

Effects Of Using Screen-Based Devices and the Prevalence of Screen Device-Induced Vision Syndrome in the Faculty Of Medicine, Wayamba University of Sri Lanka

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Abstract

The use of smartphones and other screen-based devices has increased markedly in recent years, particularly among young adults. This trend has raised concerns regarding “problematic smartphone use,” which shares features with behavioral addiction. Prolonged exposure to digital screens is associated with a range of health issues, including computer vision syndrome (CVS), headaches, musculoskeletal pain, and peripheral numbness. Despite these concerns, digital devices remain indispensable in modern life, especially in medical education, where they facilitate rapid access to information and enhance learning efficiency.

This descriptive cross-sectional study assessed screen-based device usage among medical students at the Faculty of Medicine, Wayamba University of Sri Lanka. A total of 313 students from all academic years were selected using stratified sampling. Data were collected through self-administered questionnaires distributed in Sinhala, Tamil, and English via Google Forms over two months. Responses were analyzed using SPSS version 28. Ethical approval was obtained from the Faculty’s Ethical Review Committee. The mean age of participants was 23.7 ± 1.8 years; 46.6% wore spectacles, and 5.1% were on medication for psychological conditions. WhatsApp (98.5%) and YouTube (91.9%) were the most commonly used platforms. Average daily screen time was 603 minutes (10.05 hours), comprising smartphones (268.8 minutes), tablets (256.9 minutes), and computers (115.1 minutes). Most students (94.9%) used devices for academic purposes, while 82.4% used them for social interaction.

Overall, 32.26 % were classified as heavy users (mean 881 minutes/day), and 43.45 % as light users (mean 398 minutes/day). Increased usage was largely attributed to academic demands. Symptoms of CVS were reported, including headaches (57%) and back pain (14.2%), associated with prolonged use and poor posture.

Conclusion: The findings highlight substantial screen exposure among medical students and underscore the need for awareness and preventive strategies to mitigate associated health risks.

Key words: screen-based devices, screen time, computer vision syndrome, problematic smartphone use

INTRODUCTION AND LITERATURE REVIEW

Since the introduction of smartphones in 1997, cellphones have increasingly permeated daily life, offering a vast range of applications for news, entertainment, communication, and education. The twenty-first century has seen a marked rise in smartphone overuse, with more people now devoting their leisure time to these devices. Studies evaluating subjective smartphone usage have reported smartphone addiction rates from 8.7% in Korea to 32% in India (1,2). Additionally, a recent study by Deloitte found that 60% of American adults aged 18 to 34 acknowledged

using their smartphones excessively (3). Over the past decade, average screen time has increased significantly, with a 2018 Nielsen survey revealing that American adults spend nearly 11 hours per day in front of screens, with young adults (aged 18 to 34) attributing 43% of their media consumption to digital devices (4).

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The global trend of increased screen time (ST) is closely linked to problematic smartphone use, which shares characteristics with substance addiction (5,6). Although the term “problematic smartphone use” is preferred over “smartphone addiction,” as the latter is not recognized as a mental disorder, problematic use remains a concern due to associated stigma (6,7). Research on medical students in Serbia in 2018 found a significant prevalence of problematic smartphone use, with a strong correlation between screen time and the severity of smartphone use issues (8).

Despite concerns, screen-based devices are now integral to daily life. Medical professionals, particularly younger healthcare professionals and trainees, have adopted mobile technologies—such as personal digital assistants (PDAs), smartphones, and tablets—since their introduction (9,10). Mobile devices have quickly become primary tools for accessing clinical data (11,12). In a study on mobile device usage in healthcare, researchers found that medical students, residents, and faculty used mobile devices most commonly for accessing pharmacological information (73.5%), conducting clinical calculations (57.9%), and taking notes (51.6%). Additionally, a substantial percentage of respondents (46.5% and 50.2%) used these devices to locate and read journal articles, while more than half of third- and fourth-year students and residents used mobile devices to research drugs, review clinical guidelines, access point-of-care information, perform calculations, or generate differential diagnoses. Medical students and residents reported a wider range of device applications compared to other groups (13).

While the benefits of smart devices are extensive, there are also adverse health effects related to screen time. Research has shown that each additional hour of daily television viewing is associated with a 6% increased risk of fatal or nonfatal cardiovascular diseases (CVD) and an 8% increased risk of coronary heart disease, irrespective of age, gender, education, lifestyle factors, or physical activity (14). Other studies indicate a 125% increased risk for CVD events among individuals engaging in four or more hours of recreational screen time daily compared to two hours, with a 48% increased risk of all-cause mortality (15).

University students, including medical students, now spend significant time in front of screens for studying and research, resulting in a high prevalence of computer vision syndrome (CVS) (16,17,18). CVS manifests as symptoms like burning or foreign body sensation, headaches, blurred vision, dryness, eye pain, itching, tearing, light sensitivity, eye redness, and musculoskeletal pain in the hands, neck, shoulders, or back. At King Abdulaziz University in Saudi

Arabia, a study reported that 95% of undergraduate medical students experienced at least one CVS symptom during screen-based study sessions. Women, comprising 54.3% of the study sample, were found to have a higher prevalence of CVS (19). Similarly, a study in the United Arab Emirates showed significant vision-related issues among university students, with prolonged close-up screen time and lack of screen filters linked to increased symptom occurrence and more frequent interruptions (20).

Moreover, frequent screen-based technology usage has been associated with poor sleep quality, with both sleep duration and quality inversely related to screen time (21). Frequent screen use, particularly before bedtime, is thought to be a primary factor. Recent studies also report a relationship between extended screen time and depression, as well as increased stress levels among female college students in China who reported high screen time (>6 hours/day) (22-26).

During the COVID-19 pandemic, research on screen time and physical activity among Indonesian medical students showed increased screen time and a more sedentary lifestyle, with notable changes in the use of applications. For instance, usage of the mobile messaging app Line (similar to WhatsApp) declined significantly, highlighting how the pandemic altered application usage and affected students' physical activity patterns. While evidence on screen time and screen-based device usage patterns post-COVID-19 remains limited, further research is warranted to address potential intervention needs (27).

Screen-based devices, including laptops, desktops, tablets, and smartphones, are now indispensable for students, both for academic purposes and entertainment. However, the rise in screen time brings an increased prevalence of associated health issues, such as headaches, dry eyes, and musculoskeletal problems resulting from poor posture. Despite the centrality of these devices in education and entertainment, there is growing concern regarding the amount of time students spend on screens and their purposes for device usage. Therefore, this study was conducted to investigate screen usage patterns among students in the Faculty of Medicine at Wayamba University of Sri Lanka.

OBJECTIVES

General Objective

To assess screen time, screen-based device use, and the prevalence of screen-related health concerns among students at the Faculty of Medicine, Wayamba University of Sri Lanka.

Specific Objectives

To quantify the average screen time among students at the Faculty of Medicine, Wayamba University of Sri Lanka.

To evaluate the various purposes and patterns of screen-based device usage among students at the Faculty of Medicine, Wayamba University of Sri Lanka.

To determine the prevalence of screen device-induced health issues among students at the Faculty of Medicine, Wayamba University of Sri Lanka.

METHODOLOGY

This study was conducted as a descriptive cross-sectional study at the Faculty of Medicine, Wayamba University of Sri Lanka. The study focused on students from all current batches within the faculty, totaling 596 students. The batch-wise distribution of students is shown below:

A sample size of 234 students was calculated to be sufficient for a 95% confidence interval. This calculation was done using an online sample size calculator from

Batch	Number of Students (N = 596)	Percentage
Final year	71	12.33%
Fourth-year	66	11.46%
Third year	142	24.65%
Second year	147	25.52%
First-year	150	26.04%

Qualtrics.com, and a non-response rate was calculated after data collection.

Participants

The study included students who were currently enrolled in the MBBS program at the Faculty of Medicine, Wayamba University. However, students who were undergoing treatment for any psychological condition were excluded from the study.

Data Collection

An investigator-developed questionnaire, incorporating the Perceived Stress Scale, was created and distributed in three languages: Sinhala, Tamil, and English. Data collection was conducted through a Google Form, which was sent to students via email along with an information sheet and a consent form. Students were given two months

to complete the questionnaire, with three reminder emails sent during this period. Participants could review the information sheet, consent to participate by selecting an option, and then proceed to fill out the questionnaire. The data collected was securely stored and accessible only to the researchers.

Data Analysis

Once the data collection period ended, responses were downloaded as an Excel file, and quantitative analysis was performed using SPSS version 28.

RESULTS

A total of 313 students from the Faculty of Medicine, Wayamba University of Sri Lanka, participated in the survey. The average age of respondents was 23.7 ± 1.8 years. By batch, responses were distributed as follows:

Final year Batch:	69 students, with an average age of 25.899 ± 0.957 years.
Fourth year Batch:	63 students, with an average age of 24.677 ± 0.919 years.
Third year Batch:	61 students, with an average age of 23.700 ± 1.030 years.
Second year Batch:	26 students, with an average age of 22.720 ± 1.100 years.
First year Batch:	94 students, with an average age of 21.708 ± 0.869 years.

Among the participants, 146 students (46.64%) reported wearing spectacles. Additionally, 16 participants (5.11%) indicated they were currently undergoing treatment for a diagnosed psychological condition. The demographic details are further summarised in Table 2.

Table 2. Usage of spectacles and obtaining of medications for diagnosed psychological conditions among the participants

Batch	Usage of spectacles		Positive percentage (%)	Diagnosed psychological conditions		Positive percentage (%)
	Yes	No		Yes	No	
2017/2018	32	37	46.37	3	66	4.35
2018/2019	25	38	39.68	1	62	1.58
2019/2020	34	27	55.74	6	55	9.83
2020/2021	12	14	46.15	1	25	3.84
2021/2022	43	51	45.74	5	89	5.32
Total	146	167	46.64	16	297	5.11

To assess the usage of screen-based devices, participants were requested to identify the three social media platforms they most frequently use. The results revealed that 98.5% of respondents reported using WhatsApp, followed by 91.9% who used YouTube, 53.9% who used Facebook,

and 26.5% who used Instagram. In contrast, only a small proportion of participants reported using platforms such as Telegram, Viber, Imo, LinkedIn, and TikTok. Additionally, respondents indicated the use of other applications, including Google, Snapchat, Twitter, and Reddit (Table 3).

Table 3. Commonly used social media platforms

Social media platform	Percentage of students (%)
WhatsApp	98.5
YouTube	91.9
Facebook	53.9
Instagram	26.5
Telegram	19.2
TikTok	9.3
Viber	0.9
Imo	0.9
LinkedIn	0.0
Other (Google, SnapChat, Twitter and Reddit)	7.2

Participants were asked to report their average daily time spent on laptops/computers, smartphones, and tablets. The findings indicated that students spent the greatest amount of time on smartphones, with a mean duration of 268.84 minutes (4.48 hours) per day. The average daily

usage of laptops/computers was 115.1 minutes (1.82 hours), while tablet use averaged 256.96 minutes (4.28 hours) per day. A detailed breakdown of device usage time by batch is presented in Table 4.

Table 4. Usage time of screen based devices (in minutes) by the participant

Device	Batch	N*	Mean usage time (minutes)
Laptop/Computer	2017/2018	69	81.5
	2018/2019	63	86.8
	2019/2020	61	160.8
	2020/2021	26	144.2
	2021/2022	94	102.2
Smartphone	2017/2018	69	344.3
	2018/2019	63	242.4
	2019/2020	61	284.3
	2020/2021	26	222.7
	2021/2022	94	250.5
Tablet	2017/2018	69	285.2
	2018/2019	63	225.0
	2019/2020	61	247.9
	2020/2021	26	279.2
	2021/2022	94	247.5

*N = Number of respondents

Students were subsequently asked to select the three primary reasons for their use of screen-based devices from a predefined list. The majority of participants (94.9%) reported using these devices for academic purposes, including reading, viewing educational videos, and attending online lectures. Furthermore, 82.4% indicated

that they used such devices to communicate and engage with friends, family, and the wider community. Other reasons, including entertainment, alleviation of boredom, and staying informed about current affairs, were reported by comparatively smaller proportions of participants. These findings are summarized in Table 5.

Table 5. *Reasons for screen-based device usage*

Reasons	Percentage of students (%)
For study purposes – reading, watching video lessons, attending online lectures	94.9
To engage with friends and family, and the society in general	82.4
Entertainment purposes	3.8
To fight boredom	1.3
As a mode of staying connected to what is happening around you	1.0

To explore the potential association between screen-based device usage and computer vision syndrome, students were asked to identify any signs or symptoms they experienced from a predefined list derived from those

commonly reported in the literature. The proportion of students reporting each sign or symptom is presented in Table 6.

Table 6. *Signs and symptoms of computer vision syndrome*

Signs and symptoms	Percentage of students (%)
No symptoms	20.0
Headache	57.0
Back pain	14.2
Blurred vision	2.8
Increased sensitivity to light	2.7
Tearing	1.9
Itching of the eyes	1.3
Burning sensation of the eyes	0.1
Foreign body sensation of the eyes	0.0
Dryness of the eyes	0.0
Numbness of the hands and fingers, and/or neck, shoulders	0.0
Eye redness	0.0
Eye pain	0.0

Among the respondents, 21.7% reported experiencing only one symptom, while 58.3% reported the presence of two or more symptoms.

The results indicated that the mean daily screen time among students was 603 minutes. Screen time was defined as the total duration spent viewing content on a television,

smartphone, computer, or other electronic devices. Based on duration, screen time was categorized into three groups: light (180–600 minutes), moderate (601–1000 minutes), and heavy (1001–1440 minutes), as presented in Table 7.

Table 7. *Number of students and average screen times relevant to the screen time categories*

Screen time category	N*	Percentage of students (%)	Average screen time (minutes)
Light (180 – 600 minutes)	136	43.45	398
Moderate (601 - 1000 minutes)	76	24.28	572
Heavy (1000 - 1440 minutes)	101	32.26	881

*N = Number of respondents

A Chi-square test examined the association between the students' batch (and the corresponding academic year) and the screen time category. Table 8 presents the relevant

statistics for the test, while Table 9 displays the results of the Chi-square analysis

Table 8. *Statistics for the association between batch of the students and screen time category*

	Heavy	Moderate	Light	Total
2017/2018	27 39.13	17 24.64	25 36.23	69
2018/2019	16 25.40	16 25.40	31 49.20	63
2019/2020	21 34.43	18 29.51	22 36.06	61
2020/2021	10 38.46	9 34.62	7 26.92	26
2021/2022	27 28.72	16 17.02	51 54.26	94
Total	101	76	136	313

Table 9. *Chi-square Test for the association between batch of the students and screen time category*

	Chi-square	DF	P-value
Pearson test	13.195	8	0.105
Likelihood Ratio	13.393	8	0.009

The p-value obtained from the Chi-square test was greater than 0.05 ($\alpha = 0.05$), indicating no significant association between the students' batch (and thus their academic year) and the screen time category. Conversely, since the p-value from the likelihood ratio test was less than 0.05 ($\alpha = 0.05$), this suggests that a positive relationship between the two variables is not statistically significant.

DISCUSSION

Smartphones and other screen-based devices play a pivotal role in the lives of contemporary individuals. Unlike in previous decades, the usage of screen-based devices has increased dramatically and appears poised for continued growth. Numerous studies indicate that average screen time is notably high, particularly among young adults. In the healthcare profession, screen-based devices such as smartphones, tablets, and laptops are extensively utilised by healthcare students, trainees, and young professionals, primarily due to the convenient access they provide to clinical information. Research has shown that medical students engage with these devices for a broader array of activities compared to other student groups, with their screen time often being significantly elevated.

The findings of the present study corroborate these observations. It is well-established that students utilize screen-based devices not only for academic purposes but

also for social media interaction. In this study, the most popular social media platforms among participants were WhatsApp, YouTube, and Facebook. On average, students reported spending 268.84 minutes (4.48 hours) per day on smartphones, 256.96 minutes (4.28 hours) on tablets, and 115.1 minutes (1.82 hours) on laptops/computers. The overall average screen time for students was determined to be 603 minutes (10.05 hours) per day, which represents more than one-third of a day and is indicative of an increased duration of use.

Literature indicates that some studies have reported similar or even higher screen time values compared to the results of this study. For instance, research conducted in Indonesia among medical students indicated an average of 8.20 hours of smartphone use, 2.10 hours on tablets, and 3.94 hours on laptops, with a total average screen time of 14.75 hours. Another study in Indonesia reported an average total screen time of 17.7 hours per day. Conversely, a study involving medical students from a Serbian university found an average smartphone usage time of 234 minutes (3.9 hours) per day, which is more in line with the findings of the current study. Collectively, these studies suggest that medical students worldwide are experiencing increased screen time, regardless of their geographic location.(7,8,12,13,32)

According to the screen-time categorization, 32.26% of respondents in this study fell into the “heavy screen time” category, with an average usage of 881 minutes per day, equivalent to 14.68 hours. This finding is significant, as a substantial proportion of students appear to exhibit extremely high screen time, which may pose health risks. Additionally, this observation may contribute to the presence of signs and symptoms associated with computer vision syndrome.

Furthermore, 24.28 % of students were categorized as having “moderate screen time,” with an average usage of 572 minutes (9.53 hours), while 43.45 % fell into the “light screen time” category, averaging 398 minutes (6.63 hours) of screen use. These findings align with previous studies in the literature. For instance, a study conducted in India assessing dry eye disease related to digital screen exposure among medical students reported that 30% of participants had screen time exceeding 6 hours, while another 30% spent between 4 to 6 hours on screens. Additionally, 25% of participants had screen time ranging from 2 to 4 hours.

Similarly, a study in Pakistan investigating screen time and its relationship with ophthalmic problems among medical students found that 6.58% of participants had an average screen time exceeding 12 hours, while 20.39% reported usage between 10 to 12 hours. Notably, 45.39% of participants had screen time between 7 to 9 hours, and only 27.63% spent 4 to 6 hours on screens. These findings suggest that increased screen time among medical students is a widespread issue.(18,19,20)

The elevated percentage of students classified in the heavy screen time category can be attributed to the substantial academic workload faced by medical students. They must navigate a rigorous curriculum and remain updated on the latest developments in the medical field. A few decades ago, access to information resources primarily relied on printed materials, as internet facilities and digital devices were not as prevalent. Today, however, technological advancements have made information easily accessible through handheld devices, leading to a greater reliance on digital tools and, consequently, an increase in overall screen time

When examining the purposes for which students utilize digital devices, it was found that an overwhelming majority, comprising 94.9%, reported using these devices for academic purposes. This includes activities such as reading lecture notes and textbooks, watching video lessons, and attending online lectures. Additionally, 82.4% of respondents indicated that they engage with family, friends, and society at large through their devices. This

aligns with the findings regarding social media usage, where the most frequently used platforms were identified as WhatsApp, YouTube, and Facebook.

Approximately 6% of students stated that they rely on digital devices to combat boredom, seek entertainment, and stay informed about current events. In contrast, literature indicates differing patterns of device usage among medical students. For instance, a study conducted in India assessing addiction-like behaviours associated with mobile phone use found that 74% of students used their phones for internet browsing, 66.1% for group messaging, and 64.8% for accessing social media networks. Notably, only 46.6% reported using mobile phones for educational purposes, which is relatively low compared to leisure activities. A study investigating medical students' perceptions of mobile technology utility revealed that 56.41% utilized mobile devices for academic purposes, while 20.83% used them for entertainment. The incidence of screen-based devices for educational purposes can be attributed to technological advancements that facilitate learning.(34,33)

Moreover, many students spend their undergraduate years away from home, resulting in limited opportunities to connect with their parents and loved ones due to demanding workloads. As a consequence, they often adopt digital devices as an efficient means of communication to maintain relationships with their social circles. Given that digital devices serve as all-in-one resources, it is not surprising that students depend on them for various daily tasks.

The subsequent focus of this study was to investigate the presence of signs and symptoms of computer vision syndrome (CVS) among the students. The results indicated that 57.0% of participants reported experiencing headaches associated with digital device use. Additionally, 14.2% complained of back pain, which may be linked to improper posture during device usage and prolonged periods spent in these positions. Furthermore, 2.8 % of students reported increased sensitivity to light, while 2.7% experienced blurred vision. Symptoms such as tearing and eye itching were reported by 1.9% and 1.3% of students, respectively. A 0.1 % found to have a burning sensation of the eye. These vision-related issues suggest a potential prevalence of computer vision syndrome among medical students. However, 20% of participants indicated they experienced none of the symptoms from the provided list, which may reflect the use of appropriate techniques and postures when utilizing screen-based devices.

In total, 21.7% of students reported experiencing only one symptom, while 58.3% indicated the presence

of two symptoms. These findings are consistent with numerous studies conducted previously. For instance, a study examining dry eye disease related to digital screen exposure among medical students in India found that eye strain, headaches, blurred vision, irritated eyes, and redness of the eyes were reported by 39%, 33%, 14%, 22%, and 18% of participants, respectively.

Additionally, research conducted in Pakistan assessing screen time and its relation to ophthalmic problems among medical students reported that 67.8% of participants experienced headaches, and 27.6% encountered difficulties with refocusing. Eye strain was reported by 48% of participants, while blurred vision, redness of the eyes, and dry eyes were experienced by 22.4%, 19.7%, and 5.9% of participants, respectively. Another study in India investigating computer vision syndrome and its effects on sleep quality among medical students reported that 77.5% of participants exhibited symptoms of CVS. This study further classified the severity of CVS, revealing that 2% of students fell into the severe category, 51% into the moderate category, and 25% into the mild category. (33,35,36,37)

Furthermore, a study assessing digital eye strain and screen usage among undergraduate medical students in South India revealed that 11% of participants were diagnosed with digital eye strain. Among them, 39.4% exhibited one or more symptoms of digital eye strain, with headaches reported as the most prevalent condition (42.5%). Additionally, 37% of participants reported experiencing eye strain, neck pain, shoulder pain, or back pain.

These findings underscore the significant health-related adverse effects associated with the use of screen-based devices among students.

The results of the present study indicated an association between screen time categories and the academic year of the students ($p > 0.05$); however, the positive relationship was not statistically significant. The findings suggest that students tend to engage more with screen-based devices during their final year, as well as during the second and third academic years. In contrast, a study conducted in Germany examining screen time and sleep among medical students reported slightly higher screen time during the preclinical phase (7.02 hours) compared to the clinical phase (6.86 hours).

Given the continuous advancement of technology, it is evident that the usage of digital devices will likely continue to increase, consequently elevating screen time. This rise is directly correlated with the increasing prevalence of health issues associated with digital device use unless

appropriate measures are implemented to address this situation. Such interventions will be crucial in protecting future generations from the adverse effects of modern technology.

CONCLUSION

This study demonstrates that medical students are spending a substantial amount of time using screen-based devices, with a significant proportion classified as having heavy screen time. Additionally, the findings indicate that the majority of students utilize these devices primarily for academic purposes. However, there is also a notable prevalence of screen-related health issues among the students, suggesting a likelihood of computer vision syndrome. Consequently, it is essential to enhance students' awareness and understanding of the potential adverse effects associated with problematic smartphone use and excessive screen time. Such efforts are crucial for reducing and preventing the prevalence of computer vision syndrome and other related health concerns.

LIMITATIONS AND RECOMMENDATIONS

In this study, while symptoms associated with computer vision syndrome (CVS) were examined, a definitive association between screen time and CVS was not established. Therefore, developing a standardized criterion to assess the relationship between these two factors would be beneficial. Utilizing such a criterion could facilitate a more thorough investigation into the prevalence of CVS among students.

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Conflict of Interest

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