

REVIEW ARTICLE

Sedentary Behavior as an Impact of the Covid-19 Pandemic on Children: A Review

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ABSTRACT

The best development of a child can be achieved through adequate physical activity and sleep. The COVID-19 pandemic has impacted children, including increased sedentary behavior. This study aimed at describing changes in children's sedentary behavior during the COVID-19 pandemic. This study was a literature review. Article searching used three databases EBSCOHost, Clinical Key, and Google Scholar, with keywords "children" OR "adolescent" AND "sedentary behavior" AND "pandemic COVID-19" for a period of two years (2019-2021). This study used PICO to analyze the problem and PRISMA as the searching strategy. The result found seven suitable articles. The results showed that COVID-19 pandemic reduced children's activity levels, increased physical activity and screen load, and disrupted children's sleep patterns. In summary, this research showed that it negatively affects the play activities and behavior of children and adolescents. These results can serve as a guide for improving children's health during the COVID-19 pandemic.

Keywords: Children, Adolescents, Sedentary Behavior, COVID-19

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INTRODUCTION

Coronavirus or severe acute respiratory syndrome coronavirus (SARS COV 2) is a virus that attacks the respiratory system. SARS COV 2 or COVID-19 virus can cause respiratory system disorders and can cause acute pneumonia, which can have an impact on death. SARS COV 2 is a new type of virus, which can spread rapidly from person to person, which is very dangerous. This virus can attack anyone regardless of age, from infants, children, adolescents, adults, the elderly, pregnant women to post-natal mothers or those who are breastfeeding (1). The death toll caused by COVID-19 continues to rise. The Centers for Disease Control and Prevention (CDC) released data that an average of 2.67% per day died from COVID-19 (2). On August 22, 2020, in America as many as 161,392 people have died from COVID-19 (2). Patients with COVID-19 generally die from comorbidities that aggravate their condition, such as influenza and pneumonia (3).

COVID-19 can affect anyone, including children. Based on daily case data from the COVID-19 Task Force on

May 15, 2021, the number of additional cases was 2385 cases. COVID-19 cases have increased sharply. On June 15, 2021, there were 8161 cases (4). COVID-19 cases in Indonesia children aged 0-18 years old according to the data of the COVID-19 Task Force was 12.6%. It means 1 in 8 people infected with COVID-19 were children. The number of COVID-19 cases in one to five years old children was 2.9%, in school-age children of six to 18 years old adolescents it was 9.7%. The mortality rate of one to five years old children was 0.6%, that of six to 18 years old children 0.6% (4).

The wide spread of the COVID-19 virus has particularly affected the health and social life of children. Social restrictions, such as lockdowns or quarantines, which help to prevent wider spread have an impact on community life. It also has an impact on the social life of children and adolescents. Social limitations increase the risk of child and adolescent health problems, including changes in activity, sedentary behavior, sleep patterns, screen exposure, and mental health issues. The study claims that the new coronavirus pandemic has increased the levels of depression, anxiety and sleep disorders in children and adolescents (5). The decrease in physical activity in children is related to the school closure policy during the COVID-19 pandemic. Since April 2020, schools have been closed for direct learning in approximately 195 countries, affecting approximately

1.6 million children (6)

Physical activity in childhood has a vital role because it is related to children’s motoric and psychological development. Physical activity in children is also associated with lifestyle in adulthood, as well as the likelihood of obesity and heart and blood vessel disease (7). A study explained lower levels of physical activity in children during COVID-19 pandemic (8). Inadequate physical activity in children can have a negative impact on children’s mental health.

Changes in physical activity that occurred in children due to social restrictions during the pandemic are an increase in sedentary behavior. Based on the results of the study, with the policy of school closures during the pandemic, children tend to experience a decrease in physical activity and an increase in sedentary behavior compared to when they went to school (9). This can increase the incidence of overweight in school-age children. So far, study about sedentary behavior in children during COVID-19 pandemic and its effect is still limited. Based on this description, the purpose of this review was to describe changes in children’s sedentary behavior during the COVID-19 pandemic.

METHOD

Search strategy of this study was carried out systematically based on Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) (10), as seen in Figure 1. The searching strategy was systematically based on scientific papers selected through the database, namely EBSCOHost, Clinical Key, and Google Scholar with the keywords “children” OR “adolescent” AND “sedentary behavior” AND “pandemic COVID-19”. The inclusion criteria of this study included 1) study of quantitative data; 2) study population was related to physical activity and/or sedentary behavior; 3) study design was observational studies (cross-sectional, longitudinal/cohort); 4) respondents in the reviewed studies were children aged 0-18 years old who did not have comorbidities or obesity and reported the prevalence of physical activity or sedentary behavior; 5) the language of the articles used or published is in English; 6) articles published in 2019 to 2021; and 7) study focused to explain the prevalence of physical activity and or sedentary behavior.

The prevalence of physical activity and sedentary behavior was measured by self-reported measurements (validated questionnaires) or objective measurements (pedometer or accelerometer). Synthesis Research articles that match the inclusion criteria are collected. A summary contained the name of the researcher, the year of publication, the research location, the methods and the summary of the research results. The exclusion criteria of this study were participants over 19 years old, the purpose does not concern sedentary behavior, only reporting data, articles cannot be access completely, a

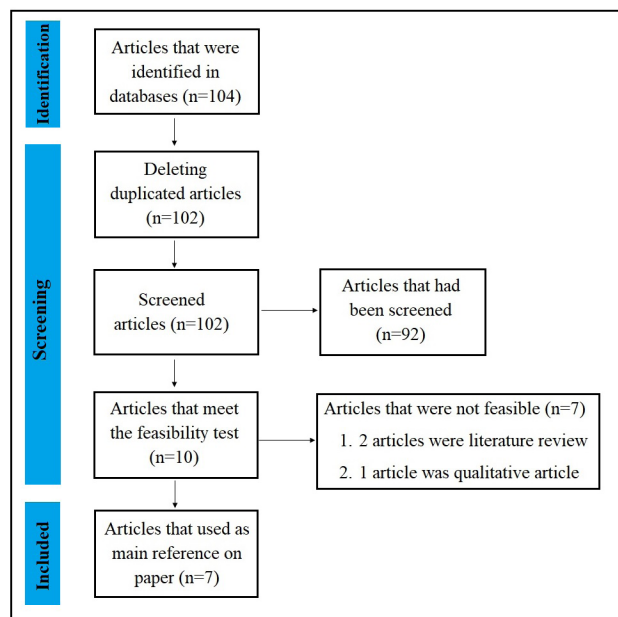


Figure 1: PRISMA flow of the study

literature review, and a qualitative research.

The result of quality appraisal can be seen in Table I. Two quantitative studies were good quality that had seven out of eight questions answered with yes (11,12). Meanwhile, one cross-sectional study had enough quality with six out of eight questions answered yes (13). Two cohort studies had enough quality that had seven out of eleven questions answered yes (14,15). The last two articles were survey studies and had good quality (7) and enough quality (16).

RESULTS

The results of this study were sedentary behavior during the COVID-19 pandemics, physical activity during the COVID-19 pandemic, and sleep patterns during the COVID-19 pandemic, as shown in Table II. The results of the review found that there was an increase in sedentary behavior during a pandemic in children from the age of 0-19 years old (7,1 1–14). In children aged 3-11 years, sedentary behavior such as screen use was most obtained, namely watching television, viewing tablets and mobile phones. The most sedentary behavior is watching television, the second is playing tablets, and the third is playing mobile phones (11,13). The WHO recommends (2019) those children under five uses a higher layer than the recommended one. Children aged 13-19 years use the highest layer, namely social media and the internet (12,14).

The results showed that, during the COVID-19 pandemic, children’s physical activity decreased. Children aged 0-19 years have reduced activity and are more at home (7,11,12,14,15). This review study also found that, during the COVID--19 pandemic, there was an increase in sleep patterns (12) in contrast to the

Table I. Quality Appraisal

Author, year	JBI % Critical appraisal checklist	Quality evaluation
Vukovic, et al (2021)	66,6% (6/9)	Enough
McCormack, et al (2020)	75% (6/8)	Enough
Moore, et al (2020)	88% (7/8)	Good
Arufe-Gir6ldez, et al (2020)	88% (7/8)	Good
Munasinghe, et al (2020)	64% (7/11)	Enough
Dunton, et al (2020)	88% (8/9)	Good
Velde, et al (2021)	64% (7/11)	Enough

Description: Good (100-80%), Enough (79-50%), Not good (<50%)

research which explained that sleep time in children aged 0-4 years during a pandemic is less than the minimum WHO recommendation (11). A similar study also explains that preschool students in China exhibit poor sleep habits. The decrease in sleep time can be influenced by increasing the device layer's time (17).

DISCUSSION

The COVID-19 pandemic has changed social conditions in society, including those for children. The policy of social restrictions reduced children's activity due

Table II: Research matrix

Study location	Researcher, year	Sample	Study type	Research result
Australian	Munasinghe, et al, 2020 (15)	582 youth aged 13-19 years	Cohort	<ol style="list-style-type: none"> 1. Decreased physical activity (OR: 0.53) 2. Increased social media or internet use (OR: 1.86) 3. Increased use of smartphones 4. Decreased excitement (OR: 0.38) 5. Consumption of fast food (0.46) <p>There is a decline in physical activity and welfare, rising unemployment, consumption of fast food.</p>
Canada	Moore, et al (2020) (16)	1472 parents who have children aged 5-17 years	Survey	<p>Children and adolescents have less physical activity, less time outside, increased sedentary days and more sleep during a pandemic.</p>
United States	Dunton, GF, Do, B., & Wang, S. D 2020 (17)	211 parents who have children aged 5-13 years	Online survey	<p>Parents consider their children's physical activity to have decreased, while their children's sedentary behavior has increased in the pre-COVID 19 (February 2020) and early COVID 19 (April – May 2020) periods.</p> <ol style="list-style-type: none"> 1. 36% of parents report that their child does much less physical activity 2. 41% of parents report that their child sits more
Dutch	Velde, et al (2021) (18)	Cohort A: 102 with a mean age of 10 years Cohort B: 131 with a mean age of 10 years	Cohort	<ol style="list-style-type: none"> 1. Cohort A: 62% of children reported less physical activity during the lockdown. Total physical activity during the lockdown ie 0 , 54 ± 0.92 points. 2. Cohort B: 54% of children reported decreased physical activity during the lockdown. The decline in physical activity during the lockdown ie 0 , 34 ± 0.98 points.
Spain	Arufe-Gir6ldez , et al (2020) (19)	280 children aged 0-4 years	Quantitative	<ol style="list-style-type: none"> 1. Physical activity is lower than the recommended average of 31.81 minutes (recommended result of 180 minutes) 2. The use of layers is television (M=65 .33), tablet (M=17.10) and cell phone (M=8.34). 3. Sleep hours have been met according to the recommendations
Serbia	Vukovic, et al (2021) (20)	450 parents of children	Survey	<ol style="list-style-type: none"> 1. During the covid pandemic, children's physical activity decreased (β=0.55) 2. Children choose to spend more time looking at screens such as multimedia content.
Canada	McCormack, et al (2020) (21)	345 parents who have children aged 5 – 11 years	Cross-sectional survey	<ol style="list-style-type: none"> 1. Children, on average, achieved 60 min MVPA at 3.48 ± 2.41 days/week (18.3% without MVPA days), 2. Spending 4.52 ± 2.75 days playing for the last week (16.5% without the play), 3. Visiting park at 4 , 85 ± 6.39 days during the last month (34.5% without visiting the park). 4. The majority of children spend ≥2 hours / day watching television (74 , 1 %), using a computer or game (63.7%), and use a screen-based devices (60.7%) .

to school closure (6). A study explained that reduced children's activity gives impact to children's health, such as increased sedentary behavior, increased screen time, and increased non communicable diseases when they are adult (15).

Social restrictions increase sedentary behavior in children. Sedentary behaviors are defined as a waking behavior characterized by 1.5METs energy expenses when sitting or lying down (17) According to the results of research in Canada, the closure of schools during a pandemic adversely affected children's physical activity and lack of playing time outside the room (12). This is confirmed by studies in the USA: 41% of parents with school-age children said that their children have been sitting more since the pandemic because of the learning process on cell phones or computers (7).

When children's sedentary behaviors increase, their use of mobile phones also increases. This finding is consistent with a study conducted in Australia, which found that an increase in sedentary behavior among adolescents led to an increase in mobile phone and internet use (14). This is also supported by research, that there was an increase in time of screen exposure in children during the pandemic through television or phone (11). A study said that an internet addiction can affect daily activities in adolescents including sleeping (18). According to the physical guidelines of the activity issued by WHO, children of five to 17 years old should carry out moderate to vigorous physical activities for at least 60 minutes a day And aerobic activity that strongly reinforces muscles and bones at least three days a week. (17). Based on the results of the articles review, the physical activity carried out by children and adolescents during the pandemic was not in accordance with WHO physical activity guidelines.

Without intervention, the sedentary behavior of children and adolescents will affect the quality of life of children and adolescents as adults. The increase in physical activity related to health-related quality and sedentary behavior is inversely proportional to the health-related quality of life of children and adolescents. Physical activity and sedentary behavior have significant effects on all areas of the body, psychology, and social psychology. Children and adolescents who spend more time sedentary report lower HRQOLs in physical, psychological and socio-psychological, academic and general health areas (19).

In contrast to the results of the study, it was explained that there was no relationship between total sedentary time and health that was measured objectively in children aged 0-4 years (20). Thus, sedentary behavior is harmless and necessary for good growth and early development. The results also explain that sedentary behavior such as reading a book or storytelling tends to have a beneficial effect on children's cognitive development.

Social restrictions during the COVID-19 pandemic also had an impact on children's sleep patterns. The results of the study explained that children's sleep time during the pandemic increased by 0.8 to 1.1 hours per day (3). This finding is supported by the results of a study carried out in Italy, according to which the sleep time of children increases significantly during periods of social limitation (21). However, the results of a study stated that social restrictions didn't affect sleep hours in children under four years of age because they were still following the recommendations of the WHO, which is for 10-12 hours/day (11).

Irregular sleep patterns in children can increase the risk of children becoming stressed, hyperactive, and difficult to focus (22). Thus, it is in agreement with a study which stated that the pandemic COVID-19 increased depression, anxiety, and sleep disturbances in children and adolescents (5). Psychological disorders that occurred in children were related to irregular sleep patterns. This condition can occur due to hormonal imbalances in the child's body, affecting the health status and development (5). Therefore, measurement of sedentary behavior level should be done to identify how far this affects children's growth and development. This study was not measuring level of sedentary behavior in children during COVID-19 pandemic.

CONCLUSION

Social restrictions have an impact on increasing sedentary behavior in children and adolescents. Parents can work together with children and teachers in schools to provide additional physical activity as a substitute for physical activity in schools during the schooling from home period. Physical activity at home can reduce screen time and children's sedentary behavior so that they can optimize children's growth and development. Further research can be conducted to measure level of sedentary behavior in children during COVID-19 pandemic and its effect on children's growth and development.

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