

Sedentary Behavior Among School-aged Students During Pandemic: A Cross-Sectional Study

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ABSTRACT

It is well established that sedentary behavior is associated with obesity, quality of life, all-cause, and cardiovascular death. Along with the COVID-19 pandemic, sedentary behavior is increasing. This study aims to describe sedentary activity among school-aged children. Participants of this study were 67 students, 30 boys and 37 girls. Data collected in the present study from Adolescent Sedentary Activity Questionnaire (ASAQ) filled by the participants about their sedentary behavior. This cross-sectional study revealed that most sedentary behavior among children was playing smartphones or tablets in their spare time (8.59 ± 5.93) hours on weekdays, while on weekends, (3.95 ± 3.41) hours. There was no significant difference regarding characteristics (age, height, weight, and BMI) and sedentary behavior between males and females. Besides, a significant correlation was found in the study-based activities on the weekend with age and other sedentary activities on BMI. This prolonged sedentary behavior among children could be the leading cause of obesity, which later can develop into a chronic disease. It is imperative to limit sedentary behavior by involving their parents and developing programs to promote physical activity engagement.

Keywords: *Sedentary lifestyle, Children, Screen time, Pandemic*

1. INTRODUCTION

It is undeniable that technological developments have increased, especially since the world entered the industrial revolution 4.0 [1]. Technology plays an essential role as a provider of information and communication in the current period, where gadgets are technologies almost everyone widely uses. Gadgets are becoming increasingly sophisticated technology along with the development of the Internet of Things (IoT), in which touchscreen-based gadgets are equipped with various kinds of social networking applications, entertainment, and other exciting things [2]. Although it can have a positive impact, technology can also hurt its user [3]. The nature of its users that can provide easy access can be something that can cause a sense of laziness in oneself [4].

Lazy behavior or lack of movement is known as sedentary behavior (SB). Sedentary behavior is a variety of behaviors characterized by low energy use or less than 1.5 metabolic equivalents (METs), including sitting and lying activities [5]. Recent studies have used inactive to

describe people who do moderate or vigorous physical exercise (MVPA) in insufficient amounts. That is, they do not meet the physical activity guidelines [6]. According to Chaput et al. [7], sedentary behavior includes using smartphones or tablets, watching TV, playing video games, using computers, driving or driving a car, and reading or studying while sitting.

Sedentary behavior is now increasing along with the Covid-19 pandemic [8]. This is in line with research conducted by Bates et al. [9], where this pandemic impact changes in lifestyle activities in children for 24 hours/day. The effects of sedentary behavior such as watching television, using the computer, or playing games together, which is referred to as screen time, have become a particular focus that negatively impacts health [10]. Children's time using digital devices is increasing rapidly along with the development of new portable and instantly accessible technologies such as smartphones and digital tablets [11]. The previous studies also showed an increase in screen time activity, especially among students during this pandemic [12]. This habit also contributed to decreased physical activity and increased

sedentary behavior in the pediatric population [13].

Most of the research conducted during the Covid-19 pandemic showed a global decline in physical activity in children and adolescents [14]. In many countries, the rising number of insufficient physical activities has significant implications for the increasing prevalence of non-communicable diseases affecting general health [15]. Some adverse health effects are increased mortality, cardiovascular disease, cancer risk, diabetes mellitus risk, hypertension, dyslipidemia, osteoporosis, depression, and cognitive impairment [16]. Lifestyle-related diseases are infrequent in children, but many chronic diseases in adulthood begin with childhood habits and lifestyles [17]. Prolonged time for screen-based activities among children is one of the risk factors of chronic disease [18]. In addition, excessive screen time also inhibits children's growth and development, reduces brain performance, and disrupts sleep patterns due to the impairment of sleep duration and quality [19].

Studies related to sedentary behavior and its health risks in children and adolescents become of great interest, especially during a pandemic. Given the potential increased risk of obesity which later can develop into chronic diseases due to prolonged sedentary behavior, it is essential to gather data regarding the impact of the covid-19 pandemic on children's physical inactivity. Thus, we conduct this research to describe the sedentary activity in school-aged children. It can provide broad information to develop programs and policies to promote children's willingness to engage the insufficient level of PA facing the new normal.

2. METHODS

2.1 Study design and participants

This descriptive quantitative research used a survey method. Conducted in June – July 2021. The population in this sample is elementary school students in Surabaya. The sampling technique used purposive sampling with inclusion criteria: 1) the sample is elementary school students; 2) 10 – 11 years old, 3) currently taking Physical Education and Health subjects. A total of 67 students participated in this study.

2.2 Data collection

Data was collected by distributing questionnaires filled out by respondents online through a google form. The data collected includes essential characteristics and sedentary activities on weekdays and weekends. The sedentary activity was measured using a self-reported questionnaire using the Adolescent Sedentary Activity Questionnaire (ASAQ) [20]. This validated questionnaire consists of 10 questions: 1 – 3 questions related to screen-

based activities, 4 – 6 study-based activities, and 7 – 10 other sedentary activities.

2.3 Statistical analysis

Data were collected, cleaned, and processed using IBM Statistic SPSS 21 application software. Data were analyzed descriptively by displaying the mean and standard deviation for each measured sedentary behavior item. Furthermore, data were analyzed using Mann-Whitney to compare sedentary activity on weekdays-weekends and to measure the association of sedentary behavior between age and BMI; Spearman rank correlation coefficient analysis was used, and the significance level (p-value) < 0.05.

3. RESULTS

Characteristics of participants from a total of 67 students showed that most of the participants were male 55.2%, 11 years old 59.7%, and BMI/A in the normal category 86.5% (Table 1).

Table 1. Characteristic of participant

Characteristic	n = 67	
	n	%
Gender		
Male	37	55.2
Female	30	44.8
Age (years)		
10	27	40.3
11	40	59.7
BMI/A		
Normal	58	86.5
Overweight	4	6
Obese	5	7.5

BMI/A – Body Mass Index/Age

Furthermore, the total average daily sedentary time of children based on the self-reported results showed that the average time children spent on sedentary behavior during weekdays and weekends were 4.93 ± 3.10 hours/day and 5.68 ± 3.03 hours/day, respectively (Figure 1). In detail, the average time spent by participants doing sedentary behavior activities during weekdays (Monday – Friday) and weekends (Saturday – Sunday) are presented in Table 3. The most sedentary behavior carried out by children was playing smartphones or tablets in their spare time, which was 8.59 (5.93) hours on weekdays, while on weekends was 3.95 (3.41) hours. Meanwhile, the lowest sedentary activity or behavior carried out was playing computer in free time, 0.50 (0.91) hours on weekdays, and weekends, using computers in doing tasks, which was 0.22 (0.27) hours.

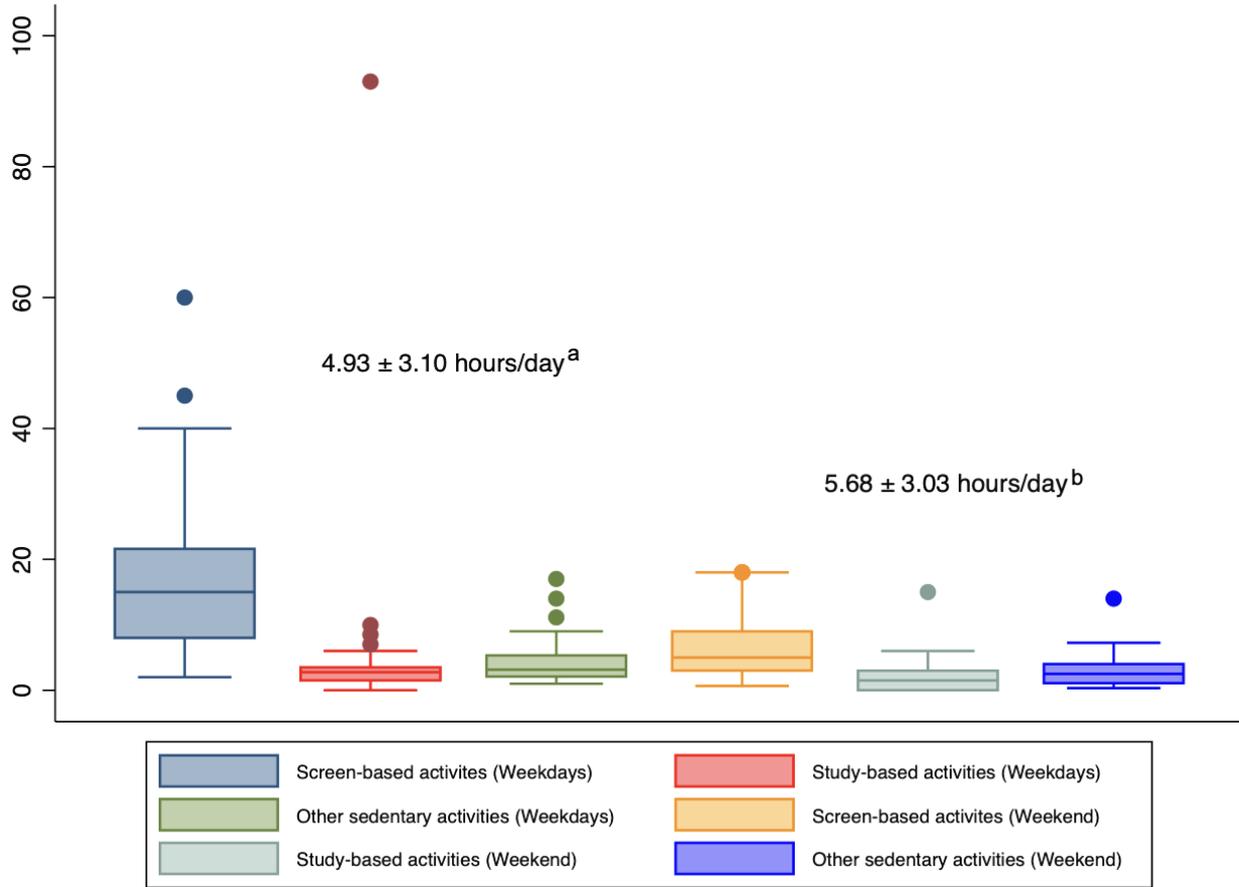


Figure 1 Self-reported the average daily sedentary time among children

Data are presented as mean (SD) ^aSB during weekdays, ^bSB during weekend

Table 2. Self-administrated sedentary behavior among children

No	Items	n = 67			
		Weekdays		Weekend	
		Mean	SD	Mean	SD
Screen-based activities					
1.	Television or video viewing	7.35	7.90	2.15	2.10
2.	Playing for recreation or leisure on a cell phone or tablet	8.59	5.93	3.95	3.41
3.	Playing for recreation or leisure on a computer	0.50	0.91	0.38	0.77
Study-based activities					
4.	Computer use for homework	1.98	1.09	0.22	0.57
5.	Doing homework not using computer	1.34	1.27	0.86	0.89
6.	Attending extracurricular classes	0.85	0.73	0.90	1.60
Other sedentary activities					
7.	Reading for fun or interest	1.09	1.09	0.85	0.83
8.	Transportation by car or bus or train	0.94	1.02	0.47	0.54
9.	Talking on the phone or sit around	0.64	0.68	0.63	0.96
10.	Others such as practicing musical calligraphy/ painting, making crafts, listening to music, etc	1.32	1.96	0.92	0.92

Subsequently, the Mann-Whitney test was performed to evaluate further the differences in characteristics and sedentary behavior between gender (Table 3). Surprisingly, our statistical test results showed no

significant difference regarding characteristics (age, height, weight, and BMI) and sedentary behavior (screen-based, study-based, and other sedentary activities) between males and females (p-value > 0.05).

Table 3. Difference of characteristic and sedentary behavior between gender

Variables	N = 67		p-value
	Girls	Boys	
	Mean (SD)	Mean (SD)	
Characteristic			
Age, years	10.6 (0.50)	10.59 (0.50)	0.964
Height (cm)	142.67 (8.80)	143.54 (9.37)	0.723
Weight (kg)	35.23 (6.79)	40.19 (10.5)	0.081
BMI	17.24 (2.59)	19.28 (4.03)	0.052
Sedentary behavior, hours/week			
Screen-based activities			
Weekday	15.83 (11.40)	16.97 (10.46)	0.596
Weekend	5.70 (4.11)	7.14 (5.16)	0.260
Study-based activities			
Weekday	5.78 (16.54)	2.90 (2.27)	0.686
Weekend	2.05 (1.52)	1.96 (2.73)	0.259
Other sedentary activities			
Weekday	3.85 (3.03)	4.13 (2.84)	0.614
Weekend	3.05 (2.75)	2.75 (1.78)	0.925

Data presented as mean (SD), BMI – body mass index, *significant p-value < 0.05

Table 4. Correlation of screen-based, study-based, and other sedentary activities between age and BMI

Characteristic	n = 67			
	Age (years)		BMI	
	p-value	r	p-value	r
Screen-based activities				
Weekdays	0.899	0.016	0.934	-0.010
Weekend	0.780	-0.035	0.581	0.069
Study-based activities				
Weekdays	0.481	-0.088	0.845	0.024
Weekend	0.040*	-0.251	0.627	0.060
Other sedentary activities				
Weekdays	0.539	0.076	0.107	0.198
Weekend	0.980	-0.003	0.010*	0.313

*significant p value < 0.05

Spearman’s Rank correlation test suggested a weak inverse correlation between study-based activities on weekends with age (p = 0.040; r = -0.251). The present study also found that another sedentary activity was positively associated with BMI (p = 0.010; r = 0.313).

4. DISCUSSION

Sedentary behavior is a public health concern [21]. Sedentary can also be defined as behavior performed with little or no energy expenditure in a sitting or lying position [22]. Watching television, reading books, playing gadgets, and lack of moving activities are included in sedentary behavior [23]. In general, sedentary behavior is mainly done by adults and the elderly who spend most of their time working in prolonged sitting positions. However, sedentary behavior is currently spreading among elementary school-aged children to young adolescents.

The present study indicates that the most sedentary behaviour carried out by children was screen-based activities such as watching television or videos, playing smartphones or online games, tablets, or computers [24]. Previous research has also shown that school-age children most frequently do screen-based activities, but this research was conducted before the COVID-19 pandemic, which was at least 1 hour/day and increased on holidays, which was 2 hours/day [25]. According to the Australian Government Department of Health [26], the recommended recommendation is not to exceed 2 hours/day. In addition, the Public Health Official has also suggested that children should not engage in sedentary activities for more than 1 hour at a time [27]. The Canadian 24 Hour Movement Guidelines for Children and Youth limit this activity to 2 hours/day [28]. Based on these data, the use of the time that is mainly used for screen-based activities can have a negative impact on children's health if it exceeds the recommended usage limit. Furthermore, the interest and culture of children's literacy or reading are very minimal compared to doing screen-based activities. This can be seen from the results of previous studies, where the decrease in the quality of learning and the increase in screen-based activity will affect children's academic and cognitive abilities [29].

Technological developments and the impact of the Covid-19 pandemic have affected children's sedentary behavior. Several previous studies believe that the pandemic is the cause of decreased physical activity and increased sedentary behavior, so further action is needed to prevent this impact [30]. According to Pangesti *et al.* [31], the causes of children being lazy to do physical activities and choosing sedentary behavior are limited playing fields, inadequate sports facilities, and technological advances. The family environment can also

be the cause of the child doing a lot of sedentary activities. The high percentage of time spent on sedentary behavior during the period of time children might pay with their parents (time outside of school and on weekends) reinforces the fact that the family environment is an essential modulator of children's behavior [32]. The most vital relationship between parent and child is when parent and child are always sided by the side (i.e., the child is not in daycare or being cared for by another adult). In this case, there is a positive relationship where the more active the parents are, the more active the child will be, and vice versa; the more parents engage in sedentary behavior, the more children will do the same thing [33].

Increasing sedentary behavior will indirectly reduce energy expenditure, which is a health risk factor. Unhealthy lifestyles such as lack of movement and lack of physical activity can lead to fat accumulation in the body and not released as energy. If this condition lasts for a long time, it can cause expansion in the abdominal area, interfering with the body's metabolism. Prolonged sitting also contributes to less energy expenditure; if it lasts for a long time, it can lead to weight gain, which develops into obesity hypertension later in life [34]. Children aged 7-18 years with sedentary behavior for 1-2 hours and > 2 hours have 1.64 times and 1.94 times chance of being obese [35]. In Canada, children who are overweight and obese are on the rise, and they consistently do not meet the recommended guidelines for limiting sedentary (no more than 2 hours/day of screen-based activity time) [36]. Sedentary behavior has a relationship with health conditions, including mental health, obesity, type 2 diabetes mellitus, cardiovascular disease, and breast, colorectal, endometrial, and ovarian cancers [36]. In addition, sedentary behavior also has a negative impact on mental health, namely anxiety disorders and depression [37], [38]. In another study, sedentary behavior can also increase the risk of insomnia and sleep disturbances [39]. The threshold in sedentary activities such as sitting is 6-8 hours/day, and watching TV activities as much as 3-4 hours/day, above that can negatively impact health more quickly [40]. Some facts about health risks that have occurred illustrate that sedentary behavior is an activity that is not good for the health of the body. Further scrutiny regarding early intervention is necessary in order to minimize the risk of this sedentary behavior.

Sedentary behavior is often associated with physical activity, which is related to energy in the body. Good physical activity has many health benefits for the body, including skeletal and cardiovascular muscle health, bodyweight health and the muscular, nervous system, the quality of the coordination system, and movement control [41]. The World Health Organization (WHO) recommends that children and adolescents aged 5-17 years are advised to do 60 minutes of physical activity/day where the frequency of activity in 1 week can be done three times. Physical activity is a preventive measure to anticipating sedentary behavior, especially

during the COVID-19 pandemic; it is highly recommended [42].

5. CONCLUSION

The present study showed that the sedentary behavior among elementary school-age children exceeds the recommended limit that has been set with the average time children spent on sedentary behavior during weekdays 4.93 ± 3.10 hours/day and weekends 5.68 ± 3.03 hours/day. The results of this study can be used as baseline data related to sedentary activity patterns in children during the pandemic so that future programs are expected to increase physical activity among children, which is no more than 2 hours/day. Prolonged time in sedentary negatively impacts health. The role of parents is essential to limit sedentary behavior among children, and increasing physical activity is highly recommended to prevent children from various health risks.

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