



Original Article

## Screen time activity and its impact to sleep duration of school-aged

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### A B S T R A C T

**Background:** Nowadays, massive development of technology impacts to human of all ages. One of the impacts to children is the increase of screen time activity duration. The activity correlates to children's sleep quality, it reduces their sleep duration.

**Objective:** this study aims to identify factors of screen time activities and its different impact to boys and girls with age range 9-11 years old.

**Methods:** This study uses an observational analytic study design with a cross-sectional approach. The respondents are school-aged children aged 9-11 years old with a total of 368 respondents.

**Results:** This study find that children have sleeping average duration 8.704 (SD  $\pm$  1.36) h/day, and 63.9% of the children is reported to get sleep insufficiency. The screen time factor relates to sleep insufficiency of boys who spend more than 2 hours for screen time ( $p=0.000$ ) and got difficulty to sleep ( $p=0.006$ ). While the girls spend 2 hours or more for watching TV ( $p=0.013$ ) and have difficulty of sleep ( $p=0.000$ ).

**Conclusion:** School-aged children who have sleep insufficiency are associated with bad media habits, in a form of excessive screen time activity. It is a challenge for the parents, children, and nurses to be aware of good media habit importance.

### INTRODUCTION

Sleeping is a basic biological need for children because it is associated with their cognitive ability. If they have enough sleeping duration, their cognitive ability would be better than children experiencing lack of sleep<sup>1</sup>. The National Sleep Foundation recommends 9 to 11 sleeping hours per day to the children aged range 6 to 13 years old<sup>2</sup>. In this decade, children and adolescent are experienced lack of sleep duration as much as one hour<sup>3</sup>. The current global trend shows that obesity cases increase<sup>4</sup>.

Sleep disorder such as awaking up frequently at night happens to 20-30% of the children, from this case about 40-80% of the children will have this disorder until two to three years ahead<sup>5</sup>. The previous study revealed that screen exposure can cause sleep disorder, especially on children<sup>6</sup>, it because the monitor's light is too bright and it will inhibit

secretion of melatonin which acts as an external desynchronization of the circadian rhythm resulting in withdrawal syndrome or a delay in the sleep phase<sup>6</sup>.

Screen time or viewing time on gadget screens including one of the sedentary time which is characterized as behavior that requires only a little energy and only involves sitting or lying position<sup>7,8</sup>. Sedentary screen time activities, such as the use of some devices such as TV, computers, smartphones and video game on children are associated with the health risks<sup>9</sup>. Excessive screen time in children can reduce their physical strength and increase the risk of obesity and being overweight, other impacts can be more complicated<sup>10</sup>.

Excessive screen time activities also adversely affect children's sleep quality, there is correlation between qualities of sleep of children aged 10 years and viewing screens for a long time<sup>11</sup>. Other studies stated that use of smartphones, televisions, and computers has an impact

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on the length of sleeping time or shortening their sleep duration<sup>12</sup>. Many parents also reported that their children have sleeping difficulty due to excessive screen time activities<sup>13</sup>. These excessive activities are also associated with hyperactivity and attention disorders in the lessons in their schools, self-internalization problems, impaired well-being and low quality of life<sup>14</sup>.

In Indonesia, the behavior of children and adolescents is also influenced by the increase in screen time activities and the use of technology. In 2014, 83% of children and adolescents in both urban and rural areas have used the internet intensely for more than five hours a day<sup>15</sup>, this long duration of screen time means excessive screen time duration<sup>16</sup>. Internet usage can be in the form of internet use through computers or smartphones<sup>15</sup>.

From the discussed phenomenon, this study is aimed at finding out the screen time factors in children and its impact on their sleep duration. The previous study has revealed excessive screen time activity which was associated with children aged 10 years old<sup>13</sup>. On the other hand, this study is intended to find out screen time activity and its different impact on boys and girls with age range 9-11 years old.

## METHOD

### **Study design**

This study used a cross-sectional design. The independent variable was the factors of screen time activity such as spending  $\geq 2$  h watching TV, spending  $\geq 2$  h using a cell-phone, total screen time duration  $\geq 2$  h/day and difficulty of sleep. The dependent variable was sleep duration or insufficiency of sleep.

### **Setting**

The study was conducted in 6 elementary schools in Purbalingga, Central Java, Indonesia in February 2019.

### **Research subject**

The sampling method used multistage random sampling, First, the area of research was selected by simple random method. By each area was selected the elementary school by simple random method. After that, the respondent selected with random sampling method, and it obtained 368 respondents (boys=201 and girls=167). The inclusion criteria were children aged between 9-11 years old and parents allowed their children to be participants. The exclusion criteria were children with growth and development disorder (syndrome down, autism, ADHD, cerebral palsy, and disability), the parents had actual psychological problems and a history of psychological problems (paranoid, bipolar, schizophrenia), and resigned during the study.

### **Instrument**

This study was intentionally aimed to determine the insufficiency of sleep in the form of fewer than 9 hours per day

of sleep<sup>2</sup>. The respondent answered the questionnaire by themselves responding to the questions about the length of their sleep duration per day, presence of difficulty of sleep, bedtime and getting up behavior at nights of schooldays and weekends.

For measuring the screen time activity, this study used the Children's Leisure Activities Study Survey, which was filled out by themselves and re-validated by the researchers to the children. The measured screen time activity included how many hours were used to watch TV, play video games or computers and also the use of smartphones on weekdays and holidays<sup>2</sup>. Children sleep quality was viewed from the duration of sleep and difficulty during sleep<sup>2</sup>. Test of the validity used the constructed test with Pearson Product Moment correlation test ( $r$ ), with results of the validity values from 0.403 to 0.705. The questionnaire had a reliability value of 0.866.

In collecting data, researchers were assisted by four research assistants who have finished their nursing undergraduate education as the requirement, and they had previously been given an explanation of the task and related to the course of the study. They have also been given training for equating perceptions in filling out the questionnaires.

### **Ethical consideration**

This study has been approved by the Research Ethics Committee, Faculty of Medicine of Universitas Jenderal Soedirman with number: 0526/KEPK/I/2019. Parents gave permission for their children to be the respondent by the signed the inform consent.

### **Data analysis**

The descriptive test was used to see the proportion of each item such as the description of screen time of the respondents, description of respondent's sleep duration. Logistic regression was used to see the screen time factors associated with insufficient sleep.

## RESULTS

The average age and standard deviation of the respondents in this study are  $9.7 \pm 0.715$ , for boys had average age  $9.64 \pm 0.709$  and girls had average age  $9.77 \pm 0.717$ . Approximately 63.9% of children are reported got sleep insufficiency, and 75.5% is reported had the difficulty of sleep (table 1). In case of sleeping time on school-days, the median is at 9 pm and their sleep preparation is done a half hour earlier. There is 2 hours delay on their weekend-sleeping time compared to their schooldays-sleeping time.

**Table 1.** Sleep and screen time behavior in respondents (n=368)

Variable	Total (n=368)	Boys (n=201)	Girls (n=167)
Duration time of sleep a day, mean ( $\pm$ SD)	8.704 $\pm$ 1.36	8.32 $\pm$ 1.48	9.15 $\pm$ 1.04
Insufficient sleep (<9 h), n %	235 (63.9%)	141 (70.15%)	94 (56.29%)
Difficulty of sleep, n %	278 (75.5%)	181 (90%)	97 (58.1%)
Bedtime on school days, median (IQR)	9 PM (30 min)	10 PM (30 min)	9 PM (30 min)
Time getting up on school days, median (IQR)	6 AM (30 min)	6 AM (30 min)	5 AM (30 min)
Bedtime on weekends, median (IQR)	10 PM (30 min)	11 PM (30 min)	10 PM (30 min)
Time getting up on weekends, median (IQR)	8 AM (30 min)	8 AM (30 min)	7 AM (30 min)
The difference between getting up on school days and weekends, median hours (IQR)	2 (30 min)	2.5 (30 min)	2 (30 min)
Time watching TV on school days, mean ( $\pm$ SD)	5.85 $\pm$ 2.59	5.26 $\pm$ 2.57	6.72 $\pm$ 4.37
Time watching TV on weekends, mean ( $\pm$ SD)	7.15 $\pm$ 3.87	7.59 $\pm$ 3.54	6.61 $\pm$ 2.47
Time on a computer or playing video games on school days, mean ( $\pm$ SD)	0.87 $\pm$ 1.81	1.17 $\pm$ 2.01	0.5 $\pm$ 1.46
Time on a computer or playing video games on weekends, mean ( $\pm$ SD)	1.02 $\pm$ 1.92	1.30 $\pm$ 2.11	0.67 $\pm$ 1.644
Time on using a cellphone on school days, mean ( $\pm$ SD)	1.58 $\pm$ 1.64	1.61 $\pm$ 1.72	1.56 $\pm$ 1.55
Time on using a cellphone on weekdays, mean ( $\pm$ SD)	3.87 $\pm$ 0.74	3.65 $\pm$ 4.01	4.16 $\pm$ 4.03
Having TV in bedroom, n %	75 (30.4%)	34 (16.9%)	41 (24.5%)
$\geq$ 2 h watching TV, n %	195 (52.9%)	110 (54.7%)	85 (50.8%)
$\geq$ 2 h using cellphone, n %	37 (10.1%)	20 (10%)	17 (10.2%)
Total screen time duration $\geq$ 2 h/day, n %	316 (85.9%)	168 (83.6%)	148 (88.6%)

Min=minutes; IQR = Interquartile range

**Table 2.** Factors associated with insufficient sleep (<9 h) amongst respondents, with logistic regression analysis (n=368)

Variable	Total (n=368)			Boys (n=201)			Girls (n=167)		
	OR	95% CI	p-values	OR	95% CI	p-values	OR	95% CI	p-values
Spending $\geq$ 2 h watching TV	0.302	0.16-0.58	0.000	-	-	-	2.81	1.24-6.36	0.013
Spending $\geq$ 2 h using cellphone	2.841	1.09-7.43	0.033	-	-	-	-	-	-
Total screen time duration $\geq$ 2 h/day	18.75	7.68-45.7	0.000	0.13	0.59- 0.31	0.000	-	-	-
Difficulty of sleep	9.526	5.01-18.1	0.000	0.25	0.09 - 0.67	0.006	0.08	0.03-0.19	0.000

Hosmer and Lemeshow goodness-of-fit test, p=0.32; Nagelkerke R<sup>2</sup>=0.351. Missing cases, n=0

Hosmer and Lemeshow goodness-of-fit test, p=0.84; Nagelkerke R<sup>2</sup>=0.201. Missing cases, n=0

Hosmer and Lemeshow goodness-of-fit test, p=0.66; Nagelkerke R<sup>2</sup>=0.32. Missing cases, n=0

Based on table 1, the children spend more time watching TV (52.9%), and there are 30.4% of them watch a TV in the bedroom. They could spend for 5.85 h/day for watching TV in the school days-sleeping time and 7.15 h/day on the weekends-sleeping time. And, they spend more time using cellphones than playing video games or computer, 1.58 h/day in using cellphones in the school days-nights and 3.87 h/day in the weekend nights.

From the analysis of logistic regression (table 2) among factors that associated to insufficiency of sleep, the result shows that there are several factors that are associated with insufficiency of sleep (<9 h). The dominant factor for children to experienced insufficient sleep are two or more hours of watching TV (p=0.000), two more hours of using a cellphone (p=0.033), more than 2 hours to spend time for screen time (p=0.000), and performing difficulty of sleep (p=0.000).

Screen time factors related to the insufficiency of sleep of boys were more than 2 hours for screen time (p=0.000) and had the difficulty of sleep (p=0.006). While girls spend 2 hours or more for watching TV (p=0.013) and had the difficulty of sleep (p=0.000).

## DISCUSSION

Insufficient sleep experienced by children can be defined (categorized) when their sleep duration is less than 9 hours and more than 13 hours per day<sup>2</sup>. This study finds that about 63.9% of the children have insufficient sleep, boys have a higher percentage than girls (70.15%). In average, girls' sleep duration shows a good score which is 9.15 hours per day. It means that most of the girls perform sufficient sleep, and 56.29% of them have sleep insufficiency. But, sleep average duration for all respondents is

8.704 h/day. The previous study shows the same result; the average duration of the children sleep duration was 8.5 hours per day, with 40.1% of them perform insufficient sleep<sup>13</sup>.

There is different time to get sleep and wake up between boys and girls. The male respondents have 1 hour later (10 PM and 6 AM) than the females (9 PM and 5 AM). In weekends, bedtime and waking up are an hour later than in schooldays. It is the same with the previous study that discussed that children have the difference time between bedtime and getting up time for about one hour<sup>13</sup>. On weekends, they spend more time for playing, same other research results also show that total screen time activities done by children at weekends are longer than in schooldays.

Screen time activities in this study include time for watching TV, using a cellphone, playing video games or computer. A child spends more time watching TV (5.58 h/day) than the other activities (playing video games or computer were 0.87 h per day and using a cellphone which is 1.58 h/day). Boys spend more time for watching TV both in schooldays and weekends (5.26 h and 7.59 h) than girls (6.72 h and 6.61 h), but the girls take more time for using cellphone at weekends (4.16 h) than boys (3.65 h).

This study finds that children aged between 9-11 years old perform excessive screen time activities duration (more than 2 hours) (85.9%). The same as the previous study, only 22.6% of the children met the standard of screen time ( $\leq 2$  h/day)<sup>17</sup>, which are 16.4% for boys and 11.4% for girls. Nowadays, there is a rapid increase in learning media for children utilizing electronic devices/gadgets and this condition contributes to the decrease of their sleep duration<sup>18</sup>.

The correlation between screen time and reduced sleep duration because of screen time activity and increased sleep problems have been previously reported<sup>12,13,19,20</sup>. This study also discovers that there are four factors associated to insufficient sleep for all respondents, such as spending  $\geq 2$  h watching TV ( $p=0.000$ ), spending  $\geq 2$  h using a cellphone ( $p=0.033$ ), total screen time duration  $\geq 2$  h/day ( $p=0.000$ ), and performed difficulty of sleep ( $p=0.000$ ). But, there are different factors that are associated with insufficient sleep of boys and girls. Screen time factors related to insufficient sleep in boys spent more than 2 hours for screen time ( $p=0.000$ ) and had the difficulty of sleep ( $p=0.006$ ). In girls, the factors were spent 2 hours or more for watching TV ( $p=0.013$ ) and had the difficulty of sleep ( $p=0.000$ ).

The previous study issues same results about factors associated to insufficient sleep such as spending  $\geq 2$  h watching TV, spending  $\geq 2$  h using a computer, difficulty falling asleep, feeling tired at school,  $>1.5$  h difference be-

tween getting up on school days and weekends, and overweight/obese<sup>13</sup>. The using of electronic media/gadget becomes one of the sedentary activity that is characterized as behavior that just needs less energy in forms of sitting and lying position<sup>7,8</sup>. This excessive activity is associated with health risk<sup>9</sup>. The amount of time spent by children on screen time (especially in sitting position) should be minimized<sup>17</sup>.

Electronic gadgets can be both opportunities and challenges. As the developments of the era (technology), they may help human, but on the other hand, it can result in health problems. To make it balance with their physical activities, it strongly requires the roles of parents<sup>13</sup>. It can be also an opportunity for other researchers to conduct further researches on parents' role to reduce the electronic gadgets used by their children.

## CONCLUSIONS AND RECOMMENDATION

The decrease in children sleep duration is associated with media/gadget habits that can increase amounts of screen time duration such as watching TV and using cellphone. It is a challenge for parents, children, and nurses to be aware of the importance of good media habits. For example, the parents give a rule about the maximum time for using gadget (max 2 hours a day).

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