

Parental perception and guideline awareness of children's lifestyle behaviours at ages 5 to 14 in Singapore

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ABSTRACT

Introduction: There are limited data on the descriptive lifestyle behaviour of school-age children in Singapore.

Methods: A total of 100 parents of children ages 5 to 14 participated in a parents' proxy-reported survey. Frequency of moderate physical activity (PA) and vigorous PA was assessed, while t-tests or chi-square test was used to examine differences between weekdays and weekends for sleep, screen viewing time (SVT) and sedentary behaviour (SB).

Results: Of the 100 children (68% of Chinese ethnicity, 59% boys, mean age 9.1±2.9 years), 31% were overweight or obese, with body mass index z-score of >1. For moderate and vigorous PA participation in a typical week, 32.0% and 43.0%, respectively, did not participate, while median (interquartile range) days of participation were 3 (2–3) days/week and 2 (1–3) days/week for a duration of 60 (interquartile range 30–120) minutes/session. When comparing weekends with weekdays, the means (standard deviation) of both SVT and sleep duration were higher on weekends (SVT: 4.1 [2.9] versus 3.3 [3.1] hours/day, $P=0.07$; sleep: 8.8 [1.5] vs 8.3 [1.3] hours/day, $P=0.02$), while there were no significant differences for SB. A higher proportion of children had SB of ≥ 10 hours/day and slept <8 hours/day on weekdays compared with on weekends (SB: 23.5% vs 20.6%, $P>0.05$; sleep: 18.8% vs 2.1%, $P<0.05$), while the proportion exceeding SVT of 2 hours/day were higher on weekends than on weekdays (63.8% vs 45.4%, $P=0.03$). Overall, there was higher parental awareness of sleep guidelines (80.0%), but lower awareness of PA (51.0%) and SVT (59.0%) guidelines.

Conclusion: Lifestyle behaviours were suboptimal in Singapore children compared with existing overseas guidelines, indicating a need for an integrated guideline with greater dissemination.

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Keywords: Childhood and adolescents, integrated guideline, lifestyle behaviours, physical activity, screen viewing time, sleep

INTRODUCTION

Evidence from longitudinal studies in Singapore has suggested that long-term health implications on children stems from less-than-optimal lifestyle behaviours,¹⁻³ encompassing physical activity (PA),⁴ sleep⁵ and sedentary behaviour (SB) which includes screen viewing time (SVT).⁶

In recent years, specific combinations of integrated movement behaviours (i.e. sufficient PA, low SB, limited SVT and adequate sleep) known as the 24-hour movement guidelines for children 5–17 years were developed in Canada⁷ and Australia.⁸ The greater the

number of integrated guidelines accomplished, the better the health-related quality of life.⁹ These behaviours have also been independently associated with desirable health indicators related to cardiometabolic health^{4,5,10} and better psychosocial health.^{5,11} The recommendations from these guidelines include sufficient PA (e.g. moderate to vigorous PA of ≥ 60 min/day), limited SVT (≤ 2 hours/day) and adequate sleep duration (e.g. 9–11 hours/night for children aged 5–13 years).^{7,8} Data of children aged 5.5 years from the Growing Up in Singapore Towards Healthy Outcomes birth cohort study has shown that relatively few children (5.5%)¹² adhered to these guidelines.^{7,13} The study further

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CLINICAL IMPACT

What is New

- This study highlights the suboptimal lifestyle behaviours of the Singaporean children aged 5–14 years.
- Findings also point to the lack of awareness of existing activity guidelines among parents with children in this age group.

Clinical Implications

- This study led to the development of the Singapore Integrated 24-Hour Activity Guidelines for Children And Adolescents to help with better monitoring and improvement of these behaviours.

suggested the adaption of the integrated movement guidelines for Singapore to better monitor children's daily activities to achieve the desirable health indicators. However, more data on lifestyle behaviours are first required in children from older age groups to support the development of such guidelines.

Currently, most of the data we have on lifestyle behaviours of children in Singapore come from those of preschooler age (3–6 years)^{1,3,12,14–16} or younger (below 2 years).^{2,17} Cross-sectional data in the preschooler age group have shown that time spent engaged in moderate to vigorous PA is low, while time spent in SB is high;¹⁵ the duration of night-time sleep is significantly lower than recommended values.¹⁶ At ages 2–3 years, 50% of children were already spending >2 hours/day on SVT, exceeding the recommended guidelines for this age group.¹⁴ Studies in children of ages 5 years and above from Singapore spanning across the school-going age groups (kindergarten, primary and secondary school) are not as comprehensive, especially on evidence surrounding SVT, SB and sleep. Existing studies have focused on either the younger age group only (primary school at ages 7–12)—with only one study on PA¹⁸—and the adolescent age group only (secondary school at ages 13–18 years), examining PA¹⁹ and sleep.²⁰

In view of the limited data in children aged 5 years and older, our study aimed to comprehensively assess the lifestyle behaviours of Singapore children aged 5–14 years. Specifically, this survey aimed to (1) describe PA, SVT, SB and sleep; (2) compare SVT, SB and sleep between weekdays and weekends; and (3) describe the parental perceptions of child health and awareness of existing guidelines.

METHODS

Study sample

A convenience sampling method was used to recruit participants from the KK Women's and Children's Hospital for this survey. Eligible participants had to be Singaporean or permanent resident parents (mother or father) of children aged 5–14 years, who were able to read and understand English. Parents would need to give verbal consent for an anonymous survey before they were given either a hard copy of the survey to complete or an electronic version via FormSG (<https://form.gov.sg/>). Parents who completed the survey received SGD25 in cash, and 100 parents completed this survey within a 1-month period from 1 October to 1 November 2020. The research procedures in this study received formal approval for an exempt review by the SingHealth Centralised Institutional Review Board.

Data collection

The survey comprised 33 items that collected data on demographics, PA, SB, SVT, sleep habits (night-time sleep and day-time napping), parental perceptions on child's health and well-being, and parental awareness of lifestyle guidelines for children and adolescents. The parents would self-report their demographic characteristics and report their child's demographics and lifestyle behaviours by proxy. They were asked to recall their child's past 7-day lifestyle and activities while completing the survey questions. Items on PA and SB were adapted from the International Physical Activity Questionnaire,²¹ while the items on sleep were adapted from the Child Sleep Habits Questionnaire;²² both questionnaires have been widely used to assess PA or sleep.²³ Recreational SVT was captured as the average time a child spends on a screen.¹⁴ The entire survey took parents approximately 10–15 minutes to complete.

Assessment of physical activity and sedentary behaviour

Examples of activities common in children were stated as a guide for parents alongside questions on PA levels: vigorous (i.e. fast running, fast swimming, or fast cycling), moderate (i.e. fast walking or regular-paced cycling) and light (i.e. recreational or leisure walking). Parents reported by proxy their child's SB separately for weekdays and weekends, with SB being defined as time spent at school and at home, including time spent sitting at a desk studying and reading, as well as reclining, sitting or lying down to watch television.²⁴

Assessment of screen time

Screen viewing time duration (in hours and minutes) was assessed using the questions “In a typical week, how much time does your child spend on recreational screen viewing time on a weekday?” and “In a typical week, how much time does your child spend on recreational screen viewing time on a weekend?” Screen time included the use of 3 types of screen devices: television (viewing or playing television games), computer and handheld devices.

Assessment of sleep

Parents reported their child’s bedtime, waketime, naptime duration (in hours and minutes) and naptime frequency separately for weekdays and weekends. Bedtimes and waketimes were used to calculate total 24-hour sleep times for each child. Naptime frequency was captured with the question “In the past week, how many naps does your child take per day?”, with the response options of “No naps”, “1 nap”, “2 naps” and “3 naps or more”. Naptime duration was captured with the questions “What is the average time spent on a nap during a weekday?” and “What is the average time spent on a nap during a weekend?”.

Parental perception of child’s health

Parental perception of their child’s weight, calorie intake, PA, screen time exposure and sleep were assessed with the question “Do you think your child is ...”, with the response options of “Overweight”, “Normal weight” and “Underweight”. The other 4 questions were (1) “Do you feel that your child receives adequate amount of physical activity to benefit his/her growth, development and health?”; (2) “Are you concerned about the amount of recreational screen time your child is currently exposed to?”; (3) “Do you think your child is getting adequate sleep to support his/her growth, development and health?”, with the response options of “Yes” and “No”; and (4) “Do you think your child is receiving adequate calories to support his/her growth, development and health?”, with the response options of “Yes”, “Too much” and “No”.

Parental awareness of lifestyle guidelines for children

To assess parental awareness of available lifestyle guidelines for children, parents were asked 3 separate questions regarding PA, sleep and screen time: “Are you aware of the current recommendations regarding the amount of physical activity/sleep/screen time your child should be receiving per day?”, with the response options of “Yes” and “No”.

Statistical analyses

Continuous datasets that were normally distributed were presented as mean and standard deviation (SD), while non-normally distributed datasets were presented as median and interquartile range (IQR). SVT, SB and sleep were analysed as continuous variables and categorical variables. SVT was categorised into 3 levels (≤ 2 , $>2-4$ and >4 hours), as evidence has shown that recreational SVT of more than 2 hours daily is associated with the most adverse health outcomes.^{7,11,25} SB was categorised into <10 and ≥ 10 hours, based on reported evidence that SB taking up more than 60–70% of one’s waking day is considered high SB.²⁶ In this survey, 10 hours of SB out of 15 waking hours (considering mean duration of 9 hours of sleep) is about 67% of a child’s day. Sleep was categorised into 3 levels (<8 , $8-9$ and >9 hours) based on the recommended amount of sleep for school-aged children of 7–18 years (i.e. 8–9 hours/day).²⁷ The independent t-test and the chi-square test were used to compare continuous and categorical variables, respectively, between the weekday and weekend. Sex- and age-specific body mass index (BMI) z-scores were derived using the World Health Organization (WHO) references.²⁸ The cut-offs for overweight and obese were defined as +1SD and +2SD, respectively, above the reference distribution as per WHO recommendations.²⁹ Statistically significant results were determined at 2-sided $P < 0.05$. All analyses were performed using the STATA software version 13 (StataCorp, College Station, US).

RESULTS

Study participants

Parent and child characteristics are detailed in Table 1. The mean age of the 100 respondents was 40.5 ± 4.8 years, with the majority being mothers (89.0%). Of all the parents, 68.0% were Chinese, 62.6% had a university education and 63.0% were reporting by proxy for their first child.

Child demographics revealed that 50.9% were boys, the mean age was 9.1 ± 2.9 years, and 92.0% did not have any chronic illnesses. The mean BMI z-score was -0.22 ± 2.27 ; 18.0% of the children were overweight with a BMI z-score of >1 , and 13% were obese with a BMI z-score of >2 .

Parents’ proxy-reported physical activity

Table 2 shows the descriptive characteristics of parents’ proxy-reported child engagement in PA. In a typical week, 57.0%, 68.0% and 92.0% of children participated

Table 1. Characteristics of the parent respondents of the survey and their children (N=100)

Characteristics	No. (%) or mean \pm standard deviation
Respondent characteristics	
Parent	
Mother	89 (89.0)
Father	11 (11.0)
Age, year	40.5 \pm 4.8
Ethnicity	
Chinese	68 (68.0)
Malay	25 (25.0)
Indian	7 (7.0)
Education ^a	
University	62 (62.6)
Secondary	31 (31.3)
Primary	6 (6.1)
Child characteristics	
Birth order	
First-born	63 (63.0)
Second-born or later-born	37 (37.0)
Sex	
Male	59 (59.0)
Female	41 (41.0)
Chronic illness ^b	
No	92 (92.0)
Yes	8 (8.0)
Age (year)	9.1 \pm 2.9
Body mass index (z-scores) ^c	-0.22 \pm 2.27
Overweight (>+1 z-score) ^c	18 (18.0)
Obese (>+2 z-score) ^c	13 (13.0)

^a Missing data, n=1

^b Chronic illness includes asthma, diabetes, congenital heart disease, cerebral palsy, sickle cell anaemia, spina bifida and epilepsy

^c Sex- and age-specific body mass index z-scores were derived using the World Health Organization references

in vigorous PA, moderate PA and low PA, respectively. Median days of children participating in vigorous PA and moderate PA in a typical week were 3 (IQR 2–3) days/week and 2 (IQR 1–3) days/week for a duration of 60 (IQR 30–120) minutes/session, respectively. The median frequency of low PA

Table 2. Parents' proxy-reported engagement in physical activity, frequency per week and duration per session of vigorous, moderate and light physical activity in children aged 5–14 years

Physical activity	No. (%) or median (IQR)
Vigorous	
Yes	57 (57.0)
Frequency per week (day)	3 (2–3)
Duration per session (min)	60 (30–120)
No	43 (43.0)
Moderate	
Yes	68 (68.0)
Frequency per week (day)	2 (1–3)
Duration per session (min)	60 (30–120)
No	32 (32.0)
Light	
Yes	92 (92.0)
Frequency per week (day)	5 (3–7)
Duration per session (min)	30 (20–60)
No	8 (8.0)

IQR: interquartile range

engagement was 5 (IQR 3–7) days/week for 30 (IQR 20–60) minutes/session.

Parents' proxy-reported SVT, SB and sleep

Table 3 shows the SVT, SB and sleep duration assessed in the children, comparing weekdays with weekends. Most children were engaged in SVT on weekdays (90%) and weekends (94%), and the children had, on average, higher SVT on weekends than on weekdays (4.1 \pm 2.9 vs 3.3 \pm 3.1 hours/day; $P=0.07$). Similarly, the percentage of children exceeding 2 hours/day of SVT (i.e. >2–4 and >4 hours/day) tended to be higher on weekends (29.8% and 34.0%, respectively) than on weekdays (25.6% and 19.8%, respectively; $P=0.03$). In contrast, the overall average time spent in SB was higher on weekdays than on weekends (6.5 \pm 3.3 vs 6.0 \pm 3.1 hours/day, $P=0.26$), with a higher percentage of children spending more time in high SB (≥ 10 hours/day) on weekdays than on weekends (23.5% vs 20.6%, $P=0.23$). Children in this survey had less night-time sleep on weekdays than on weekends (8.3 \pm 1.3 vs 8.8 \pm 1.5 hours/day, $P=0.02$), with 18.8% of children receiving less than 8 hours of sleep on weekdays compared with only 2.1% of children on weekends ($P=0.001$).

Table 3. Parents' proxy-reported screen viewing time, sedentary behaviour and sleep in children aged 5–14 years^a

	Weekday	Weekend	<i>P</i> value
Screen time, hour/day ^b			
≤2	47 (54.6)	34 (36.2)	
>2–4	22 (25.6)	28 (29.8)	
>4	17 (19.8)	32 (34.0)	
Mean±SD	3.3±3.1	4.1±2.9	0.07
Sedentary behaviour, hour/day ^c			
<10	75 (76.5)	77 (79.4)	0.23
≥10	23 (23.5)	20 (20.6)	
Mean±SD	6.5±3.3	6.0±3.1	0.26
Night-time sleep, hour/day ^d			
<8	18 (18.8)	2 (2.1)	0.001
8–9	45 (46.9)	31 (31.6)	
>9	33 (34.4)	65 (66.3)	
Mean±SD	8.3±1.3	8.8±1.5	0.02

SD: standard deviation

^a Data are presented as no. (%) or mean ± standard deviation^b Weekday: n=90, with 4 missing; weekend: n=94^c Missing data: n=2 for weekday, n=3 for weekend^d Missing data: n=4 for weekday, n=2 for weekend

Parental perception of child health and awareness of existing lifestyle behaviour guidelines

Table 4 shows parental perceptions of their child's health. Of the parents, 20.0% and 18.0% perceived their child to be underweight and receiving inadequate calories, respectively, while 11.0% perceived their child to be overweight and receiving too much calories. There were 37.0% and 34.0% of parents who perceived their child to be receiving inadequate PA and sleep, respectively, while 73.0% expressed concerns over their child's SVT. Only 51.0% and 59.0% of parents were aware of existing PA and SVT guidelines, respectively, whereas 80.0% were aware of existing sleep guidelines.

DISCUSSION

This study gave us further insight into the lifestyle behaviours of children aged 5–14 years. Our data revealed that in a typical week, approximately 30% and 40% of the children in this age group did not engage in any vigorous or moderate PA, respectively. At least a fifth were engaged in high SB and were not receiving adequate sleep, while more than half were exceeding SVT recommendations. None of the children in this study met the recommended PA guidelines, while only

19.3% and 21.7% met both sleep and SVT guidelines on weekdays and weekends, respectively (data not shown).⁷

Children who engaged in PA spent only 2–3 days/week in moderate or vigorous PA. Our observations of low PA involvement concur with another Singapore study using self-reported PA from primary school students.¹⁸ However, other Singapore studies have shown that engagement in PA was substantially lower when measured using heart rate monitoring data, with <15% of the primary school children^{18,30} and none of the adolescents¹⁹ meeting recommended PA guidelines. This trend of relatively low PA seems to begin as early as preschool; results from accelerometry data showed that children in Singapore aged 4.4 years spent only a median of 0.5 (interquartile range 0.3–0.8) hour/day on moderate to vigorous PA.¹⁵ A large 12-country study (including 8 Western, 2 Asian and 2 African countries) using data from accelerometers reported that the overall adherence to moderate to vigorous PA guidelines in other Western and Asian countries in children of primary school age (9–11 years) was 44%.³¹ The highest adherence was in Finland at 61%, and the lowest adherence was in China at 15%. Our findings, which included other existing Singapore-published data,^{12,18,19,30}

Table 4. Parental perception on child health and parental awareness of available lifestyle guidelines (N=100)

Parental perceptions	No. (%)
Weight of child	
Normal	69 (69.0)
Underweight	20 (20.0)
Overweight	11 (11.0)
Child receiving adequate physical activity	
Yes	63 (63.0)
No	37 (37.0)
Concerns over screen viewing time of child	
Yes	73 (73.0)
No	27 (27.0)
Child receiving adequate sleep	
Yes	66 (66.0)
No	34 (34.0)
Child receiving adequate calories	
Yes	71 (71.0)
No	18 (18.0)
Yes, too much	11 (11.0)
Awareness of physical activity guidelines	
Yes	51 (51.0)
No	49 (49.0)
Awareness of sleep guidelines	
Yes	80 (80.0)
No	20 (20.0)
Awareness of screen time guidelines	
Yes	59 (59.0)
No	41 (41.0)

point to overall low PA involvement in all age groups and indicate that any interventions promoting PA in children need to begin as early as preschool. With great emphasis placed on homework, enrichment classes and long hours spent in school, more opportunities for movement and play should be incorporated into the school-based programmes.

Time spent watching television remains the most common measure of SB in children and adolescence.²⁵ Our findings of SVT, which ranged from 3–4 hours/day in children with a mean age of 9 years, agree with a Singapore-published survey,³² and weekends seem to be the time when more children indulge in

recreational screen time, as previously shown.^{33,34} It is known that higher SVT is common in higher-income countries³¹ like Singapore, where handheld devices have become increasingly accessible to young children and where most adults own their own screen devices.³⁵ The average SVT reported in our study was comparable to data in children aged 9–11 years from higher-income countries like the UK, US and Australia, with SVT ranging from 3.0 to 3.4 hours/day.³¹ Excessive SVT appears to begin in early childhood, with 75% of Singaporean children aged 2 years exceeding the American Academy of Pediatrics recommendations of 1 hour/day limit at age 2 years,¹⁴ once again alluding that interventions need to begin at preschool level or earlier to reduce children's SVT at a later age.

Interestingly, children in our study were engaged in longer durations of SB, with a higher proportion in high SB (>10 hours/day) during the weekdays than on weekends. These observations suggest that SVT might not be the key contributor to SB in our population.³⁶ Especially in Singapore, the schooling culture leans towards prolonged sitting time during lessons, followed by a very constructed after-school life filled with enrichment classes or homework that would altogether contribute to longer durations of SB on weekdays. Similar to what we have seen with PA, high SB is already apparent in preschoolers, and objective accelerometry data have shown children spending almost 8 hours per day in SB at age 4.4 years.¹⁵ Chen et al.¹ reported a trend opposite from ours in the preschooler age group, with higher SB observed during non-school days rather than during school days. However, they did indicate that the lower SB on school days could be attributed to more regular naptimes scheduled by childcare centres, rather than an increase in PA¹.

Our survey revealed that a significantly higher proportion of children (18.8%) were receiving inadequate sleep on weekdays (<8 hours of sleep) compared with on weekends, which concurs with previous observations in Singapore adolescents.³⁷ Overall, evidence in preschoolers has shown that a large proportion (>85.0%) were not meeting the sleep guidelines.¹² The discrepancies in these findings between preschoolers and school-aged children could be due to the frequency and duration of naps the children were having in the day. The total sleep duration children in Singapore are receiving may be underestimated especially in younger children owing to the mandatory scheduled naptimes at childcare centres. It might be useful to account for the amount of sleep received at childcare, especially when approximately 70% of children in Singapore spend their days in full-day childcare by age 3 years,

and this number increases to 89–91% in the subsequent years.³⁸ While napping is more common in preschoolers,¹² 37% of children in our study's age group were still taking daily naps that lasted for 1.5 hours on average on weekdays, and for 1 hour on weekends (data not shown), which is still a significant proportion compared with that in Western countries where only 0.9% of children still slept in the daytime by 7 years of age.³⁹

Compared with previous studies, in which parents tend to underestimate the amount of sleep their children require,^{16,40} the parents in our study showed the most awareness for existing sleep guidelines (80%). Only 30% were concerned about the amount of sleep their children were receiving, which aligns with approximately the 20% of children who were not meeting the recommended guidelines during the weekdays. Only half of the parents were aware of the PA guidelines for children, and only 11% were concerned about their child being overweight when the proxy-reported BMI showed that 18% of the children were overweight and 11% were obese. Our findings corroborate previous studies on how it is common for parents to underestimate the amount of PA their child requires⁴¹ and their child's weight status.⁴² In contrast, while parents in this study claimed to be most aware of the guidelines for recreational SVT (approximately 60%) and were most concerned about SVT in children (approximately 70%), the percentage of children exceeding the guidelines were still high. Along with the reported high use of screen devices among adult Singaporeans,³⁵ a study by Bernard et al. has interestingly also shown that children's screen use behaviour at age 2–3 years was strongly influenced by parental behaviour. The results suggest that the presence of frequent screen users in the household is associated with children's screen behaviour, and thus targeting parental behaviour might be effective in reducing recreational SVT early in children.¹⁴

Strengths and limitations

This study managed to collect comprehensive data on the lifestyle behaviours of children in Singapore aged 5–14 years old, along with data on parental perception on their child's health and parental awareness of existing guidelines. The strength of the study lies mainly in the use of a cost-effective and efficient online method of survey data collection, which was preferred over the conventional hard-copy survey. The limitations of the survey include selection bias and limitations in generalisability due to the survey method, which uses a convenience sampling method, and the small sample size. The wide age range sampled in this study may

reduce the internal and external validity of the study. Other limitations include the possibility of under-reporting, especially when parents had to report by proxy the children's lifestyle behaviours, such as SVT or PA, which might have taken place at school or when the parents are at work while the children are at home.

CONCLUSION

Findings from this study support the need for an integrated 24-hour activity guideline for children and adolescents in our Singapore population to help with better monitoring and improvement of these behaviours. The data from this study spurred the creation of the Singapore Integrated 24-Hour Activity Guidelines for Children And Adolescents.⁴³ The next steps would be the dissemination and implementation of these guidelines in schools so that children and parents will be aware of integrated movement-related behaviours for the benefit of long-term health and for the prevention of obesity.

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