

Sleep Behaviour in a Sample of Preschool Children in Singapore

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Abstract

Introduction: Sleep problems are common in all ages, but may be particularly acute in urban Singapore. This study aims to describe the sleep behaviour of, and to identify any sleep problems in, preschool children. **Materials and Methods:** This was a cross-sectional questionnaire survey of 372 children attending local childcare centers. The questionnaire was based on the Children's Sleep Habits Questionnaire (CSHQ), a validated parent-report sleep screening questionnaire that contains 54 items identifying sleep behaviours in children. **Results:** A total of 372 (40.0%) children participated. The mean age was 4.1 (SD 1.3) years (range, 2 to 6 years). Average total sleep duration was 10.8 hours (SD 1.1) with average night-time sleep duration of 8.5 hours (SD 0.6) and average nap duration of 1.6 hours (SD 1.0). Co-sleeping was common; 80.9% of children shared a room with someone else. The most common sleep problems were in the domains of sleep resistance and morning behaviour; namely: requiring company to fall asleep ($n = 272$, 73.1%), being afraid to sleep alone ($n = 228$, 61.6%) and difficulty in waking up ($n = 165$, 44.4%). Among parents, 84.1 % ($n = 313$) perceived that their child's sleep duration was adequate. **Conclusion:** The duration of sleep in the Singaporean preschool population sampled is significantly lower than recommended values and that of previously described Caucasian populations. Parental perception of sleep adequacy deviates from current recommendations. Given the clear relation of sleep duration with cognitive functioning, learning, and physical growth, this sleep deprivation should be addressed with parental education and opportunistic screening of sleep in well-child follow-ups.

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Key words: Co-sleeping, Sleep duration, Sleep resistance

Introduction

It has been estimated that in the first half of the 20th century, the average person used to sleep 9 hours a day; today an individual sleeps, on the average, 7.5 hours a day.¹ The increasing time pressure from work, family, and social changes have resulted in many people sleeping a total of 6 hours a day or even less in urban societies.² It is possible that this restriction of sleep hours in adults has also impacted the sleep behaviour of children.

Sleep plays an integral role in the normal development of children. It has been well-proven that sleep is related to the physical growth and behaviour of children as well as their cognitive functioning and learning.³⁻⁵ Both quantity and quality of sleep are of importance for the normal developmental growth of children. Various studies from around the world have shown that sleep disturbances in

children are not uncommon.^{6,7} Furthermore, significant differences have been shown to exist between the sleeping habits of children across geographic locations for instance, between Chinese and American children.⁸ However, there has been little information with regards to the sleeping habits of Singaporean children. Indeed, sleep problems may be particularly acute in Singapore (an urbanised society) where anecdotally, children often sleep later because of various cultural and social factors. These include the arguably rigorous education system, distinctive Asian ethics of hard work and societal expectations and esteem for paper qualifications. All of these combine to place significant importance on school performance and education—societal values which may well result in shorter sleep durations.

The aim of this study is to ascertain the sleep characteristics and behaviour of healthy preschool children in the Singapore

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population and to compare the data to those from existing studies.

Materials and Methods

Subjects

Study subjects were recruited from childcare centres in Singapore. Inclusion criteria were all children aged between 2 and 7 years of age, studying at a childcare centre in Singapore. Children with any form of learning disorders were excluded. In all, 950 questionnaires were given out and 372 usable questionnaires were returned (response rate: 40%).

Methods and Measure

The Children's Sleep Habits Questionnaire (CSHQ) was used as a validated tool for evaluating sleep habits in the local preschool population. The self-administered questionnaire was distributed through the teachers of the childcare centres to parents. Parents were instructed to complete the questionnaire for their child based on a recent normal week; the completed questionnaires were returned within a week to the childcare centre. Attempts to improve response rate included providing pre-stamped envelopes and actively engaging the childcare center teachers and principals to encourage participation by parents of preschoolers. Repeated reminders were given and personal visits made to the childcare centers to obtain as much responses as possible.

The CSHQ is a retrospective, parent questionnaire that has been used in a number of studies to assess sleep patterns and problems in children aged 4 to 12 years. The CSHQ focuses on sleep disorders common to this age group, in 3 domains: Dyssomnias (difficulty getting to sleep or staying asleep), Parasomnias (sleepwalking/talking, night terrors, bedwetting, restless leg syndrome, etc), and Sleep-disordered breathing. Items are rated on a 3-point scale: "usually" if the sleep behavior occurs more than 4 times per week, "sometimes" if it occurs 2 to 4 times a week, and "rarely" if it occurs 0 to 1 time per week. The 50 items were conceptually grouped into the following sleep domains: Sleeping arrangement, Sleeping duration, Sleep routine, Sleep resistance, Night awakenings, Parasomnias, Sleep-disordered breathing, Morning behavior, Daytime behaviour and Parental perception.

Ethics approval for the study was obtained from the National Healthcare Group Domain Specific Research Board, Singapore.

Statistical Analysis

All analyses were performed by using the Statistical

Program for Social Sciences (SPSS) for Windows, version 16.0. All statistical significance was set at $P < 0.05$. Stata version 9.0 was used to compare our sleep duration values with those from previous studies.

Results

Demographics

Referring to Table 1, the mean age of the sample was 4.06 years (SD 1.27) with a range of 2 to 6 years. There were 170 (45.7%) girls and 188 (50.5%) boys. The racial distribution was similar to that of the general Singapore population,⁹ with 283 (76.1%) Chinese, 43 (11.6%) Malays, 25 (6.7%) Indians, and 13 children (3.5%) from other races.

Sleep Duration

For the entire study population, average sleep duration at night was 8.5 hours (SD 0.6), and average nap duration was 1.6 hours (SD 1.0), with average total sleep duration of 10.5 hours.

Stratifying these results by age, the total, nighttime and daytime sleep duration decreased with increasing age (Table 2). Among the study population, the average total sleep duration decreased from 11.3 hours (SD 0.7) among the 2-year-olds to 10.4 hours (SD 0.9) among the 6-year-olds. Similarly, nighttime sleep decreased from an average of 9.1 hours (SD 1.0) in the 2-year-olds to 8.8 hours (SD 0.7) in the 6-year-olds.

Daytime sleep decreased from an average of 2.2 hours (SD 0.7) among the 2-year-olds to 1.6 hours (SD 0.7) among the 6-year-olds. Despite this trend of decreasing average daytime sleep duration, the number of children who had regular naps stayed persistently high across the age groups. The 2-, 3- and 4-year-olds had a napping rate of 80% each with the figure falling slightly to 76% of the population among the 5 and 6-year-olds.

Table 1. Demographic Data of Study Subjects Including Age, Gender and Race

Characteristic	Subgroup	Number	Percentage of total sample
Age/years	2	45	12.1
	3	70	18.8
	4	83	22.3
	5	78	21.0
	6	50	13.4
Gender	Female	170	45.7
	Male	188	50.5
Race	Chinese	283	76.1
	Malay	43	11.6
	Indian	25	6.7
	Others	13	3.5

Table 2. Total Sleep Duration, Nighttime Sleep Duration and Daytime Sleep Duration According to Different Age Groups

Age (years)	n	Total-sleep duration (hours)		Nighttime Sleep duration (hours)		Daytime Sleep duration (hours)		Children with regular naps (%)
		Mean	SD	Mean	SD	Mean	SD	
2	38	11.3	0.7	9.1	1.0	2.2	0.7	80
3	58	11.2	1.1	9.2	0.8	2.0	0.7	81
4	69	10.7	0.9	8.7	0.7	1.8	0.6	80
5	66	10.5	1.0	8.8	0.8	1.7	0.5	76
6	45	10.4	0.9	8.8	0.7	1.6	0.7	76

Table 3. Prevalence of Children Co-sleeping in Same Room or in Same Bed with Another Individual

Age (years)	n	Prevalence*	
		Sleeping in the same room	Sleeping in the same bed
		Number (%)	Number (%)
2	45	36 (80.0)	21 (46.7)
3	70	59 (84.3)	30 (42.3)
4	83	67 (80.7)	39 (40.0)
5	78	63 (80.8)	35 (44.9)
6	50	40 (80.0)	14 (28.0)

*Prevalence defined as occurring more than 4 times a week

Sleeping Arrangement

Co-sleeping (sleeping in the same room or same bed as someone else) was prevalent in the population with 80.9% of the study population sleeping in the same room as someone else and 42.2% of participants sharing a bed. Further stratification by age (Table 3) did not show any specific trends, with no significant difference in the prevalence rates of co-sleeping between the different age groups.

Sleep Problems

The average CSHQ scores for sleep problems ranged from 1.00 to 3.00 based on their frequency of occurrence in a typical week (Table 4). Overall, the prevalence of sleep problems was 31.4% (SD 21.8). The most common sleep problems were in the domains of sleep resistance and morning behaviour. Sleep resistance problems including “needing company to fall asleep” and “being afraid to sleep alone” were prevalent in the sampled population with rates of 73.1% and 61.6% respectively. In addition, morning behaviour problems such as “difficulty in waking up” (44.4%) and “waking up tired” (41.1%) were seen in a significant proportion of the population. Among the Parasomnias studied, restlessness in sleep, bruxism and enuresis had prevalence rates of 41.9%, 24.7% and 22.9% respectively. The most common problem of sleep-disordered breathing was snoring (26.7%).

Parental Perception

The majority of parents (84.1%) felt that their child had adequate sleep. In addition, 90.3% of parents felt that their child did not have a sleep problem. Among those who felt that there was a sleep problem, most perceived the problem as a deviation, and expected the child to outgrow the problem soon.

Discussion

This study is, to our knowledge one of the first few to profile sleep patterns of preschool children in Singapore, especially sleep duration in different age groups. We chose to focus on a specific subpopulation of children in childcare centres for a start; this group is known to have mandatory afternoon naps which provide a degree of uniformity within the sample. The demographic data are representative of the general Singapore population for race and gender with a good spread among the preschool ages.

The results show that the average sleep duration in the study sample is much shorter than the values reported in previous studies across all age groups. One such study is that by Iglowstein et al¹⁰ which established reference values for sleep duration in children based on a large cohort of Swiss children. Across all the age groups, there is a consistent significant difference between the average sleep duration values, with Singaporean children having a significantly shorter total and nighttime sleep duration ($P < 0.001$, 5% significance level). The biggest difference was among the youngest of the sample population—the 2-year-olds. In this age group, the average total sleep duration in our sample is 11.3 hrs \pm 0.7 compared to 13.2 hrs \pm 1.2 in the Swiss sample. Nighttime sleep duration was on average 9.1 hrs \pm 1.0 in our population compared to 11.5 hrs \pm 0.9 in the Swiss sample respectively. Both of these differences were statistically significant with a P value of < 0.001 . Unfortunately, previous studies from other Asian countries have not included the preschool age group, making a comparison of results from this study with other Asian populations difficult.

Interestingly, the children in the present study population

Table 4. Prevalence of Sleep Problems in the Study Population

Domain	Sleep Problem	n	CSHQ score		Prevalence* (%)
			Mean	SD	
Sleep routine	Follows a fixed bed time routine	372	1.82	0.85	52.2
	Needs sleep aids	372	1.70	0.85	41.9
Sleep resistance	Prepared to go to sleep	365	1.32	0.54	20.4
	Tries to delay bedtime	337	1.33	0.57	56.7
	Struggles during bedtime	357	1.27	0.55	21.0
	Requires company to fall asleep	355	2.25	0.81	73.1
	Falls asleep on others' bed	355	1.91	0.89	53.0
	Afraid to sleep alone	370	1.93	0.93	61.6
	Afraid to sleep in the dark	348	1.65	0.85	37.4
Night awakenings	Awakes during the night	372	1.27	0.52	22.9
	Moving to other's bed in the night	333	1.40	0.65	26.9
Parasomnias	Sleep talking	354	1.23	0.46	21.0
	Sleep walking	335	1.02	0.17	1.1
	Bruxism	346	1.31	0.54	24.7
	Restlessness when asleep	358	1.54	0.68	41.9
	Enuresis	340	1.30	0.56	22.9
	Suffers from nightmares	349	1.16	0.40	14.0
	Awakes with terror	352	1.12	0.37	10.5
Sleep disordered breathing	Snoring	350	1.33	0.55	26.7
	Noisy breathing	343	1.23	0.47	18.8
	Difficulty breathing	372	1.05	0.24	4.6
	Apnoea	341	1.05	0.24	0.8
Morning behaviour	Awakened by others in the morning	361	2.06	0.79	69.6
	Difficulty in waking up	356	1.60	0.71	44.4
	Waking up irritable	355	1.46	0.63	36.6
	Waking up tired	352	1.51	0.64	41.1
Daytime behaviour	Drowsy in the day	369	1.09	0.32	7.8
	Irresistable urge to sleep during the day	368	1.19	0.44	15.6
	Falls asleep at inappropriate times	369	1.16	0.41	13.2
	Taking a long time to be alert	335	1.10	0.31	8.9
	Falling asleep while watching TV	365	1.65	0.91	33.9
	Falling asleep while riding in car	363	1.82	0.90	47.3

*Prevalent problems are defined as those occurring 2 or more times a week

have a high rate of napping across all the age groups studied. This is unlike values from Iglowstein's study, which had very few children napping regularly beyond the age of 4 years. In fact, after 4 years of age, children in older age groups had a fewer than 5% rate of napping compared with the consistently higher than 70% rate of napping found in this sample population. In line with this, the average duration of daytime sleep is also higher for this study population compared with the Swiss children, at least among the 2- to 4-year-old age groups (the corresponding values for the older age groups being unavailable in the Swiss data). This finding is likely to be a reflection of inadequate nighttime sleep in Singaporean children although cultural differences

and schooling practices could contribute as well. Of note, currently there is no concrete evidence on the effectiveness of daytime sleep as a substitute for shortened nighttime sleep in children. It is also interesting to note that there were features suggestive of sleep deprivation in these children with morning behaviours such as "difficulty in waking up" and "waking up tired" being reported in a good proportion of children. However, a point to note is that the Swiss study also had, in its sample population, children who did not attend childcare centres—this could be a contributing factor to the proportion of daytime and nighttime sleep observed in the results.

The above findings pertaining to Singaporean preschoolers

are especially worrying in the context of what is known about the importance of sleep. Literature suggests that children with later or irregular bedtimes, short sleep time and daytime sleepiness have lower academic achievements than normal children.^{11,12} In addition, sleep deprivation is associated with increased incidence of learning disorders,¹² unintentional injuries,¹³ obesity, impaired immunity and mood and anxiety disorders.¹⁴ Hence the significantly shorter duration of sleep that Singaporean preschoolers obtain may have implications on their long-term health and academic performance. In particular, it is of note that the younger preschoolers in the 2-year-old age group are having a much shorter sleep duration than their Caucasian counterparts. Without clear evidence of daytime sleep being an effective substitute for nighttime sleep, the findings are certainly a cause for concern. Further analysis of correlation, if any, between sleep duration and daytime symptoms and sleep problems and comparison of the same with Caucasian studies was difficult as the studies often did not have comparable age groups and used different instruments to measure sleep problems.

In addition, co-sleeping is common in the Singapore population across all the preschool ages. The prevalence of co-sleeping among Singaporean children is comparable to values from Japan and China, both Asian and culturally similar countries.¹⁵⁻¹⁷ However, this study's values are markedly higher than those from studies in the United States.^{16,17} These differences are likely attributable to differences in cultural and social norms between the Western and Asian societies. The high prevalence of sleep resistance problems in the sampled population could also have contributed to the high prevalence rates of co-sleeping obtained.

Sleep problems are common among the sampled population. Notably, morning behaviour problems such as "difficulty in waking up" and "waking up tired" were present in more than 40% of the study population. These could be suggestive of inadequate total sleep duration in the local population and further, chronic sleep restriction/deprivation. These values appear to be higher than those from studies in the Western population.^{6,8} Other common sleep problems like restlessness during sleep, bruxism and sleep-talking are comparable in prevalence to those from previous studies.^{18,19}

In this study, the vast majority of parents felt that their child was getting adequate sleep. Bearing in mind that the sleep duration for the same population is inadequate from the above results, it appears that parental understanding of sleep adequacy in this population deviates significantly from worldwide norms. This emphasises the need for greater parental education.

Some advantages of this study are its large sample size

and comprehensive screening questionnaire, thus giving a fair representation of the sleeping habits of Singaporean pre-schoolers. The main limitation of the study is the fact that sleeping patterns and behaviour were measured using parents subjective measurements rather than objective measurements. As this was a questionnaire based survey, the potential for recruitment bias was present despite the measures to improve responder rate. Including children who do not attend childcare centres in the study group will also aid in giving a clear picture of the sleep habits of the children of Singapore.

This study nonetheless highlights the problems of sleep in a hitherto uninvestigated population and forms the basis for future studies, where prospective data should be collected from the preschool age group over time with evaluation of the various morbidities of sleep-disordered breathing. Future studies could also further study the key area of total sleep duration identified, exploring the issue of daytime sleep as an effective substitute for shortened nighttime sleep. If resources permit, it would be interesting to explore, among the participants, the current physical and mental health to better elucidate the impact of sleep duration on their well-being. Also, longitudinal cohort studies can be designed to study the future academic and social development as well as incidence of medical problems in children with inadequate sleep duration.

Conclusion

In conclusion, this study has identified decreased total and nighttime sleep in the study sample of Singaporean preschoolers. This is a cause of concern and may have significant implications on long-term health and academic performance. This issue of sleep deprivation in local preschoolers can be addressed on 2 fronts, namely (i) parental education on recommended sleep duration in each age group and (ii) opportunistic screening of children in well-child visits for sleep adequacy, using validated questionnaires.

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