.83) [D]	3.17 (0.92) [D]	2.61 (1.18) [A, B, C]
Scheduling	3.52 (0.94) [D]	3.39 (1.03) [D]	3.63 (0.94) [D]	2.82 (1.15) [A, B, C]

Note. P-values were adjusted using the False Discovery Rate.

[A] denoted a significant difference ($p < .05$) from the "did not nap in past month & naps <1 day/week" group

[B] denoted a significant difference ($p < .05$) from the "Naps 1-3 days/week" group

[C] denoted a significant difference ($p < .05$) from the "Naps 4-5 days/week" group

[D] denoted a significant difference ($p < .05$) from the "Naps 6-7 days/week" group

Table D6b. Post-hoc differences between Parent's Nap Beliefs Scale, Reasons Children Nap Scale, and Napping Frequency Groups in the Replication Sample

Napping Frequency	Did not nap in past month & Naps <1 day/week	Naps 1-3 days/week	Naps 4-5 days/week	Naps 6-7 days/week
	n = 51	n = 18	n = 47	n = 28
Subscale	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)
Parents' Nap Beliefs				
Positive Beliefs	3.16 (0.90) [B, C, D]	3.69 (0.82) [A, D]	3.88 (0.65) [A]	4.01 (0.75) [A, B]
Negative Beliefs	3.65 (0.83) [B, C, D]	2.99 (0.88) [A, D]	2.82 (0.94) [A, D]	2.35 (0.97) [A, B, C]
Reasons Children Nap				
Encouragement				
Child-Related	3.63 (0.80) [D]	3.83 (0.79)	3.80 (0.81)	3.85 (0.90) [A]
Parent-Related	2.75 (1.26) [B, C, D]	3.14 (1.21) [A, C]	3.66 (0.97) [A, B, D]	3.32 (1.15) [A, C]
Discouragement				

Child-Preference	3.57 (1.03) [B, C, D]	3.12 (1.25) [A, D]	3.04 (1.23) [A, D]	2.58 (1.17) [A, B, C]
Child-Function	3.22 (1.11) [D]	3.03 (1.16) [D]	3.2 (1.10) [D]	2.44 (1.07) [A, B, C]
Scheduling	3.48 (1.11) [D]	3.28 (1.15) [D]	3.42 (1.05) [D]	2.73 (1.08) [A, B, C]

Note. P-values were adjusted using the False Discovery Rate.

[A] denoted a significant difference ($p < .05$) from the "did not nap in past month" group

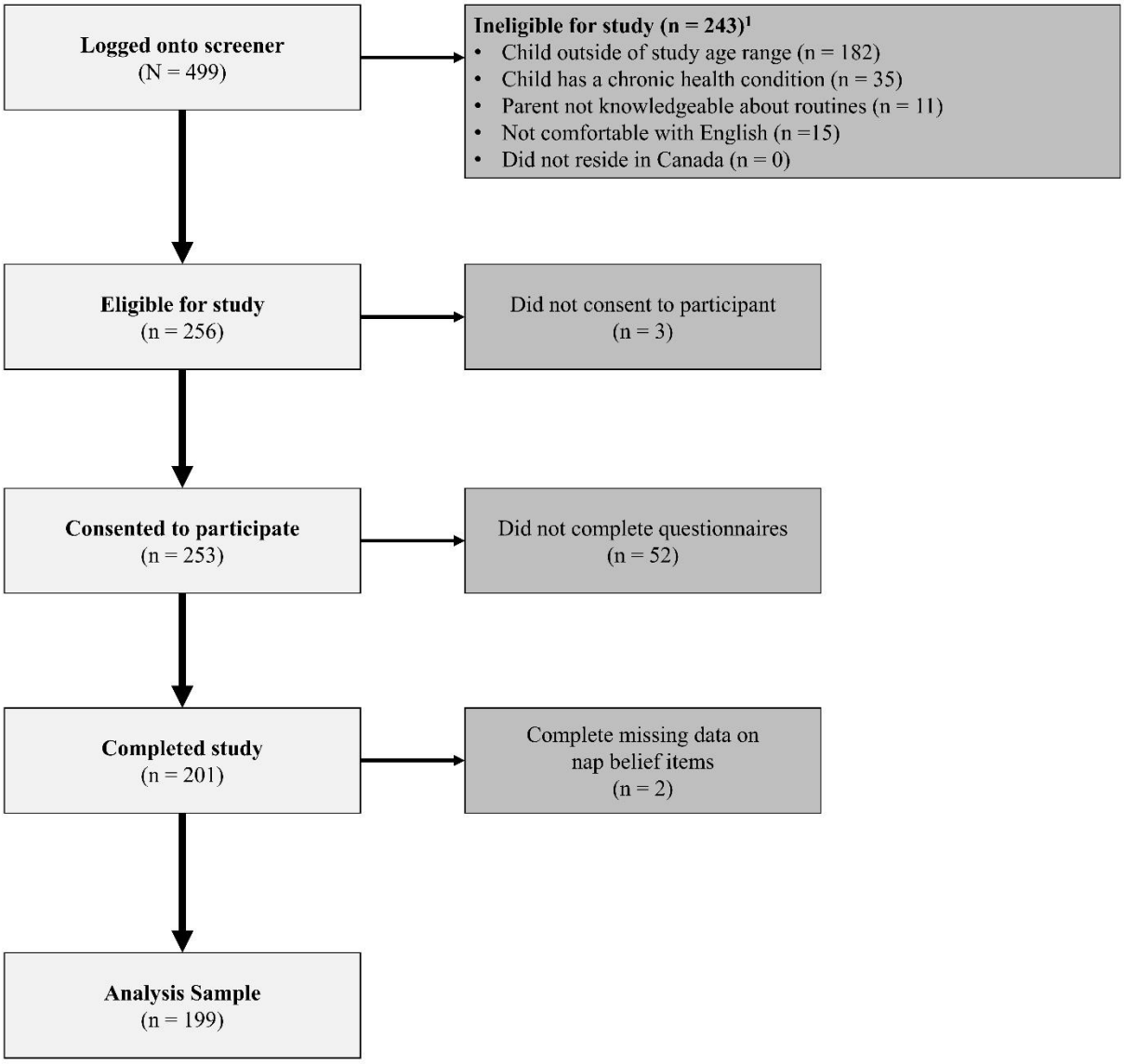
[B] denoted a significant difference ($p < .05$) from the "Naps <1/week" group

[C] denoted a significant difference ($p < .05$) from the "Naps 1-4 days/week" group

[D] denoted a significant difference ($p < .05$) from the "Naps 5-6 days/week" group

[E] denoted a significant difference ($p < .05$) from the "Naps daily" group

P-values were adjusted using the False Discovery Rate.



Supplemental Figure D1a. Participant flowchart in the Pilot Sample. [1] Note: exclusion criteria were sequentially ordered, such that if a parent endorsed an exclusion criterion (e.g., parent not knowledgeable about the child's routines), they were not shown additional questions. As such, parents could not meet more than one exclusion criteria.

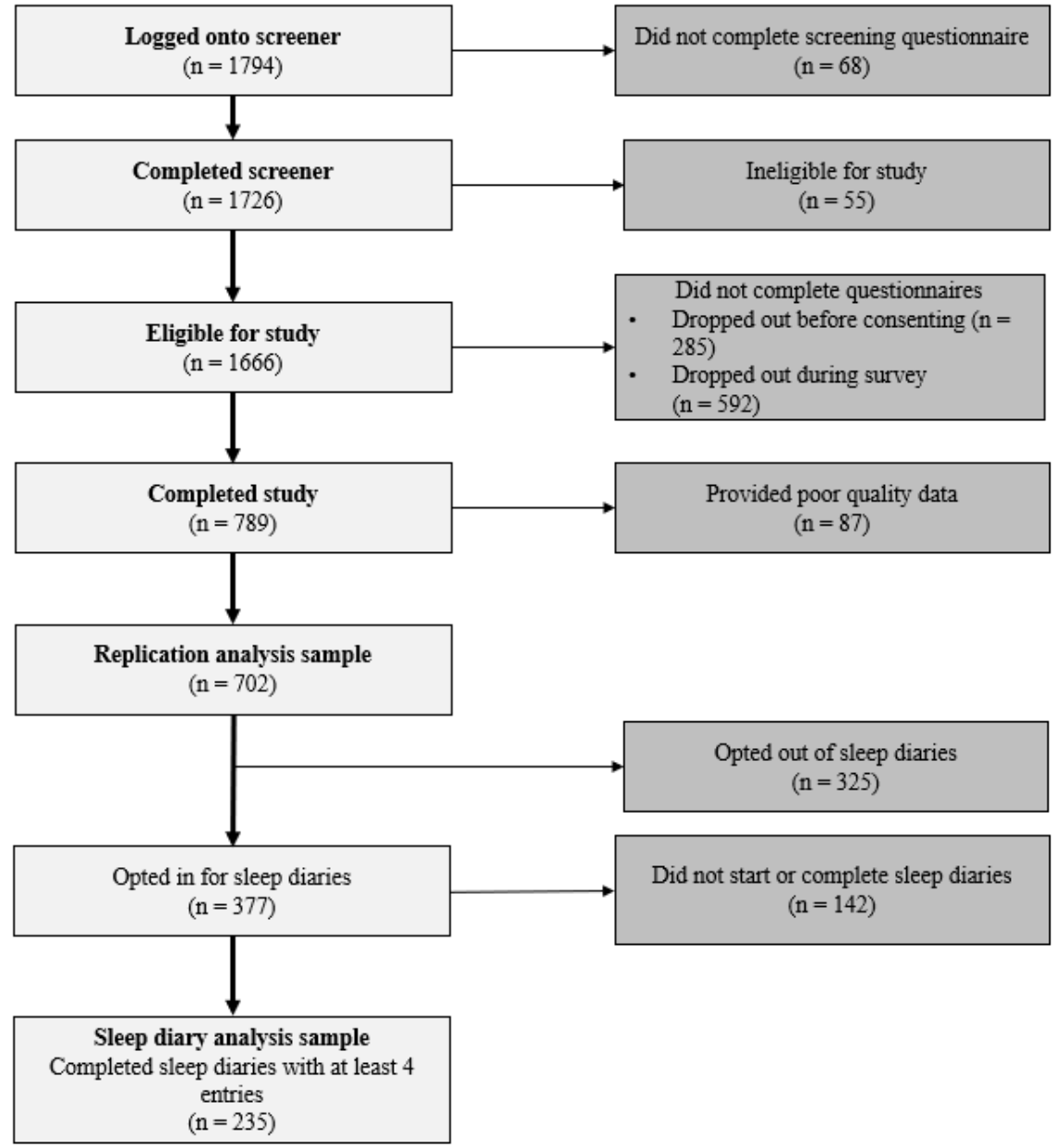


Figure D1b. Participant flowchart in the Replication Sample.

Appendix E: Chapter 5 Supplemental Materials

Methodology for Establishing Validity for Latent Profile Analyses Indicator Variables Using Sleep Diary Data

Five indicator variables were used in the Latent Profile Analyses to establish profiles of nap behavior. To assess the validity of these indicators, each variable was compared to similar variables collected during 1-3 weeks of prospective sleep diaries completed by a subset of parents. The methodology used for the sleep diaries and the associations/comparisons between survey and sleep diary variables are summarized below.

Procedure

Participants were given the option to opt-in to complete sleep diaries at the end of the main survey. Participants who consented received email instructions to complete these sleep diaries each day for up to three weeks. Participants were asked to complete at least four diaries each week. Participants who completed at least 4 sleep diaries over a consecutive 7-day period were considered to have completed the sleep diaries. Overall, 377 parents opted in for the sleep diaries (53.7% of survey completers) and of these, 235 completed the sleep diaries (62.3% of those who opted in to complete the sleep diaries). Participants completing the sleep diaries received compensation directly from the research team: gift cards worth $10 CAD for each week completed, plus a bonus incentive for consecutive weeks completed ($5 CAD bonus for 2 consecutive weeks completed, $10 CAD bonus for 3 consecutive weeks completed).

Measure: Diary-Reported Daytime Sleep Behavior

Parents reported on their children's daily nighttime and daytime sleep duration and quality using sleep diaries and parents' own sleep. The sleep diaries were scored to yield five child daytime sleep variables: (1) the proportion of days with a nap over the total reported days; (2) average daily nap duration (i.e., sum of daily nap durations divided by total reported days); (3) average timing of first nap (i.e., sum of daily timing of first nap [coded as minutes from midnight] divided by total days with a nap); (4) average proportion of sleep during the daytime (i.e., average daily sleep during the day divided by the sum of the average total sleep during the day and during the night); and (5) proportion of spontaneous naps (i.e., number of naps reported

as spontaneous divided by total number of naps). The sleep diaries were scored to yield one parent daytime sleep variable: (1) the proportion of days where the reporting parent had a nap (i.e., days with a reported parent nap divided by total reporting days). The items were based on diaries previously used by our research group.

Results

Children's Nap Behavior

Typical weekly napping frequency (survey) and the proportion of days with a nap (diaries). The proportion of days with a nap variable (diaries) was transformed using an arcsine transformation. A one-way between subjects ANOVA was used to evaluate differences between typical weekly nap frequency (independent variable) on the proportion of days with a nap (dependent variable; arcsine transformed). The omnibus test was significant, $F(8, 223) = 61.88$, $p < .001$, indicating a significant difference in average proportion of days with a nap between typical weekly nap frequency groups. Post-hoc Least Significant Difference (LSD) tests revealed that: (1) the "less than one nap per day" group differed from all other groups except "does not nap"; (2) the "naps 1 day per week," "naps 2 days per week," and "naps 3 days per week" groups did not differ significantly from each other but generally differed significantly from the other groups. The exception was that the "naps 3 days per week" did not differ significantly from the "naps 5 days per week" group. (3) The "naps 4 days per week" and "naps 5 days per week" groups did not differ significantly from each other but generally differed from the other groups (see exception above); and (4) the "naps 6 days per week" and "naps 7 days per week" groups did not differ significant from each other but did differ significantly from the other groups. These results are depicted in Figure A1 below. Proportions are used, rather than arcsine transformed values to aid in interpretation.

To further confirm reduced groupings (i.e., 0 = does not nap, 1 = naps less than one day per week, 2 = naps 1-3 days per week, 3 = naps 4-5 days per week and 4 = naps 6-7 days per week), a second one-way between subjects ANOVA was conducted. This omnibus test was significant, $F(4, 227) = 121.02$, $p < .001$. Post-hoc LSD tests revealed that all groups differed significantly. These results are depicted in Figure A2 below.

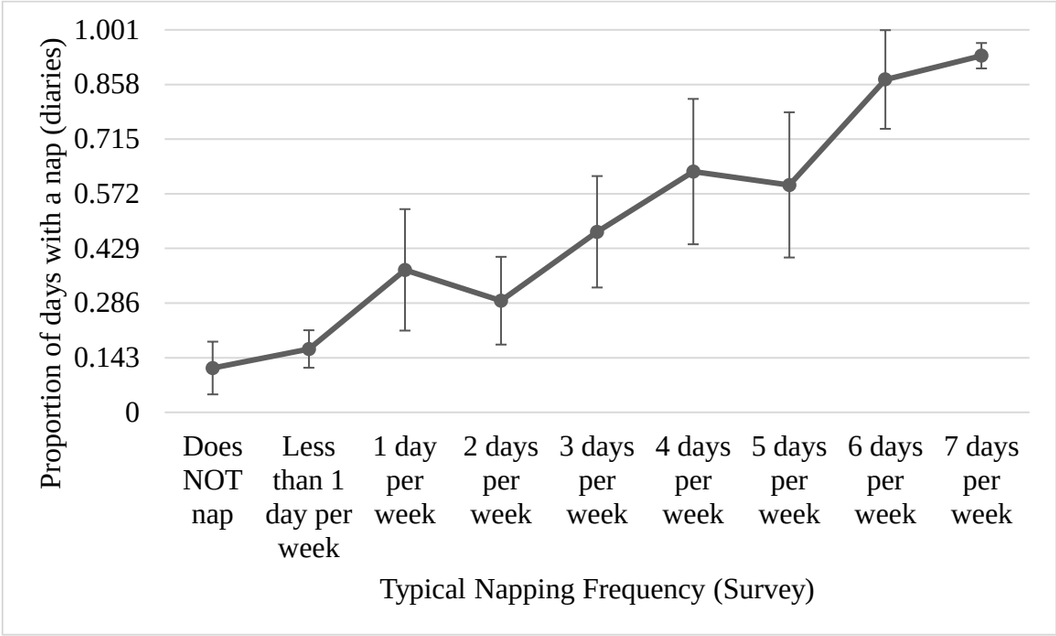


Figure E1. This figure depicts the group differences on typical napping frequency (survey) on the proportion of days with a nap (diaries). Error bars depict 95% confidence intervals. Proportions are presented, rather than arcsine transformations to aid in interpretability. Values on the y-axis correspond to the days per week for that proportion (e.g., 1 day per week equals a proportion of 0.143; 5 days per week equals a proportion of 0.715).

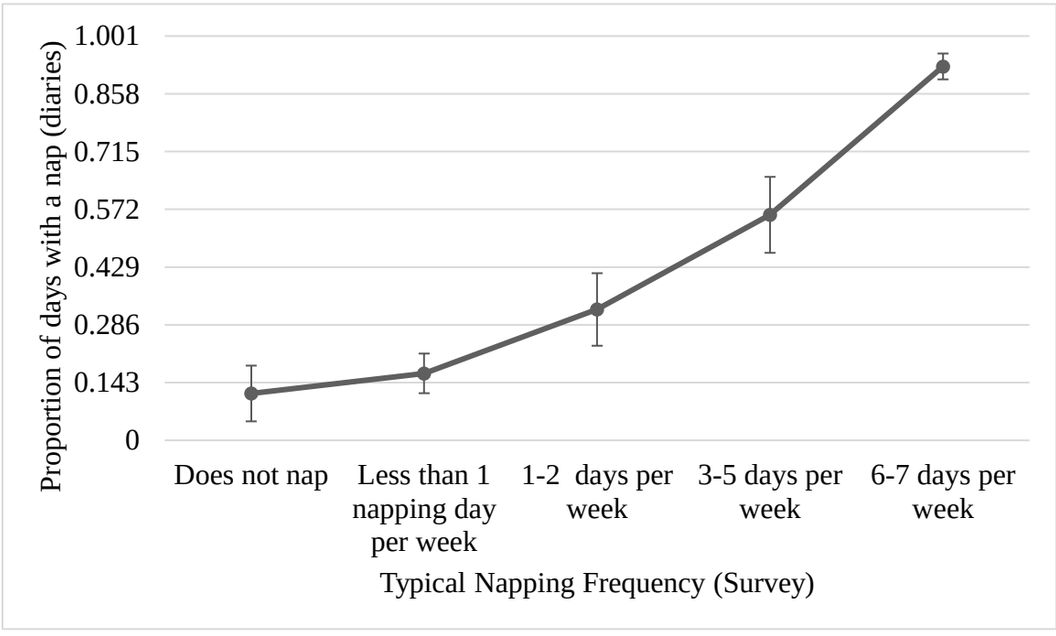


Figure E2. This figure depicts the group differences on reduced categories of typical napping frequency (survey) on the proportion of days with a nap (diaries). Error bars depict 95% confidence intervals. Proportions are presented, rather than arcsine transformations to aid in interpretability. Values on the y-axis correspond to the days per week for that proportion (e.g., 1 day per week equals a proportion of 0.143; 5 days per week equals a proportion of 0.715).

Typical nap duration (survey) & average daily nap duration (diaries). Only children who had at least one nap on the sleep diaries could be included in analyses. The relation between

these measures of nap duration was assessed using a Pearson correlation and they were strongly positively correlated, $r(188) = .569$, $p < .001$.

Typical nap timing (survey) & average timing of first nap (diaries). Only children who were reported to nap at least once in the past month (survey) and who had at least one nap on the sleep diaries could be included in analyses. The relation between measures of nap timing was assessed using a Pearson correlation and they were strongly positively correlated, $r(170) = .742$, $p < .001$.

Proportion of sleep during the daytime (survey) & average proportion of sleep during the daytime (diaries). Both proportion variables were transformed using an arcsine transformation prior to analyses. The relation between these measures of daytime sleep was assessed using a Pearson correlation and they were strongly positively correlated, $r(229) = .826$, $p < .001$.

Proportion of spontaneous naps (survey) & proportion of spontaneous naps (diaries). Both proportion variables were transformed using an arcsine transformation prior to analyses. Only children who were reported to nap at least once in the past month (survey) and who had at least one nap on the sleep diaries could be included in analyses. The relation between these two measures of spontaneous naps was assessed using a Pearson correlation and they were strongly positively correlated, $r(170) = .707$, $p < .001$.

Parents' Nap Behavior

Weekly frequency of parent's naps (survey) & proportion of days with a parent nap (diaries). The proportion variable was transformed using an arcsine transformation prior to analyses. Due to sample size constraints, the survey-reported days parents napped categories were reduced to 0 = "never naps to <1 day/week"; 1 = "naps 1 to 5 days/week"; and 2 = "naps 6 to 7 days/week". A one-way between subjects ANOVA was used to evaluate differences between parents' nap behavior (days napped; independent variable) on the arcsine transformed proportion of days with a parent nap (dependent variable). The omnibus test was significant, $F(2, 232) = 46.93$, $p < .001$. Post-hoc LSD tests showed that the "never naps to <1 day/week" differed from all other groups but the "naps 1 to 5 days/week" group did not differ significantly from the "naps 6 to 7 days/week" group. As such, we decided to combine the "naps 1 to 5 days/week" and

"naps 6 to 7 days/week" groups. These results are depicted below in Figure A3. Then, an independent samples t-test was conducted with the further reduced categories. This test was statistically significant, $t(233) = -9.65$, $p < .001$. These results are depicted below in Figure A4.

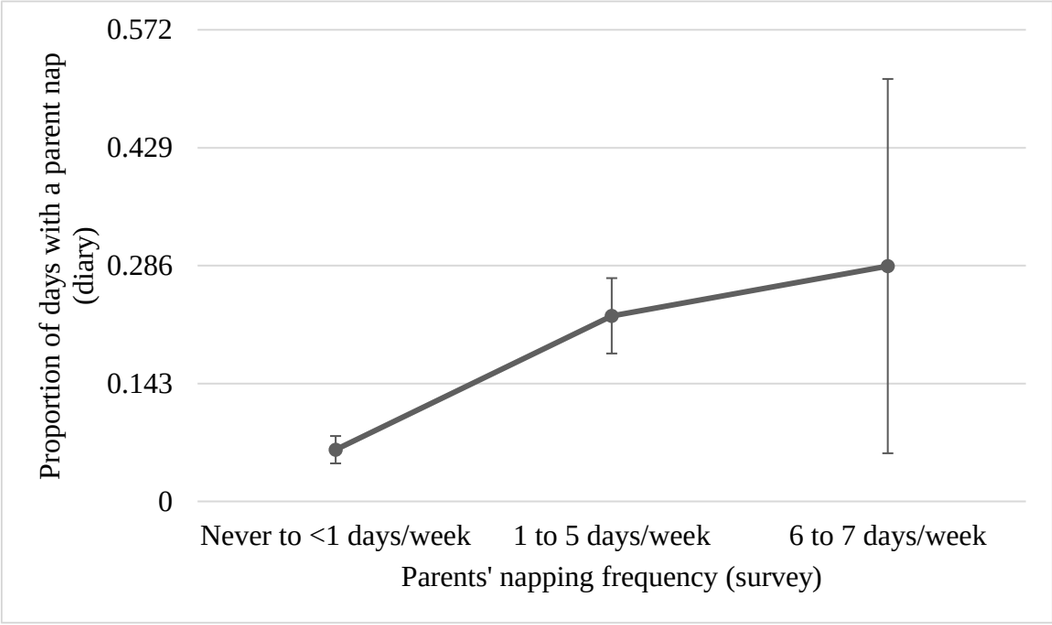


Figure E3. This figure depicts the group differences in the reduced categories of parents' napping frequency (survey) on the proportion of days with a parent nap (diaries). Error bars depict 95% confidence intervals. Proportions are presented, rather than arcsine transformations to aid in interpretability. Values on the y-axis correspond to the days per week for that proportion (e.g., 1 day per week equals a proportion of 0.143; 5 days per week equals a proportion of 0.715).

Given the large confidence interval presented in Figure A3, we have summarized this data in the table below to increase interpretability.

Table E1. Group differences in the reduced categories of parents napping frequency (survey) on the proportion of days with a parent nap (diaries)

	Proportion of days with a parent nap (diary)		
Parents' napping frequency	*N*	*M* (*SD*)	95% CI of *M*
Never to <1 per week	152	0.06 (0.10)	[0.05 - 0.08]
1-to-5 per week	77	0.23 (0.20)	[0.18 - 0.27]
6-to-7 per week	6	0.29 (0.22)	[0.06 - 0.51]

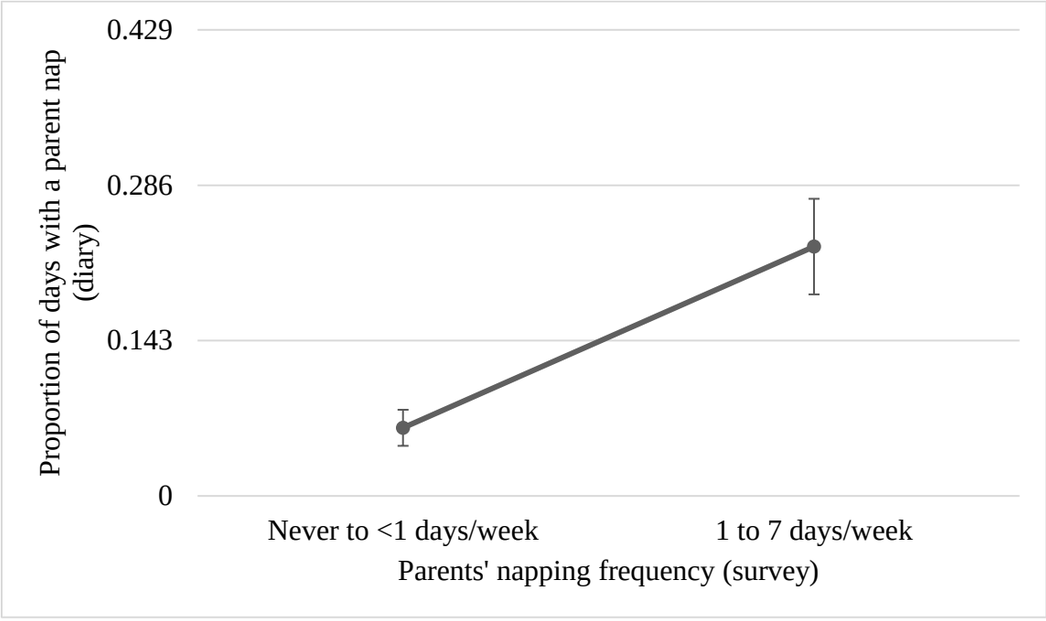


Figure E4. This figure depicts the group differences in the further reduced categories of parents' napping frequency (survey) on the proportion of days with a parent nap (diaries). Error bars depict 95% confidence intervals. Proportions are presented, rather than arcsine transformations to aid in interpretability. Values on the y-axis correspond to the days per week for that proportion (e.g., 1 day per week equals a proportion of 0.143; 5 days per week equals a proportion of 0.715).

Table E4. Summary of key validation statistics.

Survey Variable	Diary Variable	Statistic Used	Main Result
Typical weekly napping frequency	Proportion of days with a nap	One-way ANOVA	Revised groups differ significantly $F(4, 227) = 121.02$, $p < .001$.
Typical nap duration	Average nap duration	Pearson correlation	$r = .569$, $p < .001$
Typical nap timing	Average nap timing	Pearson correlation	$r = .742$, $p < .001$
Proportion of sleep during the daytime	Proportion of sleep during the daytime	Pearson correlation	$r = .826$, $p < .001$
Proportion of spontaneous naps	Proportion of spontaneous naps	Pearson correlation	$r = .707$, $p < .001$
Weekly frequency of parent's naps	Proportion of days with a parent nap	Independent Samples T-test	Revised groups differ significantly $t(233) = -9.65$, $p < .001$.

Table E5. Summary of original and revised coding for survey variables.

Survey Variable	Original coding		Revised coding	
	Categories	% (n)	Categories	% (n)
Typical weekly napping frequency	Does not nap	27.5% (193)	Does not nap	27.5% (193)
	Naps less than one day per week	10.5% (74)	Naps less than one day per week	10.5% (74)
	Naps 1 day per week	3.6% (25)	Naps 1-3 days per week	16.1% (113)
	Naps 2 days per week	7% (49)		
	Naps 3 days per week	5.6% (39)		
	Naps 4 days per week	5.4% (38)	Naps 4-5 days per week	14.2% (100)
	Naps 5 days per week	8.8% (62)		
	Naps 6 days per week	4.6% (32)	Naps 6-7 days per week	29.5% (207)
	Naps 7 days per week	24.9% (175)		
	Missing	2.1% (15)	Missing	2.1% (15)
Weekly frequency of parent's naps	Never naps to <1 day per week	50.1% (352)	Never naps to <1 day per week	50.1% (352)
	Naps 1 to 5 days per week	42.9% (301)	Naps 1 to 7 days per week	49.1% (345)

	Naps 6 to 7 days per week	6.3% (44)		
	Missing	0.7% (5)	Missing	0.7% (5)

Notes: There were no changes to the coding of the linear variables (i.e., Typical nap duration, typical nap timing, proportion of sleep during the daytime, proportion of spontaneous naps).

Supplementary Table E6. Descriptive statistics for multinomial logistic regression predictor variables by napping profile

		Profiles			
Variable	Level/Units	Profile A	Profile B	Profile C	Profile D
		Regular nappers	Intermittent nappers	Spontaneous nappers	Non-nappers
		M (SD) or % (*n*) within Profile	*M (SD)* or % (*n*) within Profile	*M (SD)* or % (*n*) within Profile	*M (SD)* or % (*n*) within Profile
Child's Nighttime Sleep					
Nighttime Sleep Problems	Units	12.94 (8.22)	12.16 (8.28)	11.47 (6.44)	11.69 (7.75)
Nighttime sleep duration	Hours	10.56 (1.16)	10.69 (0.96)	10.62 (0.98)	10.69 (0.90)
Parental Nap Beliefs					
Parents' Nap Beliefs – Positive Beliefs	Units	4.11 (0.71)	3.74 (0.76)	3.23 (0.84)	3.20 (0.92)
Parents' Nap Beliefs – Negative Beliefs	Units	2.31 (0.96)	2.87 (0.94)	3.39 (0.96)	3.71 (0.77)
Reasons Parents Discourage Napping – Child functions well without a nap	Units	2.30 (1.08)	3.12 (1.10)	3.09 (1.10)	3.32 (1.07)
Reasons Parents Discourage Napping – Child prefers not to nap	Units	2.55 (1.19)	3.02 (1.24)	3.50 (1.04)	3.57 (1.01)
Reasons Parents Discourage	<25th percentile	56.2% (100)	24.7% (55)	25.2% (27)	21.9% (42)

Napping – Scheduling related					
	25^{th} – 50^{th} percentile	22.5% (40)	27.8% (62)	21.5% (23)	18.8% (36)
	50^{th} – 75^{th} percentile	14.6% (26)	23.3% (52)	22.4% (24)	29.7% (57)
	>75^{th} percentile	6.7% (12)	24.2% (54)	30.8% (33)	29.7% (57)
Reasons Parents Encourage Napping – Child-related	Units	4.00 (0.85)	3.71 (0.83)	3.75 (0.78)	3.58 (0.81)
Reasons Parents Encourage Napping – Parent-related	Units	3.36 (1.17)	3.38 (1.11)	2.63 (1.14)	2.91 (1.31)
Family and parent variables					
Environmental confusion	Units	30.5 (7.85)	29.95 (6.91)	31.07 (7.28)	33.74 (7.7)
Parent naps	At least 1/weeks	55.4% (98)	56.1% (125)	33.7% (69)	45.1% (87)
Socio-demographics					
Child age	Months	31.74 (12.15)	46.83 (15.28)	51.62 (13.38)	52.64 (15.06)
Child's sex	Male	60.5% (107)	45.9% (102)	62.3% (66)	53.4% (103)
Child's ethnicity	White	64.6% (115)	70.4% (157)	74.1% (80)	78.2% (151)
Child has older sibling(s)	Yes	39.5% (70)	39.9% (89)	44.4% (48)	43.4% (82)
Highest education in the household	High school or below	11.2% (20)	12.6% (28)	13.0% (14)	6.7% (13)
	Above high school, below university/ college graduate	15.7% (28)	13.0% (29)	11.1% (12)	19.2% (37)

	University/college graduate or higher	73.0% (130)	74.4% (166)	75.9% (82)	74.1% (143)
Family Income	< $40K	23.2% (39)	19.5% (43)	22.0% (22)	15.9% (30)
	$40K - $100K	53.6% (90)	62.0% (137)	55.0% (55)	63.0% (119)
	> $100K	23.2% (39)	18.6% (41)	23.0% (23)	21.2% (40)
Parent's occupational status	Employed full time	47.2% (84)	56.1% (124)	43.9% (47)	55.4% (107)
	At home parent & on parental leave	31.5% (56)	24.4% (54)	27.1% (29)	23.8% (46)
	Employed parttime, unemployed, & other	21.3% (38)	19.5% (43)	29.0% (31)	20.7% (40)
Other child-related variables					
Developmental Milestones	Z-score	-0.10 (1.07)	-0.04 (1.04)	0.19 (0.90)	0.03 (0.92)
Birthweight	< 2500 grams	14.0% (21)	10.0% (18)	4.7% (4)	12.8% (61)
Maternal alcohol use during pregnancy	Once or more	6.9% (12)	3.6% (8)	7.8% (8)	11.5% (22)
Childcare arrangement	In Jr. or Sr. kindergarten [1]	6.7% (12)	23.8% (53)	34.0% (36)	29.5% (57)
	Care by non-parent/guardian or center	27.0% (48)	16.6% (37)	17.0% (18)	14.0% (27)
	Care exclusively by parent(s)/ guardian(s)	66.3% (118)	59.6% (133)	49.1% (52)	56.5% (109)

Notes: [1] Entry age for kindergarten varies by province.

Supplemental Table E7a. Odds ratios of the multinominal logistic regressions predicting nap behavior profile: Models 1 & 2

		Model 1			Model 2		
Variable	Category/Units	Profile A	Profile B	Profile C	Profile A	Profile B	Profile C
Nighttime Sleep Problems	Half SDs	1.08 [0.98 - 1.20]	1.03 [0.94 - 1.14]	0.98 [0.88 - 1.10]	1.02 [0.90 - 1.15]	1.02 [0.92 - 1.13]	0.98 [0.88 - 1.10]
Parents' Nap Beliefs – Positive Beliefs	Units	4.29 [3.17 - 5.81]	2.14 [1.69 - 2.7]	1.04 [0.80 - 1.35]	3.10 [2.28 - 4.23]	2.01 [1.59 - 2.55]	1.03 [0.79 - 1.34]
Parents' Nap Beliefs – Negative Beliefs	Units	0.19 [0.14 - 0.25]	0.36 [0.28 - 0.45]	0.64 [0.49 - 0.85]	0.21 [0.16 - 0.29]	0.37 [0.29 - 0.47]	0.65 [0.49 - 0.86]
Reasons Parents Discourage Napping – Child functions well without a nap	Units	0.43 [0.35 - 0.53]	0.84 [0.70 - 1.01]	0.82 [0.66 - 1.02]	0.47 [0.37 - 0.59]	0.86 [0.72 - 1.03]	0.82 [0.66 - 1.02]
Reasons Parents Discourage Napping – Scheduling related [1]	25th – 50th Percentile	0.47 [0.26 - 0.84]	1.32 [0.74 - 2.35]	1.02 [0.50 - 2.08]	0.49 [0.26 - 0.94]	1.34 [0.75 - 2.39]	1.00 [0.49 - 2.04]
	50th – 75th Percentile	0.19 [0.11 - 0.35]	0.70 [0.41 - 1.22]	0.66 [0.33 - 1.31]	0.18 [0.09 - 0.35]	0.70 [0.40 - 1.23]	0.66 [0.33 - 1.30]
	>75th Percentile	0.09 [0.04 - 0.18]	0.73 [0.42 - 1.26]	0.91 [0.48 - 1.74]	0.11 [0.05 - 0.23]	0.75 [0.43 - 1.29]	0.90 [0.47 - 1.73]
Reasons Parents Discourage Napping –	Units	0.46	0.65	0.93	0.47	0.66	0.94

Child prefers not to nap		[0.38 - 0.56]	[0.54 - 0.77]	[0.76 - 1.15]	[0.38 - 0.58]	[0.56 - 0.79]	[0.76 - 1.15]
Reasons Parents Encourage Napping – Child-related	Units	1.90 [1.44 - 2.51]	1.21 [0.97 - 1.5]	1.27 [0.98 - 1.65]	1.76 [1.33 - 2.34]	1.20 [0.96 - 1.49]	1.28 [0.97 - 1.68]
Reasons Parents Encourage Napping – Parent-related	Units	1.36 [1.14 - 1.63]	1.38 [1.17 - 1.63]	0.83 [0.69 – 1.00]	1.33 [1.10 - 1.60]	1.37 [1.16 - 1.61]	0.83 [0.69 – 1.00]
Environmental confusion	Units	0.42 [0.27 - 0.66]	0.36 [0.24 - 0.54]	0.49 [0.31 - 0.79]	0.41 [0.25 - 0.69]	0.37 [0.25 - 0.55]	0.49 [0.30 - 0.80]
Parent naps [2]	≥ 1 nap/week	1.51 [1.00 - 2.27]	1.55 [1.06 - 2.29]	1.28 [0.97 - 1.68]	2.09 [1.28 - 3.39]	1.81 [1.21 - 2.71]	0.64 [0.38 - 1.06]
Childcare arrangement	In kindergarten	0.19 [0.10 - 0.38]	0.76 [0.49 - 1.20]	1.32 [0.78 - 2.25]	0.93 [0.43 - 2.02]	1.10 [0.67 - 1.8]	1.46 [0.83 - 2.55]
	Care by non-parent/guardian or center	1.64 [0.96 - 2.81]	1.12 [0.64 - 1.96]	1.43 [0.72 - 2.83]	1.74 [0.99 - 3.04]	1.11 [0.64 - 1.92]	1.39 [0.70 - 2.73]
Child age	Years	0.91 [0.89 - 0.92]	0.97 [0.96 - 0.99]	1.00 [0.98 - 1.01]			

Notes. Profile A = Regular nappers; Profile B = Intermittent nappers; Profile C = Spontaneous nappers. Reference group is Profile D (non-nappers).

Model 1 = Unadjusted (bivariate) odds ratios; Model 2 = bivariate odds ratios and child age.

Significant Odds Ratios are bolded.

[1] Reference category is <25th percentile

[2] Reference category is parent does not nap or naps <1/week

Supplemental Table E7b. Odds ratios of the multinominal logistic regressions predicting nap behavior profile: Models 3, 4, & 5

		Model 3			Model 4			Model 5		
Variable	Category/Units	Profile A	Profile B	Profile C	Profile A	Profile B	Profile C	Profile A	Profile B	Profile C
Nighttime Sleep Problems	Half SDs	1.19 [1.02 - 1.40]	1.17 [1.03 - 1.33]	1.06 [0.94 - 1.20]	1.16 [0.99 - 1.37]	1.16 [1.02 - 1.32]	1.03 [0.9 - 1.17]	1.18 [0.99 - 1.41]	1.22 [1.06 - 1.40]	1.04 [0.91 - 1.19]
Parents' Nap Beliefs – Positive Beliefs	Units	3.02 [1.86 - 4.9]	2.46 [1.69 - 3.59]	1.19 [0.83 - 1.71]	3.40 [2.05 - 5.62]	2.52 [1.71 - 3.73]	1.17 [0.81 - 1.69]	3.53 [2.09 - 5.95]	2.65 [1.79 - 3.92]	1.18 [0.81 - 1.71]
Parents' Nap Beliefs – Negative Beliefs	Units	0.23 [0.15 - 0.34]	0.35 [0.26 - 0.48]	0.64 [0.47 - 0.88]	0.23 [0.15 - 0.36]	0.35 [0.25 - 0.48]	0.63 [0.46 - 0.87]	0.24 [0.15 - 0.37]	0.34 [0.25 - 0.48]	0.63 [0.45 - 0.87]
Reasons Parents Discourage Napping – Child functions well without a nap	Units	0.74 [0.51 - 1.09]	1.16 [0.85 - 1.58]	0.88 [0.63 - 1.23]	0.70 [0.47 - 1.05]	1.12 [0.82 - 1.52]	0.85 [0.61 - 1.19]	0.71 [0.47 - 1.07]	1.10 [0.80 - 1.52]	0.87 [0.62 - 1.22]
Reasons Parents Discourage Napping – Scheduling related [1]	25th – 50th Percentile	0.90 [0.41 - 2.01]	2.07 [1.03 - 4.17]	1.26 [0.58 - 2.71]	0.94 [0.41 - 2.15]	2.03 [1.01 - 4.08]	1.24 [0.56 - 2.75]	0.87 [0.37 - 2.04]	1.94 [0.94 - 3.98]	1.21 [0.55 - 2.70]

	50th – 75th Percentile	0.27 [0.11 - 0.69]	1.10 [0.52 - 2.33]	1.06 [0.46 - 2.44]	0.29 [0.11 - 0.75]	1.15 [0.53 - 2.47]	1.10 [0.47 - 2.59]	0.29 [0.11 - 0.76]	1.15 [0.52 - 2.51]	1.11 [0.47 - 2.64]
	>75th Percentile	0.17 [0.06 - 0.53]	1.22 [0.51 - 2.97]	1.53 [0.62 - 3.77]	0.14 [0.05 - 0.46]	1.22 [0.50 - 2.99]	1.66 [0.65 - 4.2]	0.15 [0.05 - 0.50]	1.27 [0.51 - 3.20]	1.57 [0.61 - 4.02]
Reasons Parents Discourage Napping – Child prefers not to nap	Units	0.95 [0.68 - 1.32]	0.77 [0.59 - 1.02]	1.02 [0.77 - 1.34]	0.96 [0.68 - 1.37]	0.77 [0.58 - 1.02]	1.01 [0.76 - 1.34]	0.95 [0.66 - 1.37]	0.79 [0.60 - 1.05]	1.04 [0.78 - 1.38]
Reasons Parents Encourage Napping – Child-related	Units	1.68 [1.10 - 2.56]	0.98 [0.7 - 1.39]	1.41 [0.98 - 2.02]	1.59 [1.02 - 2.46]	0.98 [0.69 - 1.40]	1.36 [0.95 - 1.94]	1.63 [1.03 - 2.59]	0.98 [0.68 - 1.40]	1.33 [0.93 - 1.91]
Reasons Parents Encourage Napping – Parent-related	Units	1.66 [1.20 - 2.28]	1.38 [1.06 - 1.78]	0.84 [0.64 - 1.11]	1.75 [1.24 - 2.47]	1.45 [1.10 - 1.90]	0.88 [0.66 - 1.18]	1.69 [1.19 - 2.41]	1.43 [1.08 - 1.89]	0.88 [0.66 - 1.18]
Environmental confusion	Units	0.53 [0.26 - 1.07]	0.20 [0.11 - 0.35]	0.58 [0.32 - 1.06]	0.53 [0.25 - 1.13]	0.20 [0.11 - 0.36]	0.56 [0.30 - 1.04]	0.51 [0.23 - 1.09]	0.19 [0.11 - 0.35]	0.57 [0.30 - 1.08]
Parent naps [2]	≥ 1 nap/week	3.53 [1.93 - 6.46]	1.75 [1.07 - 2.85]	0.81 [0.46 - 1.41]	4.28 [2.24 - 8.17]	1.90 [1.12 - 3.23]	0.78 [0.43 - 1.41]	4.38 [2.26 - 8.48]	1.94 [1.12 - 3.34]	0.78 [0.43 - 1.40]
Childcare arrangement	In kindergarten	0.46 [0.17 - 1.24]	0.85 [0.46 - 1.58]	1.12 [0.59 - 2.13]	0.50 [0.18 - 1.39]	0.85 [0.45 - 1.62]	1.6 [0.64 – 4.00]	0.47 [0.16 - 1.40]	0.91 [0.46 - 1.78]	0.99 [0.49 - 2.01]

	Care by non-parent/guardian or center	1.39 [0.66 - 2.9]	1.14 [0.59 - 2.19]	1.43 [0.71 - 2.87]	1.40 [0.64 - 3.05]	1.09 [0.56 - 2.14]	0.57 [0.26 - 1.24]	1.33 [0.60 - 2.92]	1.07 [0.54 - 2.13]	1.32 [0.64 - 2.73]
Child age	Months	0.93 [0.91 - 0.96]	0.99 [0.97 - 1.01]	1.00 [0.98 - 1.02]	0.93 [0.91 - 0.95]	0.99 [0.97 - 1.01]	1.00 [0.98 - 1.02]	0.93 [0.90 - 0.95]	0.99 [0.97 - 1.01]	0.99 [0.97 - 1.02]
Highest education in the household [3]	High school & below				1.77 [0.68 - 4.61]	2.47 [1.07 - 5.68]	1.11 [0.47 - 2.61]	1.59 [0.57 - 4.44]	2.04 [0.86 - 4.82]	1.51 [0.59 - 3.84]
	Above high school & below university/ college graduate				1.37 [0.55 - 3.39]	0.83 [0.40 - 1.72]	0.99 [0.51 - 1.94]	1.40 [0.56 - 3.5]	0.81 [0.39 - 1.68]	0.56 [0.26 - 1.22]
Family Income [4]	<$40K				1.41 [0.50 - 4.04]	0.93 [0.40 - 2.17]	1.70 [1.02 - 2.84]	1.30 [0.45 - 3.73]	0.90 [0.38 - 2.12]	1.13 [0.49 - 2.59]
	$40K - $100K				1.56 [0.67 - 3.63]	1.19 [0.65 - 2.18]	0.99 [0.55 - 1.79]	1.55 [0.68 - 3.53]	1.21 [0.65 - 2.27]	1.05 [0.54 - 2.02]
Child’s sex [5]	Male				2.58 [1.36 - 4.91]	1.04 [0.64 - 1.68]	0.84 [0.49 - 1.45]	2.29 [1.18 - 4.48]	0.93 [0.56 - 1.54]	1.69 [1.00 - 2.87]
Child’s ethnicity [6]	White				0.58 [0.29 - 1.17]	0.72 [0.41 - 1.28]	0.95 [0.45 - 2.01]	0.61 [0.30 - 1.24]	0.73 [0.41 - 1.30]	1.00 [0.55 - 1.82]

Child has older sibling(s) [7]	≥ 1				1.14 [0.60 - 2.18]	1.21 [0.72 - 2.03]	1.27 [0.63 - 2.56]	1.11 [0.57 - 2.15]	1.17 [0.69 – 2.00]	0.84 [0.48 - 1.46]
Parent's occupational status [8]	At-home parent or on parental leave				1.36 [0.65 - 2.82]	1.06 [0.54 - 2.06]	1.09 [0.56 - 2.13]	1.56 [0.74 - 3.29]	1.13 [0.56 - 2.27]	0.96 [0.44 - 2.07]
	Working parttime, unemployed, & other				0.97 [0.41 - 2.32]	1.03 [0.52 - 2.03]	1.45 [0.70 - 2.97]	1.17 [0.50 - 2.75]	1.11 [0.55 - 2.21]	1.30 [0.64 - 2.62]
Developmental Milestones	Z-score							0.75 [0.55 - 1.02]	0.78 [0.61 - 1.01]	1.10 [0.8 - 1.50]
Nighttime sleep duration	Hours							0.71 [0.51 - 0.99]	0.92 [0.71 - 1.21]	0.86 [0.64 - 1.16]
Birthweight [9]	< 2500 grams							0.42 [0.13 - 1.31]	0.44 [0.18 - 1.11]	0.31 [0.09 - 1.03]
Maternal alcohol use during pregnancy [10]	Once or more							0.33 [0.11 – 1.01]	0.28 [0.09 - 0.82]	0.81 [0.30 - 2.16]

Notes. Profile A = Regular nappers; Profile B = Intermittent nappers; Profile C = Spontaneous nappers. Reference group is Profile D (non-nappers).

Model 3 = Multivariate model controlling for child age; Model 4 = Model 4 + controlling for demographic variables (i.e., highest education in household, family income, child's sex, child's ethnicity, child having an older sibling, parent's occupational status; Model 5 = Model 5 + controlling for other known predictors of nap behavior (i.e., Developmental milestones, nighttime sleep duration, birthweight, maternal alcohol use during pregnancy).

Significant Odds Ratios are bolded.

[1] Reference category is <25th percentile

[2] Reference category is parent does not nap or naps <1/week

[3] Reference category is university or college graduate and above

[4] Reference category is >$100K

[5] Reference category is female

[6] Reference category is non-White ethnicity

[7] Reference category is child has no older siblings

[8] Reference category is parent working full-time

[9] Reference category is birthweight ≥ 2500 grams

[10] Reference category is birth mother did not use alcohol during pregnancy

[11] Reference category is childcare exclusively by parents/guardians

Table E8. Final model multinominal logistic regression predicting napping profile with intermittent napping profile as reference category

Variable	Category/Units	Profile A Regular Nappers	Profile C Spontaneous Nappers
		OR [95% CI]	OR [95% CI]
Child's Nighttime Sleep			
Child Nighttime Sleep Problems	Half SDs	0.97 [0.84 - 1.12]	0.86 [0.75 - 0.99]
Nighttime sleep duration	Hours	0.77 [0.58 - 1.01]	0.92 [0.68 - 1.25]
Parental Nap Beliefs			
Parents' Nap Beliefs – Positive Beliefs	Units	1.32 [0.86 - 2.03]	0.45 [0.30 - 0.67]
Parents' Nap Beliefs – Negative Beliefs	Units	0.69 [0.48 – 1.00]	1.81 [1.31 - 2.51]
Reasons Parents Discourage Napping – Child	Units	0.64 [0.46 - 0.91]	0.78 [0.53 - 1.16]

functions well without a nap			
Reasons Parents Discourage Napping – Scheduling related [1]	25th – 50th Percentile	0.45 [0.22 - 0.91]	0.63 [0.28 - 1.43]
	50th – 75th Percentile	0.25 [0.11 - 0.57]	0.97 [0.38 - 2.49]
	>75th Percentile	0.12 [0.04 - 0.35]	1.24 [0.43 - 3.56]
Reasons Parents Discourage Napping – Child prefers not to nap	Units	1.21 [0.91 - 1.61]	1.31 [0.96 - 1.79]
Reasons Parents Encourage Napping – Child-related	Units	1.68 [1.16 - 2.43]	1.37 [0.91 - 2.05]
Reasons Parents Encourage Napping – Parent-related	Units	1.18 [0.89 - 1.56]	0.61 [0.45 - 0.83]
Family and parent variables			
Environmental confusion	Units	2.66 [1.46 - 4.87]	2.90 [1.43 - 5.89]
Parent naps [2]	≥ 1 nap/week	2.25 [1.32 - 3.85]	0.41 [0.22 - 0.76]
Socio-demographics			

Child age	Months	0.94	1.01
		[0.92 - 0.96]	[0.99 - 1.03]
Child's sex [5]	Male	2.45	1.83
		[1.43 - 4.21]	[1.07 - 3.15]
Child's ethnicity [6]	White	0.84	1.37
		[0.47 - 1.52]	[0.74 - 2.53]
Child has older sibling(s) [7]	≥ 1	0.94	0.72
		[0.54 - 1.63]	[0.40 - 1.3]
Highest education in the household [3]	High school & below	0.78	0.76
		[0.34 - 1.8]	[0.31 - 1.83]
	Above high school & below university/ college graduate	1.73	0.69
		[0.78 - 3.83]	[0.28 - 1.70]
Family Income [4]	<$40K	1.44	1.28
		[0.60 - 3.47]	[0.52 - 3.16]
	$40K - $100K	1.26	0.88
		[0.63 - 2.53]	[0.44 - 1.76]
Parent's occupational status [8]	At-home parent or on parental leave	1.40	0.85
		[0.76 - 2.57]	[0.38 - 1.92]
	Working parttime, unemployed, & other	1.07	1.18
		[0.51 - 2.24]	[0.56 - 2.47]
Other child-related variables			

Developmental Milestones	Z-scores	0.96 [0.75 - 1.24]	1.40 [1.02 - 1.93]
Birthweight [9]	< 2500 grams	0.93 [0.39 - 2.22]	0.61 [0.16 - 2.32]
Maternal alcohol use during pregnancy [10]	Once or more	1.21 [0.42 - 3.46]	2.88 [0.86 - 9.66]
Childcare arrangement [11]	In kindergarten	0.52 [0.20 - 1.36]	1.08 [0.53 - 2.24]
	Care by non-parent/guardian or center	1.24 [0.68 - 2.25]	1.25 [0.60 - 2.60]

Notes. Dependent variable outcome reference category is Profile B (intermittent nappers). Profile D (non-nappers) was excluded from the table as the results are already reported in Table 4. Significant Odds Ratios are bolded. Units refers to the original coding of scale. That is, for Positive and Negative Parental Nap Beliefs, parents responded on 5-point Likert scale from "completely disagree" to "completely agree"; for Reasons parents encourage or discourage napping, parents responded on a 5-point Likert scale from "not at all true" to "completely true"; for environmental confusion, parents responded on a 4-point Likert scale from "not at all like your own home" to "very much like your own home".

Supplementary Table E1 presented the descriptive statistics for the predictor variables by napping profile.

[1] Reference category is <25th percentile

[2] Reference category is parent does not nap or naps <1/week

[3] Reference category is university or college graduate and above

[4] Reference category is >$100K

[5] Reference category is female

[6] Reference category is non-white ethnicity

[7] Reference category is child has no older siblings

[8] Reference category is parent working full-time

[9] Reference category is birthweight ≥ 2500 grams

[10] Reference category is birth mother did not use alcohol during pregnancy

[11] Reference category is childcare exclusively by parents/guardians

Curriculum Vitae

Adam Newton

EDUCATION

Ongoing	**Doctor of Philosophy, Clinical Psychology** *The University of Western Ontario*, London, Ontario
2017	**Master of Science, Clinical Psychology** *The University of Western Ontario*, London, Ontario
2015	**Bachelor of Art, with Distinction, Honors Specialization in Psychology** *King's University College at the University of Western Ontario*, London, Ontario

AWARDS & DISTINCTIONS

2020-2021	**Doctoral Fellowship,** The Network for Economic & Social Trends at The University of Western Ontario
2020	**Graduate Student Summer Bursary,** The University of Western Ontario
2020	**Travel Award – Institute Community Support,** Canadian Institute of Health Research
2019	**First Place Clinical Science Talk,** Child Health Research Day
2017-2018	**Studentship,** Children's Health Research Institute
2016-2017	**Graduate Stipend,** Better Nights Better Days Training Program
2016-2017	**Ontario Graduate Scholarship**

2016	**Summer Student Research Award,** Better Nights Better Days Training Program
2015-2016	**Canadian Graduate Scholarship (SSHRC) Masters Award**
2015-2016	**Ontario Graduate Scholarship** (*Declined*)
2015-2021	**Western Graduate Research Scholarship,** The University of Western Ontario
2015	**Summer Student Research Award,** Better Nights Better Days Training Program
2015	**Canadian Mental Health Association – Organization of the Year,** Canadian Mental Health Association London-Middlesex
2015	**Faculty Association Award,** King's University College at the University of Western Ontario
2015	**Alumni Association Award,** King's University College at the University of Western Ontario
2015	**Academic Award (Top GPA) in the Psychology Program,** King's University College at the University of Western Ontario
2015	**Havelka, Dr. Jaroslav Memorial Award,** King's University College at the University of Western Ontario
2012-2015	**Continuing Scholarship,** King's University College at the University of Western Ontario

2011	**Entrance Scholarship,** King's University College at the University of Western Ontario

RELATED CLINICAL EXPERIENCE

2022-present	**Psychology Resident,** *London Health Sciences Centre,* Supervisors: Drs. Jennifer Crotogino, Abi Kandasamy, Nikki Rielly
2020-2022	**Student Clinician & Psychometrist (Private Practice)**
2020	**COVID Support Line Agent (Public Health),** *London-Middlesex Health Unit,* Supervisors: Drs. Leora Swartzman & David Dozois, C. Psych
2020	**PhD-IV Practicum Student (Pediatric Health Psychology),** *Children's Hospital, London Health Sciences Centre,* Supervisor: Dr. Danielle Cataudella, C. Psych
2019-2020	**PhD-IV Practicum Student (Outpatient Veterans Clinic),** *Operational Stress Injury Clinic, St. Joseph's Hospital London,* Supervisor: Dr. Rod Balsom, C. Psych
2019	**PhD-III Practicum Student (Community Mental Health Clinic),** *Vanier Children's Services,* Supervisor: Dr. Jeff Carter, C. Psych
2018– 2019	**PhD-II Practicum Student (Neuropsychology Private Practice),** *Susan Pigott Neuropsychological Services,* Supervisor: Dr. Susan Pigott, C. Psych

2018 – 2019	**Psychometrist (Research),** *The Western Mood Study,* Supervisor: Dr. David Dozois
2017– 2018	**PhD-I Practicum Student (Community Mental Health Clinic),** *The Child and Youth Development Clinic,* Supervisor: Dr. Colin King, C. Psych
2017	**MSc-II Practicum Student (Forensic Hospital),** *Southwest Centre for Forensic Mental Health,* Supervisor: Dr. Rod Balsom
2017	**MSc-II Practicum Student (School Board),** *Thames Valley District School Board,* Supervisors: Dr. Colin King & Dr. Katie Hillman, C. Psych
2016	**MSc-I Practicum Student (University Wellness Centre),** Student Development Centre at the University of Western Ontario, Supervisor: Dr. Beverly Ulak, C. Psych

RELATED TEACHING EXPERIENCE

2022	**Instructor,** Clinical Psychology (PSYCH 3301G), The University of Western Ontario
2019 – 2020	**Teaching Assistant,** Research Methods and Statistical Analysis (Psych 2820E), The University of Western Ontario
2019	**Teaching Assistant,** Abnormal Child Psychology (Psych 2320B), The University of Western Ontario
2018	**Instructor,** Clinical Psychology (PSYCH 3301G), The University of Western Ontario

2017	**Teaching Assistant,** Abnormal Psychology (Psych 2310B), The University of Western Ontario
2016 & 2017	**Instructor,** Clinical Psychology (PSYCH 3301 F/G), The University of Western Ontario
2016	**Teaching Assistant,** Abnormal Psychology (Psych 2310A), The University of Western Ontario
2015 - 2016	**Teaching Assistant,** Human Sexuality (Psych 2075), The University of Western Ontario
2014-2015	**Teaching Assistant,** Cognitive Psychology (Psych 2135A/B), King's University College at The University of Western Ontario

HONORS THESIS SUPERVISION

2020 – 2021 **Seamus Linton,** "The Effect of Childhood Maltreatment on Accessing Mental Health Services"

- The University of Western Ontario
- Co-Supervision with Dr. Graham Reid

2020 – 2021 **Claire Ponting,** "Parasomnias as Predictors of Delayed Sleep Onset Latency in Children"

- The University of Western Ontario
- Co-Supervision with Dr. Graham Reid

2019 – 2020 **Laura Paradi,** "Parental Distress & Night-waking among 2-10-year-old children"

- The University of Western Ontario
- Co-Supervision with Dr. Graham Reid

2018 – 2019 **Jasmine Chananna,** "Use of Mental Health Services by Ethnic Minority Children"

- The University of Western Ontario
- Co-Supervision with Dr. Graham Reid

2018 – 2019 **Janavi Shetty,** "Relationship Between Parenting Practices, Bedtime Routines and Pediatric Sleep Problems"

- The University of Western Ontario
- Co-Supervision with Dr. Graham Reid

RELEVANT PROFESSIONAL ACTIVITIES

2020 – Ongoing **Ad-hoc Reviewer**

- *Sleep Medicine Reviews* (Editor-in-Chief: Dr. Michael Vitiello)
- *Sleep Medicine* (Editor-in-Chief: Dr. W. Randerath)

2017 – 2019 **President**

Advocacy Through Action

2016 – 2020 **Reviewer**

Western Undergraduate Psychology Journal

2015 – Ongoing **Ad-hoc Mentored Reviewer (under the supervision of G. Reid)**

- *Journal of Attention Disorders*
- *Journal of Pediatric Psychology*
- *Sleep Health*
- *Journal of Early Adolescence*
- *Journal of Family Psychology*
- *Personality and Individual Differences*
- *British Journal of Psychology*
- *Pediatrics*
- *Child and Adolescent Psychiatry and Mental Health*
- *Journal of Behavioral Health Services & Research*
- *BMC Public Health*
- *Journal of Infant and Child Development*
- *SLEEP*
- *Sleep Medicine*
- *Canadian Medical Association Journal Open*
- *Children's Health Care*

2019 **Adjunct Advisory Committee Student Representative**

The University of Western Ontario Clinical Psychology Department

2016 – 2019 **Clinical Student Advisory Committee (CSAC) Representative**

The University of Western Ontario Clinical Psychology Department

RELEVANT PUBLICATIONS

PEER-REVIEWED JOURNAL PUBLICATIONS

Reid, G. J., **Newton, A. T.,** McKenzie, K. N. A., & Coulombe, J. A. (2022, January 27). Thoughts and affect experienced by parents of preschool- and school-aged children during night-waking interactions. *Journal of Family Psychology*, Advance online publication. http://dx.doi.org/10.1037/fam0000897

Shetty, J., **Newton, A. T.,** & Reid, G. J. (2021). Interactions Between Parenting Practices and Bedtime Routines: Associations with Pediatric Sleep Problems. *Journal of Pediatric Psychology,* 1-10. https://doi.org/10.1093/jpepsy/jsab072

Newton, A. T., Corkum, P. V., Blunden, S., & Reid, G. J. (2021). Influences on help-seeking decisions for behavioral child sleep problems: Why parents do and do not seek help. *Clinical Child Psychology and Psychiatry, OnlineFirst,* 1-15. doi: https://doi.org/10.1177/1359104520963375

Newton, A.T., Honaker, S. M., & Reid, G. J. (2020) Risk and Protective Factors and Processes for Behavioral Sleep Problems among Preschool and Early School-aged Children: A Systematic Review. *Sleep Medicine Reviews, 52,* 101303. https://doi.org/10.1016/j.smrv.2020.101303

MANUSCRIPTS IN PRESS

None at this time.

MANUSCRIPTS UNDER REVIEW

Newton, A. T., Tremblay, P. F., Batterink, L. J., Reid, G. J. (Under Review). Early nap cessation in young children as a predictor of language and psychosocial outcomes: Evidence from a Large Canadian Sample. *Manuscript under review in Sleep health (SLEEPHEALTH-S-22-00230).*

Newton, A. T., Tremblay, P. F., Batterink, L. J., Reid, G. J. (Under Review). Predictors of Early Nap Cessation: Longitudinal Research from a Large Study of Young Children. *Manuscript under review in Sleep Epidemiology (SLEEPE-D-22-00026).*

Newton, A. T. & Reid, G. J. (Under Review). Parents, Preschoolers, and Napping: The Development and Psychometric Properties of Two Nap Belief Scales in Two Independent Samples. *Manuscript under review SLEEP (SLEEP-2022-0574).*

Newton, A. T. & Reid, G. J. (Under Review). Regular, Intermittent, and Spontaneous: Patterns of Preschool Children's Nap Behavior and their Correlates. *Manuscript under review in Sleep Medicine (SLEEP-S-22-00846)*.

REFEREED CONFERENCE ORAL PRESENTATIONS

Newton, A. T., & Reid, G. J. (2021, Dec). Determinants of nap cessation among preschool children: Evidence from a large Canadian Longitudinal Study. Talk presented at the 11th Biennial Pediatric Sleep Medicine Meeting, Dec 2-3, 2021. Online.

Reid, G. J. & **Newton, A. T.** (2021, Dec). Parents' Nap Beliefs: The Role of Parents' Perceptions on Children's Nap Timing, Duration, and Cessation. Talk to be presented at the 11th Biennial Pediatric Sleep Medicine Meeting, Dec 2-3, 2021. Online.

Newton, A. T., Honaker, S., Reid, G. J. (2019, May). Risk and Protective Factors and Processes for Child Sleep Problems among Preschool and Early School-aged Children: A Scoping Review. Talk presented at the Child Health Research Day. London, Canada.

Newton, A. T. & Hart, K. M. (2015, October). Psychological education, awareness, and reduction of stigma (PEARS). Talk presented at the Community-University Research Alliance (CURA2) Poverty and Social Inclusion Conference. London, Canada.

Newton, A. T. & Penner-Wilger, M. (2015, June). The cognitive and mathematical profiles of children in early elementary school. Talk presented at the Annual Meeting of the Canadian Society of Brain, Behaviour, and Cognitive Science. Ottawa, Canada.

Penner-Wilger, M., Waring, R. J., **Newton, A. T.,** White, C. (2015). Calculation: A Digital Domain. Talk presented at the Talk presented at the Annual Meeting of the Canadian Society of Brain, Behaviour, and Cognitive Science. Ottawa, Canada.

Penner-Wilger, M., Waring, R. J., **Newton, A. T.** (2014, July). Subitizing and finger gnosis predict calculation fluency in adults. Talk presented at the 36th Annual Conference of the Cognitive Science Society. Quebec City, Canada.

REFEREED CONFERENCE POSTER PRESENTATIONS

Newton, A. T. & Reid, G.J. (2021, October). Predictors of Early Nap Cessation: Longitudinal Findings from a Large Nationally Representative Study of Young Children. Poster presented at the 2021 Virtual Canadian Sleep Society Conference, Oct 29-30, 2021. Online.

Newton, A. T., & Reid, G.J. (2021, February). Parents, Preschoolers, and Napping: Development and Preliminary Psychometric Properties of the Parents' Nap Beliefs Scale. Poster presented virtually at the 6th Biennial International Pediatric Sleep Association Congress, Feb 5-6, 2021. Online.

Newton, A. T., Honaker, S. M., Reid, G. J. (2019, November). Risk and Protective Factors and Processes for Child Behavioral Sleep Problems among Preschool and Early School-aged Children: A Scoping Review. Poster presented at the 10th Biennial Pediatric Sleep Medicine Meeting, Nov 16-17, 2019. Naples, Florida.

Newton, A. T. & Reid, G. J. (2019, September). Do Naps in Young Children Affect Night-Time Sleep Outcomes? If so, When? An Application of Multilevel Modelling. Poster presented at the World Sleep Congress 2019, Sep 22-25, 2019. Vancouver, Canada.

Chananna, J., **Newton, A.,** & Reid, G. J. (2019, May). Mental health service use by ethnic minority adolescents. Poster presented at Child Health Research Day. London, Canada.

Newton, A. T., King, C. Skirving, E. & Archibald, L. (2018, November). Domains of Service Activity and a Preliminary Program Logic Model of an Interdisciplinary Training Clinic for Children and Youth. Poster presented at the 2018 Children's Mental Health Ontario Conference, Nov 26-27, 2018, Toronto, Canada.

Newton, A. T., Corkum, P. V., Blunden, S., Reid, G. J. (2017, November). Parental Help-Seeking for Pediatric Insomnia: Why Parents Do and Do Not Seek Help. Poster presented at the Ninth Biennial Pediatric Sleep Medicine Conference, Nov 2-5, 2017, Amelia Island, Florida.

Newton, A. T., Reid, G. J., Corkum, P. V., Blunden, S. (2017, June). Family help-seeking for behavioural insomnia of childhood: Reasons why parents do not seek help. Poster presented at the 77th Annual Convention of the Canadian Psychological Association. Toronto, Canada.

Newton, A. T., Reid, G. J., Corkum, P. V., Blunden, S. (2017, April). Family help-seeking for behavioural insomnia of childhood: What motivates parents to seek

help? Poster presented at the 8th Conference of the Canadian Sleep Society. Calgary, Canada.

Newton, A. T., Reid, G. J., Corkum, P. V., Blunden, S. (2016, November). Family help-seeking for behavioural insomnia of childhood: Where do parents seek help? Poster presented at the 4th Annual Child and Adolescent Psychiatry Research Half Day. London, Canada.

MEDIA ENGAGEMENTS

NEWSPAPER/ONLINE ARTICLES

Newton, A. T. (2020, August 4). Newton: the dark nights. *London Free Press*. Retrieved from https://lfpress.com/health/family-child/the-dark-nights

Newton, A. T. (2020, June 30). 10 reasons kids develop sleep problems, and how parents can help. *The Conversation.* Retrieved from https://theconversation.com/10-reasons-kids-develop-sleep-problems-and-how-parents-can-help-140196

Note: republished in Today's Parents, Channel News Asia, and the "Today" line of community papers (e.g., Newmarket Today, Timmins Today, Guelph Today, Elliot Lake Today, Innisfil Today, Bradford Today, Orillia Matters)

Newton, A. T. (2014, November 13). Review: Avoiding 'hotspots' key to self-control (Book Review). *The London Free Press.* Retrieved from http://www.lfpress.com/2014/11/06/review-avoiding-hotspots-key-to-self-control

Note: republished in the Toronto Sun

Newton, A. T. (2014, February 7). No quick fix when food becomes foe: There is no cure for eating disorders. There are, however, many treatment groups (Op-ed). *The London Free Press.* Retrieved from http://www.lfpress.com/2014/02/06/newton-there-is-no-cure-for-eating-disorders-there-are-however-many-treatment-groups

RADIO INTERVIEWS

Newton, A. T. (2016, July 6). Children's sleep study and parents thoughts. *CKNI The Bend, Morning News.*

Newton, A. T. (2015, December 23). Child sleep study investigates parents' reactions. *CBC Radio One, Prince Edward Island, Island Morning.* Article retrieved from http://www.cbc.ca/beta/news/canada/prince-edward-island/child-sleep-study-investigates-parents-reactions-1.3377830

GRANTS

FUNDED & IN PROGRESS

Reid, G. J., Brown, J. B., **Newton, A. T.** (07/2020 to 06/2023). *The Developmental Importance of Napping in Preschool Children: The Psychosocial Predictors and Late Preschool Correlates of Nap Transition* (Application #: 435-2020-0842). SSHRC - Insight Grant. Amount Requested & Awarded: $99,838.

FUNDED & COMPLETED

Reid, G. J., Brown, J. B., **Newton, A. T**. (01/2020 to 12/2021). *Giving up naps: Process and correlates of preschoolers' nap cessation*. Western Strategic Support for SSHRC - Open Competition. Amount Awarded: $24,935.

UNDER REVIEW

None at this time.