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Screening Student Behavior: Exploring the Impact of Daily Screen Time on Sleep Quality, Mental Distress, and Academic Performance in Students

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ABSTRACT

The pervasive influence of technology, particularly screen usage, on daily routines and its implications for sleep quality, mental health, academic performance, and physical activity has become an increasing area of concern. **Objective:** To evaluate the daily screen time of students from different fields of study and to assess its association with demographic variables, sleep quality, psychological symptoms, physical activity, and academic performance. **Methods:** This study was performed at Isra University, Hyderabad from February 2024 to August 2024, with 152 participants. Data on demographics, sleep quality (PSQI), mental distress (DASS-42), academic performance, and screen time were collected after informed consent. Statistical analysis, conducted using SPSS version 25.0, determined correlations between daily screen time, PSQI, and DAS scores. **Results:** The participants had a mean age of 20.59 ± 2.16 years, with most residing in urban areas (87.5%) and being day scholars (74.34%). Average daily screen time was 5.85 ± 1.14 hours, significantly higher among those with GPAs below 2.5 and low physical activity levels ($p<0.05$). Mean scores for depression, anxiety, stress, and PSQI were 13.34 ± 12.01, 11.17 ± 9.41, 15.32 ± 11.09, and 6.45 ± 3.48, respectively. Screen time positively correlated with depression ($r = 0.81$, $p<0.01$), anxiety ($r = 0.78$, $p<0.01$), stress ($r = 0.83$, $p<0.01$), and PSQI ($r = 0.75$, $p<0.01$). **Conclusion:** Increased screen time was linked to poorer sleep quality, elevated mental distress, and reduced academic performance, particularly in urban populations and individuals using screens for recreation.

INTRODUCTION

With the rise of online connectivity, mobile devices, and social media platforms, technology has become an integral part of daily life, serving both recreational and professional purposes. This shift has led to a significant increase in the number of individuals using computers and electronic devices, thereby contributing to higher screen time[1, 2]. Prolonged exposure to screens emitting blue light disrupts the body's circadian rhythm, leading to sleep disturbances such as insomnia and irregular sleep patterns, which hinder sleep initiation and overall sleep quality [3]. Previous studies have shown that students with higher smartphone usage, particularly at night, experience poorer sleep quality and heightened anxiety levels [4,5]. Sleep plays a critical role in physical health, cognitive function, and academic performance. Inadequate sleep has been associated with cardiometabolic disorders such as obesity, diabetes, and hypertension, as well as psychological issues like stress, depression, and anxiety [6]. Sleep deprivation impairs attention, mental processing speed, logical reasoning, and productivity, ultimately leading to declining academic performance [6]. Like poor sleep, depression is more prevalent among younger individuals with prolonged digital content consumption, particularly on computers [1]. Research suggests that excessive screen use, combined with social media-driven validation pressures, increases vulnerability to depression. This reliance on virtual interactions reduces face-to-face socialization, often leading to social withdrawal and

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hormonal imbalances in dopamine, serotonin, and endorphins—neurotransmitters critical for emotional well-being [7].While digital technology has revolutionized education, communication, and information accessibility, prolonged screen exposure is associated with negative health consequences, including sleep deprivation, social behavior disruptions, and academic decline [8]. The global prevalence of mobile internet device usage has increased exponentially, with a thousand-fold rise in the past decade [9]. Studies indicate that daily screen time exceeding two hours is now common and may adversely impact both physical and psychological health [10]. Excessive screen time has been strongly linked to declining academic performance, largely due to its effects on cognitive function, concentration, and sleep patterns. Research suggests that late-night screen exposure disrupts sleep cycles and reduces memory consolidation, impairing focus, learning efficiency, and information retention [11]. Additionally, screen-based activities, particularly social media and entertainment content, contribute to academic procrastination, reducing the time available for studying and completing assignments [12]. Studies have also found a direct relationship between increased screen time and lower GPA, with students reporting difficulty concentrating, increased fatigue, and reduced classroom engagement [13]. Given these concerns, understanding the role of screen time in academic success is essential for developing strategies to balance digital engagement with educational achievement. Although many studies have explored the effects of screen time on sleep and mental health, research focusing on university students remains limited, particularly in developing countries, where digital habits and academic pressures may differ. Furthermore, prior research often examines mental health and sleep disturbances separately, without considering how these factors collectively impact academic performance. This study aims to bridge these gaps by providing a comprehensive analysis of the relationship between screen time, sleep quality, mental distress, and academic performance among university students.

This study's objective was to evaluate the daily screen time of students across various fields of study and to assess its association with demographic variables, sleep quality, mental health symptoms, and academic achievement.

METHODS

This cross-sectional research was performed from February 2024 to August 2024, conducted at Isra University, Hyderabad after being approved by the Isra University Ethical Review Board (ERB letter # IU/RR-10-IRC-24/N/2024/108). The sample size was estimated using the OpenEpi calculator, with a 95% confidence level (α = 0.05) and 80% statistical power (β = 0.20). An anticipated moderate correlation ($r \approx 0.3$) between screen time and mental health outcomes was used, based on previous studies that reported similar effect sizes[14]. To mitigate the impact of dropouts and non-responses, the initial estimate of 85 participants was adjusted upward by 20%, yielding a final target of 102 participants. However, a total of 152 students from various academic disciplines were recruited using purposive sampling, ensuring sufficient power for subgroup analyses and correlation studies. The sample included students from medical and allied health sciences (MBBS: 30, BDS: 20, DPT: 15, Pharmacy: 12) and non-medical fields (Engineering: 25, MBA: 25, BBA: 25), to capture a broad spectrum of screen time habits and their impacts. Informed consent was obtained after explaining the study objectives. The inclusion criteria were students who consented to participate, while those with pre-existing mental health conditions, undergoing psychological treatment, or unwilling to participate were excluded. This study controlled for certain confounding variables through eligibility criteria and participant selection. Students with pre-existing mental health conditions or those undergoing psychological treatment were excluded to minimize health-related confounders. Additionally, socioeconomic status was considered in the questionnaire, ensuring that only participants from similar educational and financial backgrounds were included, thereby reducing potential disparities. While other lifestyle factors were not explicitly controlled, the homogeneity of the sample helped minimize their impact. Demographic data included age, gender, residence, and campus accommodation. Academic performance data were self-reported by participants, providing their GPA as an indicator of their scholastic achievements. Participants provided consent for accessing their most recent GPA, which was verified through official academic records maintained by the institution. Physical activity levels were evaluated by asking participants about their frequency of exercise, categorized as frequent (≥3 times/week) or rare/none. Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), a standardized self-reported questionnaire that evaluates sleep disturbances over the past month. It consists of seven components, including subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. The total PSQI score ranges from 0 to 21, with higher scores indicating poorer sleep quality. The PSQI has demonstrated high internal consistency (Cronbach's α = 0.68) and strong validity in measuring sleep disturbances [15]. Mental distress, including depression, anxiety, and stress, was assessed using the Depression, Anxiety, and Stress Scale (DASS-42), a widely validated self-reported instrument. It consists of

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42 items divided into three subscales, each measuring symptoms of depression, anxiety, and stress over the past week. Each item is rated on a 4-point Likert scale (0 = Did not apply to me at all, 3 = Applied to me very much or most of the time), with higher scores indicating greater psychological distress. The total score is obtained by summing the responses for each subscale, with established cutoff points to categorize symptom severity. The DASS-42 has demonstrated excellent reliability, with Cronbach's α = 0.96 [16]. Daily screen time data were self-reported, measured in hours per day, and categorized into <5 and ≥5 hours. Pearson's correlation coefficient was used to assess the linear relationship between the quantitative variables: daily screen time, PSQI, and DASS scores. The Chi-square test was applied to evaluate associations between the qualitative variables: screen time, demographic factors (gender, residence, accommodation type), GPA categories, and physical activity levels. Data were analyzed by SPSS version 25.0.

RESULTS

The mean age of the participants was 20.59±2.16 years. The majority of the participants i.e. 50% belonged to the 18-20 years' age group while only 4.6% of participants belonged to the <18-year age group. A vast majority of the participants belonged to urban areas (87.5%) and were day scholars (74.34%). Table 1 provides the demographic details of the study participants.

Table 1: Demographic variables of the study population (n=152)

Category	Frequency (%)
Age Group (Years)	
<18	07 (4.60%)
18 - 20	76 (50.00%)
21 - 22	47 (30.92%)
>22	22 (14.47%)
Gender	
Male	73 (48.02)
Female	79 (51.97)
Residence	
Urban	133 (87.5)
Rural	19 (12.5)
Accommodation	
Day Scholar	113 (74.34)
Hostelite	39 (25.65)
Field of Study	
Medical	77 (50.65)
Non-medical	75 (49.34)

The study participant's mean daily screen time was identified as 5.85±1.14 hours. A statistically significant association was observed between daily screen time and participants from the urban population ($p<0.05$), as shown in Table 2. Additionally, screen usage purpose was significantly associated with daily screen time, with participants engaging in recreational screen time being more prone to report higher usage compared to those using screens mainly for academic purposes ($p<0.05$). GPA also showed a significant relationship, where students with a GPA below 2.5 exhibited significantly higher screen time compared to their peers with a GPA above 2.5 ($p<0.05$). Similarly, exercise frequency was associated with screen time, as students who engaged in regular physical activity (≥3 times/week) reported lower screen time than those with rare or no physical activity ($p<0.05$). However, no significant association was noted between daily screen time and gender or campus accommodation ($p>0.05$).

Table 2: Association of Demographic Variables With Daily Screen Time

Variables	Category	Daily Screen time in hours		X^2	p-Value
		<5	≥5		
Gender	Male	19	54	0.21	0.64
	Female	18	61		
Residence	Urban	28	105	6.25	0.01*
	Rural	9	10		
Accommodation	Day Scholar	29	84	0.41	0.51
	Hostelite	8	31		
GPA	>2.5	31	14	68.87	0.001*
	< 2.5	6	101		
Screen Usage Purpose	Academic	26	18	40.60	0.001*
	Recreational	11	97		
Exercise Frequency	≥3 times/ week	33	25	53.96	0.001*
	Rare/None	4	90		

The average PSQI score among participants was 6.45±3.48. A significant positive correlation ($r = 0.75$, $p<0.01$) indicated that increased daily screen time was linked to poorer sleep quality.

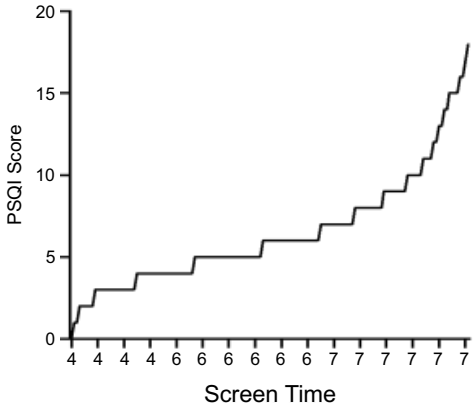

Figure 1: Correlation of Daily Screen Time with Sleep Quality (PSQI Score)

The mean scored of depression, anxiety, and stress were found to be 13.34±12.01, 11.17±9.41, and 15.32±11.09 respectively. Figure 2 shows the correlation of these mental health variables with daily screen time. There was a

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statistically significant positive relationship observed between screen time and depression (r = 0.81, p<0.01), anxiety (r = 0.78, p<0.01), and stress (r = 0.83, p<0.01).

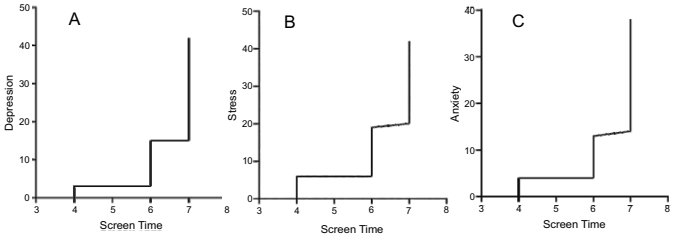

Figure 2: Correlation of Daily Screen Time with A) Depression B) Stress C) Anxiety

DISCUSSION

This study's objective was to evaluate the daily screen time of students across various fields of study and to assess its association with demographic variables, sleep quality, mental health symptoms, and academic achievement. These findings revealed a statistically significant association between daily screen time and urban residency. This is consistent with the explanation provided by Nedjar-Guerre *et al.*, who noted that urban families generally own more screen devices compared to their rural counterparts, contributing to higher screen time in urban populations[17]. However, this contrasts with Varadarajan *et al.*, and Wang *et al.*, who found no association between screen time and residential settings [18, 19]. These discrepancies may stem from differences in study populations, as this research focused on university students, whereas previous studies included younger age groups or mixed demographics. Additionally, variations in internet accessibility, urban infrastructure, and cultural screen use habits across different regions may contribute to these conflicting findings.This study found no significant correlation between daily screen time and gender.However, research by Whiting *et al.*, reported higher screen time among boys compared to girls [20]. These differences could be influenced by cultural and social norms, where in some regions, males may engage more in gaming or entertainment-based screen use, whereas in others, screen exposure may be more evenly distributed due to educational demands or technological accessibility among both genders.The study identified a significant positive correlation between screen time and PSQI scores, implying that greater screen time correlates with lower sleep quality. This aligns with Maurya *et al.*, who demonstrated that excessive screen time among young adults raised the likelihood of sleep problems [21]. Similarly, Adamczewska-Chmiel *et al.*, found that individuals with problematic smartphone usage experienced shorter sleep durations and more frequent sleep deprivation due to decreased serum melatonin levels caused by smartphone-induced magnetic fields [22]. Moreover, prolonged screen exposure, especially before bedtime, delays sleep onset due to blue light exposure and impairs body regeneration processes [23, 24]. Guerrero *et al.*, suggested that excessive screen behaviors replace essential activities such as sleep, further emphasizing the importance of balanced screen time [23].This research found a significant positive association between screen time and mental health parameters, including depression, anxiety, and stress, aligning with findings by Li *et al.*, and Adamczewska-Chmiel *et al.*, who reported that high screen time correlates with heightened anxiety and depressive symptoms [5, 22].These effects can be explained by several neurophysiological mechanisms, including dopamine dysregulation, cortisol elevation, and melatonin suppression [7, 9, 25].Digital media, particularly social media and gaming, overstimulates the dopaminergic reward system, leading to reduced dopamine receptor sensitivity, which contributes to mood instability, impulsivity, and depressive symptoms [26].Additionally, prolonged screen exposure triggers chronic low-grade stress responses, causing sustained cortisol elevation, which is linked to increased anxiety, emotional dysregulation, and cognitive impairments [7]. Furthermore, blue light from screens suppresses melatonin production, disrupting circadian rhythms, reducing deep sleep, and increasing emotional reactivity, further compounding mental health challenges [27]. Boers *et al.*, demonstrated that each additional hour spent on online platforms significantly increases depressive symptoms among youth [28], while Ma *et al.*, highlighted the role of social media and television exposure in exacerbating depressive tendencies [29].The present study highlighted that students who used screens primarily for recreational purposes were more likely to exhibit higher screen times, poorer sleep quality, and elevated mental distress compared to those who used screens for academic purposes.Furthermore, a significant relationship was observed between lower GPA scores and increased screen time, suggesting that excessive screen exposure detracts from academic performance. This aligns with the results of Sapci *et al.*, who reported that higher screen time significantly reduces GPA [30]. Similarly, an association was noted between higher screen time and lower physical activity, suggesting a more sedentary lifestyle, which contrasts with the findings of Hadianfard *et al.*, who found that recreational screen activities (≥2 hours/day) were linked to increased physical activity [31].The relationship between screen time and physical activity varies across studies due to differences in screen type, usage purpose, and study context. Television and gaming are linked to prolonged sedentary behavior, whereas smartphones may allow mobility (e.g., listening to music while exercising). Additionally, academic screen use

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may reduce activity, while fitness apps and social media challenges encourage it.These variations suggest that screen time's impact on physical activity is not universal and depends on multiple contextual factors.In light of these findings, it is evident that excessive screen time poses considerable risks to physical, mental, and academic well-being. Future research should further explore these contextual factors to better understand the complexities of screen exposure and its effects. Although the study contributes to the field, its limitations must be acknowledged, particularly the small sample size, which may restrict the extent to which the findings can be generalized. Future investigations should aim to bridge these gaps to offer an in-depth understanding of the complex relationships between screen time, health, and academic performance.

CONCLUSIONS

The study concluded that increased screen time is strongly correlated with diminished sleep quality, amplified mental distress manifested as raised levels of depression, anxiety, and stress and lower academic performance.These effects were particularly pronounced among urban populations and students using screens predominantly for recreational purposes. These observations stress the significance of balancing screen usage to safeguard both physical and mental health while supporting academic success.

Authors Contribution

Conceptualization: KAM, MT, AK, HF, UM, M
Methodology: MT, AK, HF, UM, M
Formal analysis: KAM
Writing, review and editing: KAM, MT, AK, HF, UM, M

All authors have read and agreed to the published version of the manuscript

Conflicts of Interest

All the authors declare no conflict of interest.

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