Chapter 17
Impact of Screen Time During the Pandemic of COVID-19 on Sleep Habits

Omar Boukhris, Haitham Jahrami, Khaled Trabelsi, Jordan M. Glenn, and Nicola Luigi Bragazzi

Abstract This chapter focuses on the impact of the COVID-19 pandemic on screen time and the effects of increased screen time on sleep patterns. Additionally, some strategies to cope with excessive screen time and sleep disruption will be outlined. To date, available data indicate restrictions imposed during the COVID-19 pandemic increased screen time, independent of age. This excessive use of digital devices, especially before bedtime during the pandemic, resulted in sleep perturbations. Sleep is pivotal for health, well-being, and overall health-related quality of life and is thus essential for optimal immune function. As a result, implementing strategies aimed at reducing the negative effects of increased screen time to improve sleep may help prevent the deleterious effects of the virus infection.

O. Boukhris (✉)
SIESTA Research Group, School of Allied Health, Human Services and Sport, La Trobe University, Melbourne, Australia

Sport, Performance, and Nutrition Research Group, School of Allied Health, Human Services and Sport, La Trobe University, Melbourne, Australia
e-mail: O.Boukhris@latrobe.edu.au

H. Jahrami
Department of Psychiatry, Ministry of Health, Manama, Bahrain

Department of Psychiatry, College of Medicine and Medical Sciences, Arabian Gulf University, Manama, Bahrain

K. Trabelsi
Higher Institute of Sport and Physical Education of Sfax, University of Sfax, Sfax, Tunisia

Research Laboratory: Education, Motricity, Sport and Health, EM2S, LR19JS01, University of Sfax, Sfax, Tunisia

J. M. Glenn
Department of Health, Exercise Science Research Center Human Performance and Recreation, University of Arkansas, Fayetteville, AR, USA

N. L. Bragazzi
Laboratory for Industrial and Applied Mathematics, Department of Mathematics and Statistics, York University, Toronto, ON, Canada

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17.1 Introduction

During the pandemic of COVID-19, most countries worldwide implemented severe restrictions such as quarantine and lockdowns to limit the spread of the virus. Due to these restrictions, several activities were postponed, including the closure of schools, universities, workplaces, gyms, and sports centers. These restrictions, and subsequent home confinement, generated reductions in social interaction and life satisfaction, as well as an impairment in mental health (Ammar et al. 2020). To decrease this psychosocial strain during the lockdown, Ammar et al. (2020) recommended the use of digital technology to promote social inclusion. However, the use of digital technology also resulted in an increase in screen time during this period (Drumheller and Fan 2022; Runacres et al. 2021). Screen time is defined as the amount of time spent using digital devices for work aims, education, or entertainment (Pandya and Lodha 2021). Previous studies indicated that screen time (e.g., TV, social media, and internet) increased significantly compared to before the COVID-19 pandemic (Drumheller and Fan 2022; Guo et al. 2021; Meyer et al. 2020; Bruni et al. 2022). Although digital technologies have limited feelings of loneliness and social withdrawal due to social distancing during home confinement, this increase in screen time also leads to health concerns (Pandya and Lodha 2021). Several factors including, but not limited to, sleep disturbances, markedly reduced physical activity, stress, anxiety, and obesity are all reported to relate to this increase in screen time, especially in children and adolescents (Drumheller and Fan 2022; Hammoudi et al. 2021).

Given the above considerations, this chapter aims to review the current state of knowledge about the effects of the COVID-19 pandemic on screen time and the impact of increased screen time on health and specifically sleep habits. Additionally, some strategies to cope with challenges imposed by the COVID-19 pandemic will be suggested.

17.2 Increasing Screen Time During the COVID-19 Pandemic

Characteristics of the included studies examining the pandemic's effects on screen time in children and adolescents are summarized in Table 17.1. The studies were published between the years 2020 and 2022. The highest number of participants was 1115 (Eyimaya and Irmak 2021), whilst the remaining studies ranged between 57 and 860 participants. The mean participant age ranged from 6 to 17 years.

Almost all studies conducted during the pandemic of COVID-19 reported that screen time increased significantly compared to before the pandemic independently of age and population. Additionally, excessive screen time (>1 h per day) was often

Table 17.1 Effects of COVID-19 pandemic on screen time in children and adolescents

Study	Country	Sample size	Age (years)	Restrictions	Method of screen time measurement	Results
Carroll et al. (2020)	Canada	310	5.7 ± 2.0	Closure of parks, school closures, and social distancing	Author developed	↑ to 2.4 ± 1.6 h/day
López-Bueno et al. (2020)	Spain	860	9.6 ± 3.9	Quarantine, social distancing, and lockdown requirements	Author developed	↑ by 2.9 ± 2.3 h/day
Munasinghe et al. (2020)	Australia	582	17.0 ± 1.0	School closures, social distancing, and lockdown	Adolescent sedentary activities questions	≥4 h/day on social media and ≥1 h/day on TV
Palladino et al. (2020)	Italy	57	8.0 ± 1.6	Lockdown	A brief questionnaire about the use of mobile media devices	↓ from 2.5 h during pre-lockdown to 5.8 h during lockdown
Abid et al. (2021)	Tunisia	100	8.66 ± 3.3	Lockdown	SergeTisseron's questionnaire	↑ from 1.53 ± 0.79 h/day to 4.45 ± 1.41 h/day
Eyimaya and Irmak (2021)	Turkey	1115	9.0 ± 2.0	Lockdown	Author developed	↑ to 6.42 ± 3.07 h/day
Burkart et al. (2022)	USA	231	7–12	Lockdown	Author developed	↑ by 97 min/day
Dutta et al. (2022)	India	153	8–16	Lockdown	Author developed	↑ from 4–8 h/day

(continued)

Table 17.1 (continued)

Study	Country	Sample size	Age (years)	Restrictions	Method of screen time measurement	Results
So et al. (2022)	China	577 (during the pandemic), 146 (during school closures), and 293 (when schools partially reopened)	12.85 ± 2.61 (during the pandemic), 12.14 ± 2.90 (during school closures), and 11.93 ± 2.11 (when schools partially reopened)	School closures and lockdown	Author developed	↑ from 5.38 h/day before the pandemic to 6.23 h/day during school closures and to 8.52 h/day when schools partially reopened

↑ increased, *NM* not mentioned

reported in children, indicating that this population exceeded the recommendation thresholds related to permissible screen time (Gupta et al. 2022).

Characteristics of the included studies examining the effect of the pandemic of COVID-19 on screen time in adults and older adults are summarized in Table 17.2. The studies were published between the years 2020 and 2022. The highest number of participants was 45,161 (Malta et al. 2020), whilst the remaining studies ranged between 117 and 13,754 participants. The mean ages of participants ranged from 18 to 80 years.

17.3 Impact of Increased Screen Time on Overall Health

Mental and physical health are the factors most adversely impacted by increased screen time (Pandya and Lodha 2021). Specific to children and adolescents, a high risk of myopia is considered a negative result of these increases (Singh and Balhara 2021). There is evidence that excessive digital use also has negative long-term physical impacts, including sleep perturbation, eye strain, and neck pain among them (Pandya and Lodha 2021). Excessive exposure to screens before bedtime may lead to melatonin suppression, which negatively influences sleep quality, making children susceptible to the negative effects of artificial light at night (Abid et al. 2021). Concerning mental health, excessive screen time adversely affects attention, social intelligence, and concentration, as well as engenders isolation, emotional dysregulation, anxiety, depression, and technology addiction (Pandya and Lodha 2021).

For adults, sleep routines and regular physical activity tend to be replaced by sedentary behaviors, characterized by excessive screen time, provoking negative effects such as decreased sleep duration or sleep-wake inversion, neck pain, headache, myopia, high blood pressure, obesity, insulin resistance, and digital eye syndrome (World Health Organization 2020). Excessive digital technology use can also result in collateral damage to visual health, sleep patterns, and food habits (Pandya and Lodha 2021). Furthermore, the relationship between poor mental health and increased screen time has been previously reported (Pandya and Lodha 2021). More importantly, as sleep and the immune system are related to each other, the negative effects of excessive screen time before bed, during the COVID-19 pandemic, on sleep quality and duration may negatively impact the immune system. Bryant et al. (2004) reported that sleep loss or perturbation negatively influences immune function. In this context, greater odds to contract COVID-19 infection are correlated with sleep loss or perturbation, which is not the case for people who have a greater duration of sleep (Ragnoli et al. 2022).

Table 17.2 Effects of COVID-19 pandemic on screen time in adults and older adults

Study	Country	Sample size	Age (years)	Restrictions	Method of screen time measurement	Results
Carroll et al. (2020)	Canada	351	38.5 ± 5.2	Closure of parks, school closures, and social distancing	Author developed	↑ to 2.8 ± 1.7 h/day
Cheikh Ismail et al. (2020)	United Arab Emirates	1012	NM	Quarantine and social distancing	IPAQ short form	36.2% of participants spent >5 h/day for entertainment during COVID-19 compared to 12.9% pre-COVID-19
Colivicchi et al. (2020)	France	124	71.0 ± 14.0	Lockdown	Telephone interviews	↑ in 50% of participants
Górnicka et al. (2020)	Poland	3241	46.2 ± 15.3	Social distancing and lockdown	Canadian Health Measures Survey	↑ to ≥8 h/day during COVID-19 pandemic
Hu et al. (2020)	China	1033	18–60	Lockdown	Author developed	↑ in 70% of participants
Husain and Ashkanani (2020)	Kuwait	415	38.5 ± 12.7	Lockdown	Author developed	Participants watching >6 h/day ↑ by 27.5%
Malta et al. (2020)	Brazil	45,161	18–29	Social distancing and lockdown	Internally validated questionnaire	↑ from 1.5 ± 0.1 h/day to 5.3 ± 0.1 h/day for computer or tablet uses, and from 1.5 ± 0.1 h/day to 3.3. ± 0.1 h/day for TV
Mon-López et al. (2020)	Spain	120	30–39	Quarantine, social distancing, and lockdown	Author developed	↑ from 403.0 ± 203.4 min/day to 615.6 ± 331.6 min/day
Qin et al. (2020)	China	12,107	18–80	Lockdown	IPAQ-short form	↑ to 261.3 ± 189.8 min/day during lockdown
Khare et al. (2021)	India	NM	NM	Lockdown	Author developed	61.4% of participants ↑ their screen time during lockdown

(continued)

Table 17.2 (continued)

Study	Country	Sample size	Age (years)	Restrictions	Method of screen time measurement	Results
Richardson et al. (2021)	United Kingdom	117	75.0 ± 4.0	Social distancing and lockdown	Author developed	↑ from 426.0 ± 27.0 min/day pre-COVID-19 to 490.0 ± 25.0 min/day during COVID-19
Rodríguez-Larrad et al. (2021)	Spain	13,754	22.8 ± 5.3	Lockdown	Combination of IPAQ and modified Sedentary Behaviour Questionnaires	↑ from 217 min/day pre-COVID-19 to 373 min/day during COVID-19
Rolland et al. (2020)	France	11,391	22.8 ± 5.3	Lockdown	Author developed	↑ in 64.6% of participants

↑ increased, *NM* not mentioned, *IPAQ* International Physical Activity Questionnaire

17.4 Impact of Increased Screen Time on Sleep Parameters

17.4.1 Children and Adolescents

Sleep is known to be important for child and adolescent health and well-being, and there is an increased possibility of sleep problems developing or worsening during home confinement (Bruni et al. 2022). Sleep disturbances are linked to increased levels of psychological and emotional distress, as a result of changes in family financial circumstances, uncertainty about the future, and health concerns (Becker and Gregory 2020). Additionally, social distancing, advice to stay indoors, and remote learning tend to reduce sunlight exposure, create more flexibility in wake and sleep times, increase the possibility of taking longer daytime naps, and favor the use of technology for learning during the day. In this context, the results of the review by Paterson et al. (2021) revealed an increase in sleep duration during the first year of the COVID-19 pandemic in children and adolescents. Bedtime and wake time were also delayed during the pandemic (Paterson et al. 2021). Furthermore, a systematic review and meta-analysis concluded that around half of healthy children did not accumulate the recommended total sleep time (i.e., 9–11 h for school children; Hirshkowitz et al. 2015) (Sharma et al. 2021).

Unfortunately, there are limited studies (with inconsistent findings) examining the relationship between screen time and sleep parameters in children or adolescents during the COVID-19 pandemic. In this context, Zhang et al. (2021) reported that sleep disturbances were not associated with screen time, whilst Moitra and Madan (2022) found a significant correlation between sleep problems and increased screen time. Therefore, further studies are needed to determine the relationship between

sleep parameters and screen time in children and adolescents during future pandemics.

17.4.2 Adults

Contrary to children and adolescents, several studies have investigated the relationship between screen time and sleep parameters in adults.

17.4.2.1 Relationship Between Sleep Latency and Screen Time

It has been shown that sleep latency increased significantly when screen time was higher during the pandemic of COVID-19 (Drumheller and Fan 2022). In this context, Salfi et al. (2021) reported that excessive digital use before bedtime is related to increases in sleep latency. In addition, Facer-Childs et al. (2021) reported that Australian athletes who increased their screen time during the pandemic had a higher sleep latency (i.e., 37 min), compared to a sleep latency of 22 min for athletes who reduced their screen time. Furthermore, a significant correlation existed between excessive screen time and sleep latency during the COVID-19 pandemic (Cellini et al. 2020).

17.4.2.2 Relationship Between Delayed Bedtime and Screen Time

It has been reported that delayed bedtimes were due to excessive screen time before sleep during the pandemic (Drumheller and Fan 2022). It has been shown that excessive screen time during the pandemic leads to a significant delay in bedtime, whilst a decrease or a lack of change in screen use did not lead to a delayed bedtime (Salfi et al. 2021). Moreover, Cellini et al. (2020) reported that delayed bedtime was probably due to increased screen time.

17.4.2.3 Relationship Between Sleep Duration and Screen Time

Several studies have examined the effect of screen time on sleep duration during the pandemic of COVID-19. A sleep duration of $\leq$7 h per day was attributed to the excessive use of digital devices (Souza et al. 2022). Likewise, Salfi et al. (2021) found that an increase in screen time caused a decrease in sleep duration, whereas a decrease or a lack of change in screen time did not produce a reduction in sleep duration. In addition, a significant correlation has been observed between excessive screen time and decreased sleep duration during the pandemic in individuals studying or working from home (Majumdar et al. 2020). Furthermore, Akulwar-Tajane et al. (2020) reported that 52% of students linked their reduction in sleep duration to

excessive screen time. However, Ali et al. (2022) reported a significant correlation between increased screen time and longer sleep duration during the pandemic.

17.4.2.4 Relationship Between Wake Time and Screen Time

Two studies have examined the relationship between screen time and wake time during the COVID-19 pandemic. Cellini et al. (2020) found a significant correlation between wake time and excessive screen time. Similarly, Salfi et al. (2021) found that an increase in screen time before bedtime resulted in later wake times during the COVID-19 pandemic, whereas a decrease or a lack of change in screen time did not cause later wake times.

17.4.2.5 Relationship Between Sleep Quality and Screen Time

Five studies examined the relationship between screen time and sleep quality during the COVID-19 pandemic. Of these, four reported sleep quality to be significantly impaired by increased digital use (Barrea et al. 2020; Dai et al. 2021; Salfi et al. 2021; Werneck et al. 2020), whilst one study reported that sleep quality was not affected by increased digital use (Cellini et al. 2020). Salfi et al. (2021) found that an increase in screen time before bedtime resulted in decreased sleep quality, as measured via the Pittsburgh Sleep Quality Index (PSQI) questionnaire, whereas a decrease or no change in screen time did not cause sleep quality impairment. Additionally, Barrea et al. (2020) found that sleep quality measured by PSQI decreased significantly in online workers; however, these results were not observed in offline workers. Moreover, Werneck et al. (2020) and Dai et al. (2021) reported significant declines in sleep quality due to excessive screen time before bedtime. In contrast, Cellini et al. (2020) found that sleep quality was not influenced by excessive screen time.

Although there are a high number of studies investigating the relationship between sleep and screen time in adults, a subset of studies only examined the impact of the COVID-19 pandemic on sleep, without examining the relationship between screen time and sleep. A systematic review and meta-analysis conducted by Jahrami et al. (2021) found that nearly 40% of general people have sleep problems during the COVID-19 pandemic. Another systematic review conducted in 2021 found that sleep perturbations were very common during the COVID-19 pandemic among the general population (Lin et al. 2021). Recently, Jahrami et al. (2022) concluded through a systematic review and meta-analysis that sleep problems were reported among four in every ten individuals and that children, adolescents, and patients infected with COVID-19 appeared to be the most affected groups during the lockdown.

It should be acknowledged that studies examining the relationship between sleep and screen time in athletes during the COVID-19 pandemic are lacking. Therefore, impairment in sleep quality and inadequate sleep duration, reported in athletes

during the COVID-19 pandemic (da Silva Santos et al. 2021; Romdhani et al. 2022a, b; Kurniarobbi et al. 2022), could not be attributed to increased screen time. Nevertheless, this relationship should be investigated in future studies.

17.5 Practical Recommendations

To limit or reduce the negative effects of screen use and sleep disruption during the COVID-19 pandemic and especially during home confinement, the following recommendations are proposed:

- For adults, spend less than 4 h per day for digital use with breaks every 20 min. Technology may be used to schedule this time (Agarwal et al. 2022). However, children (24–59 months) should not exceed 1 h per day of screen time use (with each session not more than 20–30 min); the less the better (Gupta et al. 2022). The maximum duration of 2 h per day including recreational screen time, and time spent on screen at home to complete educational and extracurricular assignments, was recommended for children aged 5–10 years (Gupta et al. 2022). For adolescents (10–18 years), screen time should be balanced with other activities that are required for overall development (e.g., physical activity, hobbies, and family time) (Gupta et al. 2022).
- Use audio calls instead of video calls and typing messages to minimize screen fatigue (Pandya and Lodha 2021).
- Do not bring digital devices into the bedroom or switch them off before bed to decrease sleep perturbation owing to light exposure (Altena et al. 2020).
- Use strategies that promote sleep instead of screen use (e.g., slow breathing techniques) (Borges et al. 2021).
- Avoid late and long napping during the day and caffeine consumption 4–5 h before sleep (Romdhani et al. 2022a, b).
- Heavy meals are not recommended and consume snacks rich in tryptophan 1 h before sleep (Romdhani et al. 2022a, b).
- Some activities should be implemented like reading books, indoor games, and physical exercises such as meditation and Yoga for better overall individual health (Agarwal et al. 2022).
- People should be made aware of the detrimental effects of increased screen time and the value of sleep for overall health by health departments and policymakers.

17.6 Conclusion

In conclusion, although the use of digital devices helped people to reduce social distancing during the pandemic of COVID-19, excessive screen time may lead to negative effects on physical and mental health. Sleep problems are considered

among the most negative effects of increased screen time, given that adequate sleep is essential for proper immune functioning which, in turn, helps to combat viral infections.

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