

## Physical activity levels and sleep disturbances in Indonesian primary school students during the COVID-19 pandemic

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### Abstract

**Background** During the coronavirus disease-2019 (COVID-19) pandemic, the Indonesian government implemented a large-scale, social restriction policy, including the closure of schools and recreational facilities, which potentially altered children's physical activity and sleep patterns.

**Objective** To analyze for a possible association between physical activity levels and sleep disturbances in Indonesian primary school students during the COVID-19 pandemic.

**Methods** This cross-sectional study was conducted on 437 children aged 7-13 years using data collected online in April-August 2020, including children's sociodemographic characteristics, physical activity levels, and sleep patterns. The translated Indonesian version of *Physical Activity Questionnaire for Children (PAQ-C)* and the *Children Sleep Habits Questionnaire-Abbreviated (CSHQ-A)* were used to collect data. The data analyzed consisted of sociodemographic factors and physical activity levels, sociodemographic factors and sleep disturbances, and physical activity levels and sleep disturbances.

**Results** Most children were physically inactive (60.87%) and experienced sleep disturbances (73.23%) during the COVID-19 pandemic. Female sex and physical inactivity were significantly associated. Male sex and sleep disturbances were significantly associated. Age 7 as the lowest age group was significantly associated with sleep disturbances. There was no significant association ( $P=0.248$ ) between physical activity levels and sleep disturbances.

**Conclusion** Most Indonesian primary school students are physically inactive and have sleep disorders during the COVID-19 pandemic. Female sex and physical inactivity are significantly associated, while male sex and sleep disturbances are significantly associated, age 7 (lower age group) and sleep disturbances are significantly associated. There is no significant association between physical activity levels and sleep disturbances in Indonesian primary school students during the COVID-19 pandemic. [Paediatr Indones. 2024;64:106-12; DOI: 10.14238/pi64.2.2024.106-12].

**Keywords:** COVID-19; children; physical activity; sleep disturbances

The COVID-19 pandemic caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) has infected millions of people worldwide.<sup>1</sup> Governments in various countries implemented regulatory policies, termed "large-scale social restrictions," to limit the transmission of COVID-19. The regulation mainly urged residents to stay at home and avoid crowds. Indonesian students experienced distance learning systems, as schools, playgrounds, and recreational facilities closed during the pandemic. As such, Indonesian children and adolescents experienced substantial changes in mobility levels and lifestyles at that time.<sup>2-4</sup>

The pandemic social restriction policy also decreased the level of movement behavior because of changes in physical activity, sedentary behavior, and sleep patterns in children. School closures also decreased children's social interaction, and increased their use of screens, unhealthy eating patterns, and disharmony in the home environment. These

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Submitted January 12, 2023. Accepted April 2, 2024.

factors increase the risk for children's obesity, as well as cardiometabolic, musculoskeletal, and immune diseases.<sup>2,5</sup> Sleep disturbances during the COVID-19 pandemic might also have affected children's attention span, academic performance, and emotional development.<sup>2</sup>

Previous findings from other countries have confirmed that children and adolescents had decreased physical activity and altered sleep schedules during the COVID-19 pandemic. Social restrictions in Croatia led to a physical activity decline such that teenagers did not meet average physical activity recommendations.<sup>4</sup> Similarly, results from a national survey in Canada reported a significant decrease in physical activity in children and adolescents.<sup>6</sup> Furthermore, children in Italy experienced increased sleep time during the pandemic.<sup>7</sup> In China, teenagers experienced difficulty sleeping or sleeping too long during the pandemic.<sup>8</sup> Most previous studies in children showed a positive association between physical activity level and sleep patterns, as physically active children have healthier and more consistent sleep patterns.<sup>6</sup> However, to the best of our knowledge, there have been no studies on physical activity level and sleep disturbances in Indonesian children during the COVID-19 pandemic. Furthermore, there have been few studies from various countries that specifically observed primary school students. We aimed to assess physical activity levels and sleep patterns in Indonesian primary school students during the COVID-19 pandemic to analyze for potential associations between sociodemographic characteristics, physical activity level, and sleep patterns.

## Methods

This cross-sectional design study included 437 Indonesian primary school students and was done between April and August 2020. We distributed an online structured questionnaire on *Google Forms* to parents or legal caregivers through open invitations with digital informed consent on messaging applications (*WhatsApp* and *LINE*). Children in several cities in Indonesia were surveyed for sociodemographic characteristics, physical activity, and sleep patterns. *The Physical Activity Questionnaire for Older Children* (PAQ-C) questionnaire was used

to measure children's physical activity level in the week prior to the survey, with an average score of  $>2$  defined as active.<sup>9</sup> *The Children's Sleep Habits Questionnaire* (CSHQ-A) tool was used to screen for sleep disturbances, with an average score of  $>41$  defined as having sleep disturbance(s) (present).<sup>10</sup> The PAQ-C and CSHQ-A were translated to Bahasa Indonesia. Both instruments had been used in various studies before this study. The PAQ-C and CSHQ-A instruments have also been tested for validity and instrument reliability. The results showed that the PAQ-C instrument had good item validity and was reliable. PAQ-C items showed that the majority of PAQ-C instruments had good item validity with a score range between 0.140 - 0.730. Furthermore, the PAQ-C instrument was proven to be reliable with a Cronbach Alpha score between 0.682 - 0.745.<sup>11</sup> The internal consistency of the total score of CSHQ was 0.8 with subscales ranging from 0.42 (parasomnia) to 0.66 (night waking).<sup>12</sup> Parents and caregivers filled out the required information and informed consent form. All children who met the inclusion criteria, who were children aged 7-13 years, were registered as Indonesian primary school students during the COVID-19 pandemic, and children whose parents accessed the questionnaires were enrolled in the study.

We characterized the children according to their gender (female, male), age groups (7, 8, 9, 10, 11, 12, or 13 years), and parental employment status (both parents employed, maternal employment, paternal employment, or both parents unemployed). Children were categorized according to their physical activity level (active or inactive), sleep duration (adequate was 9-12 hours of sleep per 24 hours, inadequate was  $<9$  hours of sleep per 24 hours, more than adequate was  $>12$  hours per 24 hours), and sleep disturbances (present or none).

Sociodemographic characteristics (gender, age, and parental employment status), physical activity, sleep duration, and sleep disturbances were described in frequencies, mean, and standard deviation. We analyzed for differences in the proportions of each sociodemographic characteristics, physical activity levels, and sleep disturbances in children by Chi-square and Kruskal-Wallis statistical tests, using *SPSS version 24* software. Results with P values  $< 0.05$  were considered to be statistically significant.

All parents(s) of the subjects had read and signed

the digital informed consent sent to the parents by messaging applications (*WhatsApp* and *LINE*) before participating.

## Results

Subjects were 437 children aged 7-13 years who attended primary school during the COVID-19 pandemic in Indonesia. Their mean age was 9.00 (SD 1.625) years, and about half were girls (50.11%). The majority of children had parents who were both employed (78.26%), followed by paternal employment only (15.56%), maternal employment only (4.81%), and both parents unemployed (1.37%).

The PAQ-C tool identified 171 (39.13%) active children and 266 (60.87%) inactive children, with a total average score of 1.94, indicating an inactive mean score.

Most children (55.84%) got inadequate sleep on weekdays with a mean 8 hours 31 minutes sleep duration, and most children (49.67%) getting adequate sleep on weekends with a mean 10 hours 8 minutes sleep duration. A fraction of children got more than adequate sleep on weekdays (0.46%) and weekends (1.6%). Most children (81.24%) took naps during the pandemic for an average of 1 hour 14 minutes.

The CSHQ-A tool revealed that 320 (73.23%) children experienced sleep disturbances, while 117

(26.77%) did not experience sleep disturbances. The mean score of Total Sleep Disturbances Index was 47.04.

**Table 1** shows the analysis of sociodemographic characteristics and sleep disturbances in children. Chi square test revealed that significantly more males (52.81%) had sleep disturbances than females (47.19%) ( $P < 0.05$ ). They also showed a significant association between age 7 as the lowest age group (29.38%) and sleep disturbances in children during the COVID-19 pandemic ( $P < 0.05$ ). In addition, we noted no significant association between parental employment status and sleep disturbances in children.

**Table 2** shows the analysis of sociodemographic characteristics and physical activity levels. Chi square test revealed that significantly more girls (54.89%) were inactive than boys (45.11%) ( $P < 0.05$ ). However, there were no significant associations between physical inactivity and parental employment status nor between physical inactivity and age.

Chi-square test revealed no significant association between physical activity levels and sleep disturbances in children during the COVID-19 pandemic ( $P > 0.05$ ) (**Table 3**).

**Table 1.** Analysis of sociodemographic characteristics and sleep disturbances (N=437)

Characteristics	Sleep disturbances (n=320)	No sleep disturbances (n=117)	P value
Gender, n (%)			0.043*
Female	151 (47.19)	68 (58.12)	
Male	169 (52.81)	49 (41.88)	
Age, n (%)			0.02**
7 years	94 (29.38)	20 (17.09)	
8 years	58 (18.13)	15 (12.82)	
9 years	57 (17.81)	21 (17.95)	
10 years	46 (14.38)	22 (18.8)	
11 years	49 (15.31)	30 (25.65)	
12 years	14 (4.37)	9 (7.69)	
13 years	2 (0.62)	0 (0)	
Parental employment status, n (%)			0.439*
Both parents employed	251 (78.44)	91 (77.78)	
Maternal employment	14 (4.38)	7 (5.98)	
Paternal employment	49 (15.31)	19 (16.24)	
Both parents unemployed	6 (1.87)	0 (0)	

\*Chi-square, \*\*Kruskal-Wallis

**Table 2.** Association between sociodemographic factors and physical activity levels (N=437)

Variables	Physically active (n=171)	Physically inactive (n=266)	P value
Gender, n (%)			0.013*
Female	73 (42.7)	146 (54.89)	
Male	98 (57.3)	120 (45.11)	
Age, n (%)			0.088**
7 years	53 (31)	61 (22.93)	
8 years	28 (16.38)	45 (16.92)	
9 years	30 (17.54)	48 (18.05)	
10 years	25 (14.62)	43 (16.16)	
11 years	21 (12.28)	58 (21.8)	
12 years	13 (7.6)	10 (3.76)	
13 years	1 (0.58)	1 (0.38)	
Parental employment status, n (%)			0.133*
Both parents employed	136 (79.53)	206 (77.44)	
Maternal employment	4 (2.34)	17 (6.39)	
Paternal employment	30 (17.54)	38 (14.29)	
Both parents unemployed	1 (0.59)	5 (1.88)	

\*Chi-square, \*\*Kruskal-Wallis

**Table 3.** Analysis of physical activity levels and sleep disturbances.

Physical activity levels	Sleep disturbances (n=320)	No sleep disturbances (n=117)	P value
Active, n (%)	120 (37.5)	51 (43.59)	0.248*
Inactive, n (%)	200 (62.5)	66 (56.41)	

\*Chi-square

## Discussion

The prevalence of physically inactive children in our study was 60.87%, lower than the 71% prevalence in China in 2021.<sup>13</sup> It was also lower than that of the 2018 Indonesian Republic Ministry of Health Riskesdas (2018 National Basic Health Research) report, 64.4% of inactive children aged 10-14 years using GPAQ.<sup>14</sup> However, in our study, 66.82% of respondents answered, "Yes, it decreased" to the subjective statement, "Do you think your child's physical activity has changed during the large scale social restriction?" This subjective finding was consistent with a national survey in Canada, which reported that only 3.6% of children (5-11 years) were meeting the recommended guideline of achieving 60 min of moderate-vigorous physical activity during the COVID-19 pandemic, down from the 2019 report which reported 12.7% meeting the guidelines.<sup>2</sup>

The mean physical activity level score of 1.94 (<2) obtained from this study was lower than that of other countries using the same questionnaire.

The mean physical activity level score was 2.5-3.5 in Bulgaria,<sup>15</sup> 2.7-2.9 in the UK,<sup>9</sup> and 2.88 in Montenegro.<sup>16</sup> The gaps in access and timing to perform physical activity during the COVID-19 pandemic for children in each country may have led to different study results. Factors from each child, family, school, and national policy also contributed to the differences in study results.<sup>17</sup>

Children's nighttime sleep duration was 9 hours 20 minutes, comprising 8 hours 31 minutes on weekdays and 10 hours 8 minutes on weekends. Therefore, the mean sleep duration of Indonesian primary school students on weekends met the sleep duration recommendation from the *American Academy of Sleep Medicine* for 9-12 hours per 24 hours regularly. Similarly, a study reported that the average sleep duration for children aged 5-11 years in 2020 was 9.19 hours.<sup>6</sup>

Our subjects' mean nighttime sleep duration on weekdays did not meet sleep duration recommendations from the *American Academy of Sleep Medicine*, which was 9-12 hours per 24 hours regularly. Most children

in our study also took naps, with an average duration of 1 hour and 14 minutes (81.24%). Furthermore, more than half of the children slept inadequately at night (52.29%). However, studies from several other countries stated that primary school-aged children did not experience changes in sleep duration or even sleep more than the recommendation during the COVID-19 pandemic.<sup>6,18</sup>

The prevalence of sleep disturbances was 73.23% in our study, lower than reported in Italy, which was that 90% of children aged 6-12 years experienced sleep disturbances during the one-year implementation of the social restrictions policy.<sup>19</sup> The mean score of CSHQ *Total Sleep Disturbances Index* for all subgroups obtained in our study was 47.04 (SD 9.83), lower than in Italy [mean 51.6 (SD 9.3)].<sup>19</sup> Several factors, including age, ethnicity, geography, cultural differences, and socioeconomic status may have influenced sleep disturbances in children during the COVID-19 pandemic. The timing of study conduction could also have affected the result. Studies at the beginning of the pandemic tended to result in a much lower prevalence of sleep disturbances (15-44%) compared to studies conducted after long-term social restriction implementation.<sup>19</sup>

This study showed a significant association between gender and physical activity levels in children during the COVID-19 pandemic; significantly more girls were physically inactive than boys ( $P=0.013$ ). The result was similar to a US study in children aged 5-13 years,<sup>20</sup> and in contrast to a Portugal study in children under 13 years of age.<sup>21</sup> In addition, we found no significant association between age and physical activity level in children, in contrast to a study in Brazil in children under 13 years of age.<sup>22</sup> We also found no significant association between parental employment and physical activity level in children, which was similar to a study in Ontario, Canada, for children aged 12 old and under.<sup>23</sup>

The result showed a significant association between age 7 (lower age group) and sleep disturbances in children during the COVID-19 pandemic, similar to a study in Italy for children aged 6-12 years.<sup>19</sup> However, the association between gender and sleep disturbances showed different results, where children's sex in Italy showed no significant association.<sup>19</sup> The statistically insignificant association between parental employment and sleep disturbances in this study was

similar to a study in Singapore for children aged 3-16 years.<sup>24</sup>

In our subjects, there was no significant association between physical activity levels and sleep disturbances. This result differed from other studies in various countries. Studies in Tunisian children aged 5-12 years,<sup>25</sup> in Spanish children aged 3-12 years,<sup>26</sup> and in Canadian children aged 5-17.<sup>27</sup> showed significant associations between physical activity levels and sleep disturbances in children during the COVID-19 pandemic.<sup>27</sup> The difference in our results suggest that factors other than physical activity may have affected sleep quality.

In conclusion, most Indonesian primary school students are physically inactive (60.87%) and experience sleep disturbances (73.23%) during the COVID-19 pandemic. There are significant associations between female sex and lower physical activity levels, male sex and sleep disturbances, age 7 (lower age group) and sleep disturbances. There is no significant association between physical activity levels and sleep disturbances in Indonesian primary school students during the COVID-19 pandemic.

## Conflict of interest

None declared.

## Funding acknowledgment

The authors received no specific grants from any funding agency in the public, commercial, or not-for-profit sectors.

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