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Healthy Sleep Habits in Children and Adolescents: Why Do They Matter and What Can We Do?

KEY POINTS:

- A compelling body of evidence suggests that sleep deprivation can affect physical health, mental wellbeing and cognitive performance in children and adolescents.
- Adequate sleep quality and duration are essential throughout the life-course, including the period from early childhood to adolescence when the body and brain are rapidly developing.
- Infants, children and adolescents generally require more sleep than adults for their optimal development.
- Yet, a large proportion of children in Singapore do not appear to have adequate sleep length.
- Parents/caregivers and adolescents should be offered practical guidelines to help achieve improved sleep behaviours, and these efforts can be supported by educational policy related to school start times and after-school activities.
- The health and education sectors have critical roles to play in encouraging and raising awareness of the importance of good sleep practices in childhood.

Why sleep is important

Sleep–both its quantity and quality–plays an important role in a child's development. Sufficient sleep of good quality is linked to optimal brain function in children, impacting memory[1, 2], language[3, 4] and executive function,[5, 6] (cognitive skills required for self-regulation and goal-directed behavior). Sleep quality has also been linked with metabolic health. For example, slow-wave sleep–often referred to as deep sleep–is important for hormonal processes that contribute to physical growth.[7, 8] Consequently, short sleep duration in infants has been linked to higher adiposity and obesity later in life.[9, 10]

Sleep problems in infancy (including disrupted sleep, short sleep duration, and difficulty settling) have been associated with the development of sleep problems during early childhood, which can affect cognitive functioning.[11] In turn, sleep patterns and disorders during childhood have been linked to poorer sleep quality in early adolescence.[12]

Evidence from Singapore compared with Western populations

Cross-cultural research has consistently shown that in comparison to Western populations, Asians sleep less than recommended by the United States National Sleep Foundation (NSF) across all ages.[13] Evidence from the Growing Up in Singapore Towards Healthy Outcomes (GUSTO) study in Singapore shows that younger children and adolescents have average sleep durations lower than recommended values (Table 1). The amount of sleep that young Singaporean children get can vary also substantially, depending on the child.[14] These findings suggest that even if there are cultural differences at play, children in Singapore on average are getting insufficient sleep for optimal development.

Infants and toddlers (ages birth to 2 years)

The sleep-wake cycle in early infancy is often erratic until infants establish day-night (circadian) rhythms, usually after age three to four months.[15]

Table 1. Percentage of Singapore children meeting the US National Sleep Foundation's sleep recommendations for children and adolescents

Age	NSF recommended total sleep duration (per 24h)	Singapore children meeting NSF sleep recommendations and their age at examination (unpublished GUSTO data)
Infants from birth to 3 months	14 to 17 hours	30% (3 months)
Infants 4 months to 11 months	12 to 15 hours	47% (6 months); 56% (9 months)
Children 1 to 2 years	11 to 14 hours	66% (12 months); 73% (18 months); 68% (24 months)
Children 3 to 5 years	10 to 13 hours	73% - weekdays, 73% - weekends (4.5 years) 69% - weekdays, 71% - weekends (5.5 years)
Children 6 to 13 years	9 to 11 hours	57% - weekdays, 77% -weekends (8 years)
Adolescents 14 to 17 years	8 to 10 hours	--

Sufficient sleep of good quality is linked to developing better cognitive function, learning and metabolic health.

Singaporean children and adolescents sleep less compared to children in the West

Patterns of sleep change between 3 and 12 months are similar in Singaporean infants and Western cohorts.[16]

A large cross-cultural study with over 29,000 children between 0 to 36 months reported that Asian children had later bedtimes, shorter total sleep, increased parental perception of sleep problems, and were more likely to room-share.[17] This study also showed that Singaporean infants and toddlers had later bedtimes (by >1 hour) and lower average total sleep duration (by almost 1 hour) than Western populations.[17]

The onset of prolonged sleep, that is when napping gradually ceases and sleep consolidates into a single night period, has been considered a milestone in children's development. However, there is limited consensus on the rate at which this transition occurs across childhood, the timing of napping cessation, and the possible significance of this variation.[18] Integrating the global evidence on napping patterns in children from birth to 12 years shows that fewer than 2.5% of children cease napping prior to age 2, whereas 94% cease napping by age 5.[19] More nuanced research is required to understand the extent to which these napping behaviours may influence children's neurodevelopment and learning outcomes.

Preschool-age children

Like infants and toddlers, preschoolers in Asia also had later bedtimes, were more likely to bed- and/or room-share, had more perceived sleep disturbances, and continued to nap throughout the preschool years, compared to their Western counterparts.[20] Preschoolers in Singapore had later bedtimes (by >1.5 hours) and slightly lower total sleep duration than many other Asian and Western populations.

Studies of cognitive abilities in children show that individual differences in sleep quantity and quality impact the development of memory,[1, 2] language,[3, 4] and executive functions.[5, 6] Evidence suggests that children with persistent sleep problems have lower academic performance.[21] Digital screen viewing time has also been associated with lower sleep quality and duration. Preschool children who spend more than one hour watching television per day showed a greater risk of sleep disorders.[22] Sleep deprivation has been associated with hyperactivity, inattention, and poorer school readiness.[23] Several studies also suggest that suboptimal sleep duration could potentially be a contributing factor to overweight and obesity[24, 25, 26] and impaired immunity.[27]

School-age children

According to The Sleep and Health Laboratory at NUS, school-age children in Singapore (ages 7-12 years) sleep only an average of 8.4 hours per night during weekdays, somewhat less than their peers in France, UK, Canada, and New Zealand.[28] Furthermore, 65% of school-age children in Singapore do not meet the recommended 9 to 11 hours of sleep on school days. Insufficient sleep in school-age children has been associated with poorer academic performance, sleepiness during the day, depressive symptoms, and poor social competence.[28] Previous research in Singapore[29] indicated that mothers' TV and exercise habits may influence their children's adherence to guidelines for physical activity, sleep and screen use.

Adolescents

Changes in underlying neural control of circadian rhythms in adolescents contribute to their propensity for later bedtimes and wake times.[30] Adolescents likely require approximately 9 hours of sleep per night for optimal neurobehavioral function.[31] A recent review suggests that

successive nights of restricted sleep can impair multiple cognitive and affective functions. These effects accumulate over successive nights, and, importantly, may not achieve full restitution even after recovery sleep during the weekends.[32]

Studies on adolescents in Singapore have confirmed the adverse impact of insufficient sleep. Cognitive processes essential for optimal learning and academic success are impaired, affecting attention, cognitive processing speed, and working memory.[33] Local data support the potential benefits of napping as a strategy to enhance long-term memory and learning in adolescents.[34] Singapore adolescents who reported sleeping less than 7 hours per night had poorer self-rated health, greater likelihood of being overweight and more symptoms of depression and thoughts of self-harm, compared to those who reported sleeping between 8 to 10 hours.[35]

Barriers to healthy sleep in local adolescents include later preferred sleep timing, lower parental supervision of bedtime, longer study time, early school start time, and longer travel time.[36] Additionally, time in bed for sleep was inversely related with homework/studying duration on both school days and weekends.[37] Poor sleeping habits during childhood and adolescence may persist into adulthood, increasing the risk of several chronic physical and mental health conditions in later life.[38] Therefore, improving young children's sleep at the population level could potentially help mitigate the rising prevalence of mental health conditions, childhood obesity and related chronic health conditions in later life.[39]

Poor sleeping habits during childhood and adolescence may potentially persist into adulthood, increasing the risk of several chronic physical and mental health conditions in later life.

Implications for Policy and Practice

Given that both the school and home environments play major roles in sleep quality, and that poor sleep quality may have significant health impact, public health policy and interventions to improve sleep in children would require a multi-sectoral systems approach involving the health and education domains amongst others.

Health system: A public health campaign by health promotion agencies, in conjunction with sleep experts, will be needed to help raise awareness of the importance of good sleep among parents/caregivers, adolescents, school leaders, teachers and policy makers. Health promotion messaging should be holistic, recognizing that children's sleep is related to screen use and physical activity, and emphasizing how the habits of parents and caregivers may influence their children's sleep habits. Parents-to-be and parents of infants should also be targeted to receive guidance, as early action promoting healthy sleep behaviour could help reduce the risk of childhood sleep problems persisting into adolescence. Universal screening for poor sleep patterns and duration in infants during routine check-ups would also enable targeted assistance. Primary healthcare providers should also be encouraged to proactively discuss the issue with parents and adolescents, and provide resources where available.

The campaign should include guidelines such as establishing sleep routines and setting appropriate bedtimes. Guidelines for adolescents may include reducing screen time (including devices) especially before bedtime, limiting consumption of substances that may impair sleep quality, learning relaxation techniques, and exercising. The campaign should also be complemented by efforts to understand the barriers faced by

parents and caregivers in ensuring healthy sleep habits in children.

Education system: Administrative and policy changes to school schedules that support students' sleep should be considered, acknowledging that there are broader consequences for families, the community and businesses in doing so. For example, in Singapore, schools tend to start approximately an hour earlier than the American Academy of Pediatrics recommendation of 8:30am or later. A study in a local secondary school showed that delaying school start times by 45 minutes was linked with sustained benefits including longer sleep duration, greater daytime alertness and improved psychological well-being in their students.[37] A large longitudinal study looking at later school start-times of middle and high school students in USA also found improved sleep duration and reduced daytime sleepiness, both of which were sustained for at least 2 years.[40]

Introduction of guidelines on appropriate levels of homework and after-school activities should also be considered. Excessive workload and extracurricular activities may be barriers to good sleep, and many children are likely to benefit from more moderate after-school obligations.

Given the fundamental importance of good sleep to young children and adolescents' physical health, mental well-being, and cognitive performance, improving their sleep behaviour will considerably optimize human health and potential in Singapore, a key focus in the nation's human health and potential agenda.

Public health policy and interventions to improve sleep in children require a multi-sectoral approach, focusing on the school and home environments.

RECOMMENDATIONS:

- Public health interventions to improve sleep in childhood and adolescence require a multi-sectoral systems approach involving the health and education domains.
- Such interventions should be based on holistic "healthy day" approaches that recognise how parent and caregiver behaviours may shape children's sleep habits, and the important connections between children's sleep, screen use and physical activity.
- A public health campaign by health promotion agencies is needed to help raise awareness of the importance of good sleep among parents/caregivers, adolescents, school leaders, teachers and policy makers and to better understand the issues and challenges faced by parents, caregivers and youth. This should be accompanied by practical guidance on strategies to improve sleep behaviours.
- Good sleep habits should be established as early as possible, beginning with anticipatory guidance during antenatal visits, and extending to universal screening for sleep problems in young children.
- Educational policies around school start times and after-school workload should be carefully considered to support improved sleep, especially in older children and adolescents.

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About CHILD
The Centre for Holistic Initiatives for Learning and Development or CHILD was established under the umbrella of the NUS Yong Loo Lin School of Medicine (NUS Medicine) with the Lien Foundation. In collaboration with other partners such as the Centre for Evidence and Implementation (CEI) and A*STAR's Singapore Institute for Clinical Sciences (SICS), CHILD brings together experts in the field of translational research, child development, and implementation science to help give children the best start to life.