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Effect of screen time on sleep quality among young adults: An observational cross-sectional study

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ABSTRACT

Background: Good sleep quality is associated with a wide range of positive outcomes, including better health, reduced daytime sleepiness, enhanced well-being, and improved psychological functioning. Over the past decade, the availability and usage of electronic devices have increased sharply, making them an integral part of young adults' lives. Blue light radiation emitted from electronic devices is known to suppress the production of melatonin – a hormone essential for sleep initiation – thereby worsening sleep quality. **Aims and Objectives:** To assess the effect of screen time on sleep quality among young adults and determine which component of sleep quality is most affected. **Materials and Methods:** This cross-sectional study was conducted after obtaining permission from the Institutional Ethics Committee. A total of 437 participants aged 18–25 years participated in an online survey. Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI). Data were analyzed using SPSS 27. **Results:** The average PSQI score was 5.94 (PSQI ≥5 indicates poor sleep quality). A significant association was observed between longer screen time and higher PSQI scores. Sleep latency was the most significantly affected component in our study. **Conclusion:** A substantial proportion of young adults in our study experience poor sleep quality, which is strongly associated with increased screen time. Since sleep latency is the most affected component, limiting electronic device usage before bedtime could help improve sleep quality.

Key words: Sleep quality; Screen time; Pittsburgh sleep quality index; Students; Young adults

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INTRODUCTION

Sleep is a fundamental biological process essential for maintaining optimal physical and mental health. In young adults, adequate sleep is crucial for cognitive functioning, emotional regulation, and overall well-being. However, contemporary lifestyles characterized by increased academic pressures, social engagements, and pervasive technology use have led to widespread sleep disturbances.[1]

Recent studies have highlighted the adverse effects of poor sleep quality on various health outcomes among young adults. Insufficient sleep has been associated with impaired cognitive performance, including deficits in attention, memory, and executive functions.[2] In addition, sleep deprivation has been linked to mood disturbances, such as increased anxiety and depression.[3] Furthermore, poor sleep quality has been implicated in the development of chronic health conditions, including metabolic dysregulation leading to an increased risk of obesity and

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Type 2 diabetes, as well as cardiovascular diseases due to potential contributions to hypertension and inflammation.[4]

One of the significant contributors to poor sleep quality among young adults is the extensive use of electronic devices, particularly at bedtime. The blue light emitted by smartphones, tablets, and laptops disrupts circadian rhythms and suppresses melatonin production, thereby delaying sleep onset and reducing overall sleep quality.[5] Studies indicate that individuals who frequently use electronic devices before bedtime experience increased sleep latency and reduced sleep efficiency, which can have long-term consequences on health and cognitive function.[6] Despite this, limited research has explored which specific components of sleep quality are most affected by screen exposure.

In addition, lifestyle factors such as irregular sleep schedules, high academic demands, and social obligations can further contribute to sleep disturbances. Young adults often sacrifice sleep for social engagements or academic commitments, leading to chronic sleep deprivation.[7] This bidirectional relationship between sleep quality and psychosocial functioning underscores the need for interventions that promote better sleep hygiene and time management strategies to mitigate the adverse effects of sleep deprivation. Interventions promoting good sleep hygiene, such as establishing regular sleep routines and reducing screen time before bedtime, may mitigate the adverse effects of poor sleep.[8]

Given the increasing prevalence of screen time usage among young adults, it is crucial to assess its impact on sleep quality comprehensively. Understanding which specific components of sleep, such as sleep latency, duration, or efficiency, are most affected will provide valuable insights into mitigating its adverse effects. This study aims to assess the effect of screen time on sleep quality among young adults and determine which component of sleep quality is most affected. Addressing sleep issues in young adults is essential for enhancing their health and overall well-being.

Aims and objectives

To assess the effect of screen time on sleep quality among young adults and determine which component of sleep quality has been most affected.

MATERIALS AND METHODS

Statement of ethics

The study received ethical approval from CDSIMER's Institutional Ethical Committee (CDSIMER/MR/0012/IEC/2021). The Google form itself included an explanation of the study's goal. After gaining consent, participants were permitted to take part in the study. Participants were guaranteed anonymity, and participation was entirely voluntary. The participants were not given any incentives. The acquired data were stored in a password-protected format and kept confidential.

Study design and participants

This cross-sectional survey, which took place between July and October of 2021, involved 437 young adults between the ages of 18 and 25. Simple Random Sampling was used to select the participants. Data were gathered through Google Forms that Instagram and WhatsApp distributed. Exclusion criteria included having a diagnosis of any sleep disorder, having a chronic respiratory condition (such as asthma, adenoids, allergic rhinitis, chest infections, or nasal congestion), having a chronic physical or mental illness, or taking prescription sleep aids for at least the previous 3 months. Questionnaires that were incomplete were not included in the data analysis.

Study sample

Sample size was calculating using the formula:

$$\text{Sample size } n=(DEFF\times Np[1-p])/([d2/Z21-\alpha/2\times[n-1]+P\times[1-P]),$$

Where,

n: Population size (for finite population correction factor or fpc)=1000000
P: Hypothesized % frequency of outcome factor in the population=30.36%±5
d: Confidence limits as % of 100 (absolute±%)=5%
DEFF: Design effect (for cluster surveys-DEFF)=1
Confidence interval=90%

The sample size obtained was 437.

Outcomes/Endpoints observed were subjective sleep quality, latency, duration, efficiency, disturbance, daytime dysfunction, need for medications using the Pittsburgh sleep quality index (PSQI), and screen time.

Study instrument

The standard and validated PSQI which was developed by researchers at the University of Pittsburgh in 1988 was used. The PSQI includes seven component scores which are added to obtain the Global PSQI score, which ranges from 0 to 21. A Global PSQI score that is ≥5 indicates poor sleep quality. The seven components are subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. The study questionnaire was based on PSQI and included demographic parameters such as

age, sex, screen time, and questions addressing the seven components. It also had questions regarding the screen time.

Statistical analysis

Data were collected from the participants through Google Forms and were extracted to Google Sheets, cleaned in Excel, and then imported and analyzed using SPSS 27. Descriptive statistics were used to determine demographic data. Comparison of sleep quality and sleep parameters in the participants with various "Screen time-related sleep risk factors" was done using Cross tab Chi-square Test for nominal variables. The independent t-test was used for qualitative data. A $P<0.05$ was statistically significant.

RESULTS

A total of 442 responses were obtained, of which 5 were excluded due to incomplete data. The final analysis included 437 participants (168 males and 269 females) with an average age of 19 years. Among participants, 67.4% of those with >5 h/day of screen time and 66.4% of those with <5 h/day reported screen usage after turning off the lights. In addition, 36.3% of individuals with >5 h/day and 44.3% of those with <5 h/day engaged in screen use after turning off the lights. A comparison of various components of sleep quality with screen time duration is presented in Table 1.

A total of 49.7% of users with >5 h/day screen time and 55.7% of individuals with <5 h/day screen time kept their electronic devices under or next to their pillows while sleeping, as shown in Figure 1. The scores for the "Sleep efficiency" component are presented in Table 2. A score of 3 indicates poor sleep efficiency, which ultimately contributes to decreased sleep quality. Among the participants, 95.5% (n=419) reported using mobile phones, making them the most frequently used device, while televisions were the least commonly used gadget.

A total of 21.2% of individuals with more than 5 h of screen time per day and 20.9% of those with <5 h/day kept their devices in flight mode or turned them off while sleeping. The majority of participants (75.5%) primarily used mobile phones during the daytime. Most participants (29.1%, n=127) reported a screen time of 6–8 h/day, while only 1.4% (n=6) had a screen time of <1 h/day.

Regarding the purpose of gadget usage, 19.7% used gadgets exclusively for academic work, 12.8% used them solely for non-academic purposes, and the majority (67.5%) used gadgets for both academic and non-academic activities. Additionally, 50.1% (n=219) of participants reported using devices with blue light filters (Table 3).

In this study, 55.8% (n=244) of participants had a usual bedtime between 9 PM and 12 AM, while 75.5% (n=330) reported waking up between 6 AM and 9 AM. The majority of participants (53.5%, n=234) took 15 min or less to fall asleep. Additionally, 37.5% (n=164) reported sleeping more than 5 h/night, whereas 8.7% (n=38) slept <5 h. A significant proportion (89%) of participants used electronic devices with a screen within 2 h before bedtime. Furthermore, 77.7% of individuals with more than 5 h of daily screen time and 84.6% of those with <5 h reported spending 6–12 h in bed.

In this study, 13% of individuals with more than 5 h of daily screen time and 7% of those with <5 h had a PSQI score between 11 and 17. Additionally, 28% of individuals with more than 5 h of screen time and 25.8% of those with <5 h had a PSQI score between 7 and 10, as shown in Figure 2.

DISCUSSION

This study examined the impact of screen time on sleep quality among young adults, analyzing data from 437 participants. The findings indicate a significant relationship between prolonged screen exposure and various sleep parameters. The study population comprised 168 males and 269 females, with an average age of 19 years. A majority (67.5%) used electronic devices for both academic and non-academic purposes, with mobile phones being the most commonly used device (95.5%). Notably, 89% of participants engaged in screen use within 2 h before bedtime, a practice known to negatively impact sleep quality.[9] Despite 50.1% of participants having devices equipped with blue light filters, sleep disturbances were still prevalent.

Subjective sleep quality was significantly affected by screen usage duration. Participants with more than 5 h of screen time per day reported lower subjective sleep quality ($P=0.001$), with a greater proportion rating their sleep as "fairly bad" or "very bad".[10] Similarly, the PSQI scores were significantly higher among those with greater screen exposure ($P=0.016$), indicating poorer sleep quality.[11] Despite extended screen exposure, sleep efficiency did not significantly differ between groups ($P=0.560$). However, daytime dysfunction – characterized by difficulty staying awake during daily activities – was more pronounced among high-screen users ($P=0.016$).[12]

In addition, 67.4% of individuals with >5 h/day and 66.4% of those with <5 h/day reported using screens after turning off the lights.[13] Alarmingly, 49.7% of heavy screen users kept their electronic devices under or next to their pillows

Table 1: Sleep disturbance and related details according to the number of hours of screen usage

Sleep variables	Number of hours screen usage		Total (n=437) (%)	P-value
	<5 h (n=244) (%)	>5 h (n=193) (%)		
Sleep disturbances				
Not during the past month	51 (20.9)	33 (17.1)	84 (19.2)	0.560
Less than once a week	169 (69.3)	134 (69.4)	303 (69.3)	
Once or twice a week	23 (9.4)	25 (13)	48 (11)	
Three or more times a week	1 (0.4)	1 (0.5)	2 (0.5)	
How often during the past month have you had trouble sleeping because of other problems?				
Not during the past month	206 (84.4)	164 (85)	370 (84.7)	0.971
Less than once a week	12 (4.9)	8 (4.1)	20 (4.6)	
Once or twice a week	15 (6.1)	13 (6.7)	28 (6.4)	
Three or more times a week	11 (4.5)	8 (4.1)	19 (4.3)	
Subjective sleep quality				
Very good	63 (25.8)	27 (14)	90 (20.6)	0.001**
Fairly good	147 (60.2)	117 (60.6)	264 (60.4)	
Fairly bad	27 (11.1)	43 (22.3)	70 (16)	
Very bad	7 (2.9)	6 (3.1)	13 (3)	
Use of sleep medication				
Not during the past month	236 (96.7)	177 (91.7)	413 (94.5)	0.086+
Less than once a week	2 (0.8)	8 (4.1)	10 (2.3)	
Once or twice a week	5 (2)	6 (3.1)	11 (2.5)	
Three or more times a week	1 (0.4)	2 (1)	3 (0.7)	
During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?				
Not during the past month	158 (64.8)	104 (53.9)	262 (60)	0.016*
Less than once a week	45 (18.4)	44 (22.8)	89 (20.4)	
Once or twice a week	32 (13.1)	25 (13)	57 (13)	
Three or more times a week	9 (3.7)	20 (10.4)	29 (6.6)	
During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?				
No problem at all	67 (27.5)	43 (22.3)	110 (25.2)	0.152
Only a very slight problem	82 (33.6)	55 (28.5)	137 (31.4)	
Somewhat of a problem	62 (25.4)	67 (34.7)	129 (29.5)	
A very big problem	33 (13.5)	28 (14.5)	61 (14)	
Daytime dysfunction				
0	59 (24.2)	40 (20.7)	99 (22.7)	0.206
1–2	109 (44.7)	75 (38.9)	184 (42.1)	
3–4	62 (25.4)	60 (31.1)	122 (27.9)	
5–6	14 (5.7)	18 (9.3)	32 (7.3)	
If you have a roommate or bed partner, ask him/her how often in the past month you have had loud snoring?				
No roommate or bed partner	70 (28.7)	61 (31.6)	131 (30)	0.142
Not during the past month	144 (59)	106 (54.9)	250 (57.2)	
Less than once a week	19 (7.8)	8 (4.1)	27 (6.2)	
Once or twice a week	7 (2.9)	10 (5.2)	17 (3.9)	
Three or more times a week	1 (0.4)	5 (2.6)	6 (1.4)	
If you have a roommate or bed partner, ask him/her how often in the past month you have had long pauses between breaths while asleep?				
No roommate or bed partner	76 (31.1)	66 (34.2)	142 (32.5)	0.130
Not during the past month	151 (61.9)	109 (56.5)	260 (59.5)	
Less than once a week	11 (4.5)	8 (4.1)	19 (4.3)	
Once or twice a week	5 (2)	3 (1.6)	8 (1.8)	
Three or more times a week	1 (0.4)	6 (3.1)	7 (1.6)	
If you have a roommate or bed partner, ask him/her how often in the past month you have had legs twitching or jerking while you sleep?				
No roommate or bed partner	80 (32.8)	66 (34.2)	146 (33.4)	0.215
Not during the past month	105 (43)	68 (35.2)	173 (39.6)	
Less than once a week	35 (14.3)	27 (14)	62 (14.2)	
Once or twice a week	15 (6.1)	22 (11.4)	37 (8.5)	
Three or more times a week	9 (3.7)	10 (5.2)	19 (4.3)	
If you have a roommate or bed partner, ask him/her how often in the past month you have had legs episodes of disorientation or confusion during sleep?				
No roommate or bed partner	78 (32)	69 (35.8)	147 (33.6)	0.495
Not during the past month	130 (53.3)	87 (45.1)	217 (49.7)	
Less than once a week	23 (9.4)	25 (13)	48 (11)	
Three or more times a week	4 (1.6)	3 (1.6)	7 (1.6)	

Chi-square/fisher exact test. (+Suggestive significance [P=0.05<P<0.10]. *Moderately significant [P=0.01<P£0.05]. **Strongly significant [P=P£0.01])

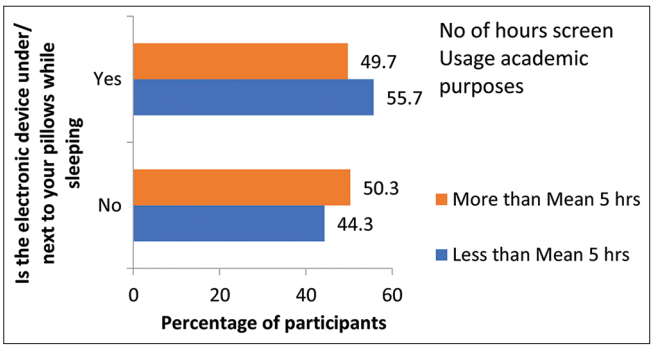

Figure 1: Percentage of participants who keep their electronic device under/next to the pillows while sleeping with a number of hours of screen usage

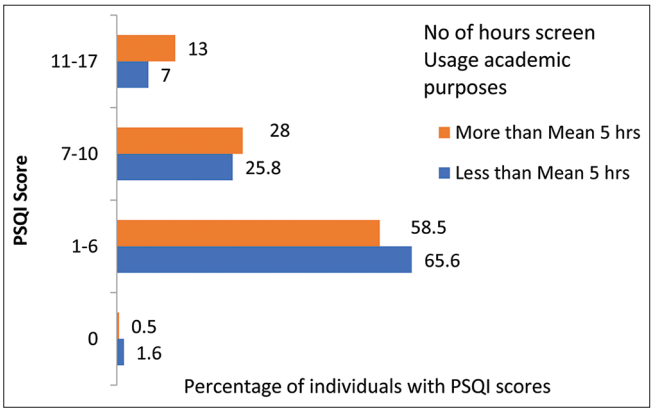

Figure 2: Comparison of percentage of Pittsburgh sleep quality index scores with screen time

Table 2: Sleep efficiency according to the number of hours of screen usage

Sleep efficiency (%)	Number of hours screen usage for academic purposes		Total (%)
	<Mean 5 h (%)	More than mean 5 h (%)	
>85	166 (68)	130 (67.4)	296 (67.7)
75–84	42 (17.2)	33 (17.1)	75 (17.2)
65–74	19 (7.8)	15 (7.8)	34 (7.8)
<65	17 (7)	15 (7.8)	32 (7.3)
Total	244 (100)	193 (100)	437 (100)

while sleeping, and only 21.2% of this group switched their devices off or to flight mode during sleep.[14] These nighttime habits have been linked to poor sleep outcomes in previous research.[15]

Our findings emphasize the detrimental effects of prolonged screen exposure on perceived sleep quality and daytime alertness. Emerging evidence suggests that excessive screen use before bedtime disrupts circadian rhythms, delays sleep onset, and reduces overall sleep quality.[16,17] Furthermore, interactive screen-based activities heighten cognitive arousal and suppress melatonin production, further compromising sleep.[18,19] These findings align with previous studies demonstrating the adverse impact of evening screen time on sleep patterns.[20]

To mitigate these negative effects, strategies such as limiting screen exposure before bedtime, using blue light filters, and promoting digital detox periods have been recommended. Studies suggest that these interventions can significantly improve sleep quality by minimizing artificial light exposure that disrupts circadian rhythms.[19,20] Prolonged evening screen use has been linked to delayed sleep onset and decreased sleep efficiency due to melatonin suppression.[16,17] In addition, excessive screen time has been associated with increased sleep latency and shorter total sleep duration, particularly in young adults.[17,19]

Furthermore, educational schedules and societal norms may exacerbate the adverse effects of nighttime screen exposure. For example, a recent study emphasized the need for adjusting school start times to accommodate adolescents' sleep–wake cycles, reducing the impact of technology use at night.[18] In addition, digital overuse during after-school hours has been shown to correlate with poorer sleep outcomes, reinforcing the importance of setting screen time limits.[19] The COVID-19 pandemic further amplified screen exposure due to online learning, which significantly affected sleep quality among university students.[20] Implementing structured digital wellness

Table 3: Comparison of baseline variables according to number of hours of screen usage

Variables	Number of hours screen usage		Total	P-value
	<5 h	>5 h		
Age in years	19.48±1.74	19.75±1.92	19.60±1.83	0.136
Number of hours of screen usage for academic purpose	2.82±1.52	6.85±2.66	4.60±2.90	<0.001**
Number of hours of screen usage for non-academic purpose	3.63±2.32	3.61±2.84	3.62±2.56	0.941
Number of hours spent in bed	7.55±1.34	7.53±1.37	7.54±1.35	0.826
Actual hours of sleep	6.90±1.31	6.75±1.2	6.83±1.26	0.221
PSQI	5.60±3.26	6.37±3.37	5.94±3.33	0.016*

*Moderately significant (P=0.01<P<0.05), **Strongly significant (P=P<0.01). PSQI: Pittsburgh sleep quality index

strategies, such as scheduled screen-free time and educational programs on healthy screen habits, could help mitigate these issues and improve sleep hygiene among young individuals.[19,20]

Limitations of the study

The limitations of this study are that there are many confounding factors that could also affect sleep quality that have not been eliminated such as diet and lifestyle of the participants. Also, it is a questionnaire-based study, the results can only give supportive evidence and more detailed studies are necessary.

Further research with objective sleep measurements, such as actigraphy or polysomnography, could provide deeper insights into the physiological impact of screen exposure on sleep quality.

CONCLUSION

The increasing prevalence of screen time among young adults is significantly associated with altered sleep patterns, reduced sleep duration, and increased sleep disturbances. This study adds to the growing body of literature highlighting the negative consequences of excessive screen exposure, particularly during evening hours. The findings underscore the importance of implementing strategies such as limiting screen exposure before bedtime, promoting digital wellness education, and encouraging healthier sleep hygiene practices. Given the significant impact of screen time on sleep, further research is warranted to explore long-term consequences and potential interventions to mitigate these effects.

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STATEMENT OF ETHICS COMMITTEE

The study was approved by Institutional Ethics Committee, CDSIMER vide approval letter CDSIMER/MR/0012/IEC/2021, dated September 11, 2021.

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