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Original article

Screen time and its impact on university students

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Summary

Introduction. The increasing use of digital devices among university students has raised concerns regarding its potential impact on physical and mental health. However, the independent contribution of different patterns of screen use remains insufficiently understood. This study aimed to examine screen use patterns among medical students and to assess their associations with selected health outcomes, with a particular focus on identifying independent predictors.

Methods. A cross-sectional study was conducted among 96 medical students aged 19–26 years. Data were collected using a self-administered questionnaire assessing daily screen time, timing of use, physical activity, and health-related outcomes. Multivariate binary logistic regression models were used to identify independent predictors of sleep disturbances, anxiety, and musculoskeletal pain.

Results. The median daily screen time was five hours. The most frequently reported health issues were eye strain (56.3%), musculoskeletal pain (53.1%), sleep disturbances (46.9%), and anxiety (40.6%). A weak but statistically significant positive correlation was observed between screen time and sleep disturbances ($r_s = 0.209$, $p = 0.044$, $N = 93$ due to missing data for three participants). In multivariate analysis, late-night screen use was identified as an independent predictor of sleep disturbances (OR = 9.37, 95% CI: 1.96–44.75, $p = 0.005$), whereas total screen time was not significant after adjustment. No independent predictors were identified for anxiety or musculoskeletal pain.

Conclusion. The findings suggest that the impact of screen use on health outcomes is domain-specific. Behavioral patterns, particularly late-night use, appear to be more relevant than total screen time in relation to sleep disturbances. These results highlight the importance of a behavior-oriented approach to digital media use among students.

Key words: screen time, media usage, medical students, sleep, digital health

Introduction

The increasing use of digital technology in daily life has significantly transformed the way how university students study, communicate, and socialize. Devices such as smartphones, tablets, and laptops have become indispensable tools for academic and personal use, allowing constant access to information and online interaction. However, this convenience has also

led to a rise in the number of hours students spend in front of screens each day, often beyond the recommended duration [1]. While digital tools contribute positively to education and connectivity, excessive screen exposure poses several health and behavioral challenges. Prolonged screen use has been linked to physical discomfort, such as eye strain, musculoskeletal pain, and sleep disturbances [2]. Extended screen time may negatively affect mental well-being, contributing to stress, anxiety, and reduced concentration levels [3].

Long-term use of digital devices can also result in physical health issues. According to Rosenfield, prolonged screen time is linked to computer vision syndrome, which manifests as headaches, blurred vision, dry eyes, and eye strain [4]. Prior studies have demonstrated that excessive smartphone usage may affect academic performance. Karpinski et al. showed that students who used social networking sites a lot tended to do worse in school and study less than students who used them less often [5]. Twenge et al. conducted a large cross-sectional study to investigate the relationship between digital media use and mental health problems in teens and young adults. The authors reported that individuals who spent more time on electronic screens were significantly more likely to report depression, stress, or life dissatisfaction. The study further emphasized that individuals with the highest levels of daily screen exposure exhibited significantly lower levels of overall well-being in comparison to those who reported moderate or limited digital media usage [6].

Numerous studies focusing on university students have investigated the correlation between digital media usage and academic engagement. Junco and Cotten investigated the impact of multitasking with digital media during academic tasks, revealing that students who regularly utilized mobile devices and social networking sites while studying exhibited diminished academic engagement and inferior academic performance. The authors posited that the incessant alternation of attention between academic tasks and digital media could detrimentally affect cognitive processing, diminish concentration, and ultimately obstruct effective learning. The study also stressed that university students who used their smartphones and social media too much while studying were not so good in school and were less productive [7].

Given these concerns, understanding how university students use screens and how much time they spend on digital devices is vital. The study aims to assess the patterns of screen usage and determine the average number of hours the university students spend on screens daily. The findings may help guide initiatives aimed at encouraging healthier digital habits and improving awareness about balanced screen use in academic settings.

Methods

The research was conducted as a cross-sectional descriptive study design to evaluate screen use patterns among students from the University of East Sarajevo, Faculty of Medicine, Foca. A quantitative approach was used to collect and analyze the data. The study was conducted in October 2025. A total of 96 undergraduate students aged between 19 and 26 years were included in the study. The inclusion criteria required participants to be current university students using digital devices daily for academic or personal purposes. Participation was not compulsory; students took part of their own free will.

Data were collected using a self-administered questionnaire, designed especially for this study, consisting of 15 questions. The questionnaire was distributed online in the form of a survey, using Google Forms. It consisted of two parts. The first part of the questionnaire was related to demographic details, including age, sex, accommodation,

and academic year. The second part included screen usage patterns, focusing on the average number of hours spent daily on digital devices such as smartphones, laptops, and tablets. Also, this part of the questionnaire included screen-based activities, breaks taken after using the devices, and health-related effects, self-reported symptoms possibly due to prolonged screen use, including eye strain, back ache, anxiety or mental fatigue, changes in body weight, and sleep disturbance. Participants expressed the frequency of the symptoms mentioned through a four-point Likert scale (never, sometimes, often, always). Regarding the timing of screen use, participants were asked to indicate the predominant part of the day when they used screens (Morning/Afternoon, Evening, or Late night). "Late night" was defined as use occurring predominantly after midnight, based on self-report.

Statistical analysis was performed using IBM SPSS Statistics v.29. Data normality was assessed using the Kolmogorov-Smirnov test. Continuous variables were expressed as median and minimal and maximal value (min, max) for non-normally distributed data. Categorical variables were presented as absolute numbers and percentages. Differences between groups were analyzed using the Mann-Whitney U test or Kruskal-Wallis H test, while correlations were evaluated using Spearman's correlation coefficient. Multivariate analysis was conducted using binary logistic regression to assess independent predictors of key health outcomes, including sleep disturbances, anxiety, and musculoskeletal pain. Each outcome was modeled separately as a dichotomous variable (0 = absence, 1 = presence). Predictor variables included total daily screen time, timing of screen use, physical activity level, sex, and frequency of breaks. Categorical predictors were entered using dummy coding, and all variables were included simultaneously in the models. Model adequacy was evaluated using the Hosmer-Lemeshow goodness-of-fit test, while model performance was assessed using pseudo-R^2 measures (Cox & Snell and Nagelkerke). Adjusted associations were reported as odds ratios (OR) with 95% confidence intervals. All statistical tests were two-tailed, and a p-value of $p < 0.05$ was considered statistically significant.

Results

The total study sample included 96 participants. Minor differences in sample size across specific analyses resulted from occasional missing responses to individual questionnaire items.

A total of 96 participants were included in the study, consisting of 52 (54.2%) males and 44 (45.8%) females. The median age in females was 21.0 (18.0 – 24.0) and in males it was 21.0 (18.0 – 28.0), with no statistically significant difference ($U = 1102.5$, $Z = -0.308$, $p = 0.758$).

Regarding the academic year, the majority of the students were in their second year (Table 1). Students mostly rated their overall health as "good", while a smaller proportion rated it "poor" (Table 2). In terms of residency, 91 (94.8%) lived in apartments.

Table 1. Frequency distribution of students' academic year

Academic year	n	%
First	2	2.1
Second	37	38.5
Third	25	26.0
Fourth	15	15.6
Fifth	5	5.2
Sixth	12	12.5

As shown in Table 1, second-year students comprised the largest group (38.5%), followed by third-year students (26.0%). First-year students were least represented (2.1%).

Table 2. Frequency distribution of students' overall health

Overall health	n	%
Poor	1	1.0
Average	21	21.9
Good	56	58.3
Excellent	18	18.8

Table 2 shows that the majority of participants (58.3%) rated their overall health as good, while 18.8% reported excellent health. Only one participant (1.0%) reported poor overall health.

A Kruskal-Wallis H test showed that there was no statistically significant difference in median overall health ratings across the different years of study (H = 5.688, df = 5, p = 0.338).

A Mann-Whitney U test was conducted to determine if there were differences in health ratings between males and females. The results indicated a statistically significant difference (U = 879.50, Z = -2.196, p = 0.028). Males reported significantly higher overall health ratings (Mean Rank = 53.59) compared to females (Mean Rank = 42.49). While both groups shared a similar median score (med = 3), the distribution of ranks suggested that male participants generally perceived their health more positively than their female counterparts.

Regarding digital habits, a Mann-Whitney U test showed no significant difference in the average daily screen time between males (Mean Rank = 45.38) and females (Mean Rank = 48.96), with U = 988.5, p = 0.521. This suggested that sex did not play a significant role in the quantity of technology use within this sample. Furthermore, a Chi-Square test was used to determine if the time of day when screens were most used (Morning/Afternoon, Evening, or Late Night) differed by sex. The results were non-significant ($\chi^2 = 1.973$, df = 2, p = 0.373), indicating that both sexes share similar patterns regarding when they use their devices during the day. Detailed frequency distribution is shown in Table 3.

As presented in Table 3, evening was the most common period of screen use overall (46.9%), followed by late night (28.1%) and morning/afternoon (25.0%). Female participants showed a slightly higher tendency toward evening use (54.5%) compared to males (40.4%).

A Kruskal-Wallis H test showed that the specific period of day for screen use (Morning/Afternoon, Evening, or Late Night) did not have a statistically significant impact on how participants rated their overall health (H = 1.197, p = 0.550).

The median daily use of the screen was five hours (min = 1, max = 19). There was no statistically significant difference between males and females in medians of hours spent in front of screens (U = 988.5, p = 0.521). The most frequently used activities were: online learning/studying, n = 80 (83.3%); watching videos, n = 77 (80.2%); social media, n = 75 (78.1%); messaging, n = 62 (64.6%); reading (e-books and articles), n = 52 (54.2%); and gaming, n = 43 (44.8%). [Figure 1: Frequency distribution of taking breaks during screen time use]

A Kruskal-Wallis H test was conducted to determine if there were differences in overall health scores between groups with different screen-break frequencies. The results indicated that there was no statistically significant differ-

Table 3. Frequency distribution of the part of the day when screens are mostly used

Time of day	Male	Female	Total
Morning/Afternoon	n = 15 (28.8%)	n = 9 (20.5%)	n = 24 (25.0%)
Evening	n = 21 (40.4%)	n = 24 (54.5%)	n = 45 (46.9%)
Late night	n = 16 (30.8%)	n = 11 (25.0%)	n = 27 (28.1%)
Total	52 (100%)	44 (100%)	96 (100%)

ence in overall health across the groups (H = 2.179, df = 3, p = 0.536).

Physical activity varied among participants. A Kruskal-Wallis H test was conducted to examine differences in self-rated overall health across levels of physical activity (Daily, Few times a week, Rarely or never). The results indicated a statistically significant difference between the groups (H = 10.60, df = 2, p = 0.005). Post hoc pairwise comparisons with Bonferroni adjustment showed that participants who reported engaging in physical activity rarely or never (med = 2.5) differed significantly in self-rated health from those who were physically active daily (med = 3) (p = 0.004) and from those active a few times per week (med = 3) (p = 0.022). There was no statistically significant difference between participants who were active daily and those active a few times per week (p > 0.05). These findings indicate that individuals who rarely or never engage in physical activity report significantly poorer overall health compared to those who are physically active more frequently.

Our findings indicated no statistically significant differences (H = 3.232, df = 3, p = 0.357) in median sleep duration among participants who self-rated their health as excellent, good, average or poor.

Common health issues associated with prolonged screen use included: eye strain, n = 54 (56.3%); headaches, n = 47 (49.0%); back or neck pain, n = 51 (53.1%); sleep disturbance, n = 45 (46.9%); anxiety, n = 39 (40.6%); and obesity, n = 24 (25.0%). Mean rank of the hours spent in front of the screens was statistically higher in participants who reported back or neck pain (U = 395.0, p = 0.002). Also, participants who reported mental stress or anxiety because of prolonged screen time had statistically significantly higher mean ranks of hours in front of screens (U = 527.0, p = 0.028).

A Spearman's rank-order correlation (Figure 2) was conducted to assess the relationship between average daily screen time (hours spent on TV, phone, computer, tablet) and the frequency of sleep problems (difficulty sleeping, waking up tired) due to late-night screen use. The analysis revealed a weak but statistically significant positive correlation between these variables (rs = 0.209, p = 0.044, N = 93). (Note: three participants had missing data on sleep problems and were excluded from this correlation.) This indicates that higher screen time is modestly associated with increased sleep difficulties.

Participants mentioned that they managed stress through various strategies, including exercise (n = 32, 33.3%), medication or relaxation techniques (n = 31, 32.3%). The majority of the students managed stress by talking to friends and family (n = 77, 80.2%) or watching TV or playing video games (n = 52, 54.2%). Moreover, 51 participants (53.1%) spent time outdoors (walking, nature activities, social events) a few times a week, while the remaining 12 (12.5%) participants spent time outdoors rarely or never.

To further explore the associations identified in the bivariate analyses, multivariate binary logistic regression models were constructed to determine independent predictors of sleep disturbances, anxiety, and musculoskeletal pain. The model for sleep disturbances was statistically significant ($\chi^2 = 19.946$, p = 0.006), with acceptable explanatory capacity (Nagelkerke $R^2 = 0.317$). Late-night screen use emerged as the only significant independent predictor, with students who predominantly used screens at night exhibiting substantially higher odds of reporting sleep disturbances (OR = 9.37, 95% CI: 1.96–44.75, p = 0.005). In contrast, total daily screen time did not retain statistical significance after adjustment.

Conversely, the regression models for anxiety and musculoskeletal pain were not statistically significant (p = 0.630 and p = 0.217, respectively), explaining only a modest proportion of variance (Nagelkerke $R^2 = 0.089$ and 0.161). None of the examined variables including screen time, timing of use, physical activity, sex, or break frequency were identified as independent predictors in these models. These

findings demonstrate that while several associations were observed in initial analyses, only late-night screen use remained a significant independent predictor in the adjusted models.

Discussion

The present study examined patterns of screen use among medical students and their associations with physical and mental health outcomes. While initial analyses indicated multiple associations between screen exposure and adverse outcomes, multivariate modeling demonstrated that these relationships were not uniform across domains. Notably, late-night screen use emerged as the only independent predictor of sleep disturbances, whereas no independent predictors were identified for anxiety or musculoskeletal pain.

In the bivariate analysis, a weak but statistically significant correlation was observed between total screen time and sleep disturbances, which was consistent with previous findings [8, 9]. However, this association did not persist after adjustment for confounding variables, suggesting that total screen time alone had limited independent predictive value. Instead, the timing of screen exposure appeared to play a more critical role. Students who predominantly used screens at night had substantially higher odds of reporting sleep disturbances, supporting the hypothesis that behavioral patterns of use may be more relevant than duration alone. This finding aligns with existing literature emphasizing the impact of nighttime device use on sleep architecture, including delayed sleep onset and circadian rhythm disruption mediated by blue light exposure [10–12].

In contrast, although anxiety and psychological distress were relatively prevalent among participants, multivariate analysis did not identify screen-related variables as independent predictors. While previous studies have reported associations between excessive screen use and mental health outcomes [6, 13, 14], the absence of such relationships in the adjusted models suggests that these effects may be mediated by broader psychosocial and lifestyle factors. This highlights the complexity of psychological outcomes. Furthermore, findings suggest that screen exposure alone may not be sufficient to explain variations in anxiety levels and that broader psychosocial and lifestyle factors likely play a more substantial role.

The present findings should also be interpreted in the context of regional research. Studies conducted among student populations in Serbia have reported a notable prevalence of problematic smartphone use, with significant associations among excessive use, poor sleep quality, and increased levels of anxiety and psychological distress [15]. Similarly, regional data indicate that higher levels of screen exposure are linked to sleep disturbances and adverse mental health outcomes [15]. However, the results of the present study extend the existing evidence by demonstrating that these associations may not persist after adjustment for confounding variables. While previous studies predominantly report significant relationships between screen use and adverse outcomes, the current findings suggest that such effects may be mediated by behavioral patterns, particularly late-night use, rather than driven by total screen time alone. This distinction highlights the importance of moving beyond a purely quantitative conceptualization of screen exposure toward a more context-sensitive understanding of digital behavior.

Similarly, musculoskeletal complaints, including back and neck pain, were frequently reported; however, no independent associations were identified in the multivariate model. Although prolonged screen use has been linked to physical discomfort and computer vision syndrome [16], these findings suggest that such outcomes are likely influenced by additional factors not captured in this study, such as posture, ergonomics, duration of uninterrupted use, and individual physical conditioning.

Taken together, these findings indicate that the impact of screen exposure is domain-specific rather than generalized. While behavioral patterns, particularly late-night use, appear to be critical for sleep-related outcomes, other health domains such as anxiety and musculoskeletal pain may involve more complex, multifactorial mechanisms. This distinction is important, as it challenges the common assumption that total screen time alone is a sufficient explanatory variable for diverse health effects.

These results are partially consistent with previous research conducted in student populations, including regional studies, which have reported increased digital media use and its association with mental health indicators [17]. However, the present findings refine this understanding by demonstrating that not all observed associations persist after adjustment, thereby emphasizing the need for more nuanced conceptualization of screen-related behaviors.

From a practical perspective, these findings suggest that interventions aimed at improving student well-being may consider focusing not only on reducing overall screen time but also on modifying behavioral patterns, particularly limiting late-night use. This approach may be more effective in mitigating sleep-related disturbances than strategies based solely on reducing exposure duration. However, due to the fact that this is a cross-sectional study, causal inferences cannot be made, and interventional studies are needed to test such strategies.

Limitations

This study has several limitations that should be considered. First, the sample size was relatively small and restricted to a single institution limiting the generalizability of the findings. Second, the cross-sectional design precludes causal inference, as only associations can be observed at a single time point. Third, all data were self-reported, introducing the possibility of recall and social desirability bias, which may have led to misclassification of exposure variables. Additionally, the study did not employ standardized and validated instruments for assessing sleep quality or anxiety (e.g., PSQI or GAD-7), which may limit comparability with other studies. Objective measures of screen use, such as device-based tracking, were also not available. Fourth, potential confounding variables, including academic workload, ergonomic factors, and pre-existing health conditions, were not fully controlled and may have influenced the observed associations. Fifth, three participants had missing data on sleep problems, reducing the effective sample size for that correlation. Sixth, the logistic regression model for sleep disturbances produced a wide confidence interval for the odds ratio (1.96–44.75), indicating imprecise estimation due to the small number of cases in some subgroups. Future research should address these limitations by incorporating longitudinal designs, larger and more diverse samples, validated measurement tools, and objective assessments of screen exposure.

Conclusion

This study provides an analysis of screen use patterns and their associations with health outcomes among medical students. While initial findings suggested multiple associations between screen exposure and adverse physical and psychological effects, multivariate analysis demonstrated that these relationships were not uniform. In particular, late-night screen use emerged as the independent predictor of sleep disturbances, whereas total screen time did not retain significance after adjustment. No independent associations were identified for anxiety or musculoskeletal pain, indicating that these outcomes were likely influenced by broader and more complex factors beyond screen exposure alone. These findings highlight the importance of moving

beyond a purely quantitative assessment of screen time toward a more behavior-oriented understanding of digital media use. Interventions aimed at improving student well-being may therefore consider modification of usage patterns, especially reducing late-night exposure, rather than focusing solely on overall screen time reduction. However, these findings are preliminary and require replication in larger, longitudinal studies.

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Ethical approval. The Ethics Committee of the University of East Sarajevo, Faculty of Medicine Foča, Republic of Srpska, Bosnia and Herzegovina, approved the study and informed consent was obtained from all individual respondents. The research was conducted according to the Declaration of Helsinki.

Conflicts of interest. The authors declare no conflict of interest.

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Vrijeme pred ekranom i njegov uticaj na studente univerziteta

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Uvod. Sve veća upotreba digitalnih uređaja među studentima univerziteta izaziva zabrinutost u vezi sa njihovim potencijalnim uticajem na fizičko i mentalno zdravlje. Međutim, još uvijek nedovoljno razumijemo nezavisni doprinos različitih obrazaca korišćenja ekrana. Cilj ove studije bio je da ispita obrasce korišćenja ekrana kod studenata medicine i procijeni njihovu povezanost sa odabranim zdravstvenim ishodima, sa posebnim fokusom na identifikaciju nezavisnih prediktora.

Metode. Sprovedena je studija presjeka među 96 studenata medicine starosti 19–26 godina. Podaci su prikupljeni putem anonimnog upitnika koji je obuhvatao dnevno vrijeme pred ekranom, vrijeme korišćenja, fizičku aktivnost i zdravstvene ishode. Za identifikaciju nezavisnih prediktora poremećaja sna, anksioznosti i mišićno-koštanog bola korišćeni su multivarijantni binarni logistički regresioni modeli.

Rezultati. Medijana dnevnog vremena pred ekranom iznosila je 5 sati. Najčešće prijavljeni zdravstveni problemi bili su naprezanje očiju (56,3%), mišićno-koštani bol (53,1%), poremećaji sna (46,9%) i anksioznost (40,6%). Uočena je slaba, ali statistički značajna pozitivna korelacija između vremena pred ekranom i poremećaja sna ($r_s = 0,209$, $p = 0,044$, $N = 93$ zbog nedostajućih podataka kod tri ispitanika). U multivarijantnoj analizi, korišćenje ekrana kasno noću identifikovano je kao nezavisan prediktor poremećaja sna (OR = 9,37, 95% CI: 1,96–44,75, $p = 0,005$), dok ukupno vrijeme pred ekranom nakon prilagođavanja nije bilo statistički značajno. Za anksioznost i mišićno-koštani bol nisu identifikovani nezavisni prediktori.

Zaključak. Rezultati ukazuju da je uticaj korišćenja ekrana na zdravstvene ishode specifičan za određene obrasce ponašanja. Posebno se ističe da su obrasci korišćenja, naročito korišćenje kasno noću, relevantniji od ukupnog vremena pred ekranom u odnosu na poremećaje sna. Ovi nalazi naglašavaju važnost pristupa koji je usmjeren na obrasce ponašanja u korišćenju digitalnih medija među studentima.

Ključne riječi: vrijeme pred ekranom, korišćenje medija, studenti medicine, san, digitalno zdravlje