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The Effect of Mobile Phone Usage on Sleep Quality and Academic Stress among University Students

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Abstract: *The present study investigated the effect of mobile phone usage before sleep on sleep quality and academic stress among university students in Pakistan. A quantitative, cross-sectional research design was used with a sample of 300 university students (M = 150, F = 150) selected from public and private universities of the Federal and Punjab regions of Pakistan through a non-probability purposive sampling technique. Sleep quality was assessed using the Pittsburgh Sleep Quality Index (Buysse et al., 1989), and academic stress was assessed using the Perception of Academic Stress Scale (Bedewy & Gabriel, 2015). Duration of mobile phone use before sleeping at night was recorded through a self constructed demographic information sheet and categorized into three groups: less than 1 hour, 1 to 2 hours, and more than 2 hours. The results indicated that mobile phone usage before sleep was significantly associated with both sleep quality and academic stress. Students who used their mobile phones for more than 2 hours before sleeping reported significantly poorer sleep quality and higher academic stress compared to those who used their phones for shorter durations. The findings suggest that pre-sleep mobile phone use is an important behavioral factor associated with disrupted sleep and elevated academic stress among university students, with implications for sleep hygiene education and digital well-being interventions on universities.*

Keywords: Mobile Phone Usage, Sleep Quality, Academic Stress.

Introduction

Mobile phones have become an inseparable part of daily life for young adults, serving functions that range from communication and entertainment to academic work and social networking. Among university students, smartphone ownership and usage rates are nearly universal, and a substantial proportion of the usage occurs during the late evening and nighttime hours, immediately before sleep (Exelmans & Van den Bulck, 2016). While mobile phones offer considerable convenience, growing evidence suggests that habitual use of these devices close to bedtime may interfere with the physiological and psychological processes required for healthy sleep (Exelmans & Van den Bulck, 2016; Tian & Wang, 2023).

Sleep quality refers to the subjective adequacy of an individual's sleep experience, including how easily sleep is initiated, how continuous it remains throughout the night, and how restorative it feels upon waking (Buysse et al., 1989). University students are widely recognized as a population at risk for poor sleep quality, given the combination of demanding academic schedules, irregular routines, and lifestyle habits such as late night screen use (Hershner & Chervin, 2014). A large body of recent research has linked smartphone use, and particularly problematic or excessive use, to poorer sleep outcomes among college and university populations across different cultural settings (Leow et al., 2023; Tian & Wang, 2023).

Several mechanisms have been proposed to explain why mobile phone use before bedtime disrupts sleep. The displacement hypothesis suggests that time spent on a mobile phone directly displaces time that would otherwise be used for sleep, effectively shortening sleep duration and delaying sleep onset (Exelmans & Van den Bulck, 2016). In addition, the light emitted from smartphone screens, particularly blue wavelength light, has been shown to suppress melatonin secretion, the hormone responsible for regulating the sleep wake cycle, thereby making it physiologically harder to fall asleep (Hirshkowitz et al., 2015; Jahrami et al., 2021). Beyond these physiological pathways, the content accessed on mobile phones, such as social media, messaging, and entertainment applications, can be psychologically stimulating, increasing cognitive and emotional arousal at a time when the body should be winding down for rest (Harvey, 2002; Jahrami et al., 2021).

Mobile phone use before sleep may also be linked to academic stress, the psychological strain that arises when academic demands exceed a student's perceived coping resources (Misra & McKean, 2000). Students experiencing high academic stress may turn to their phones as a means of distraction or emotional escape, particularly through social media use, which has been described in terms of the fear of missing out, or FOMO, a phenomenon in which individuals feel compelled to remain digitally connected (Jahrami et al., 2021). On the other hand, excessive mobile phone use before sleep may itself contribute to poorer sleep, and poor sleep has, in turn, been associated with reduced concentration, impaired emotional regulation, and heightened perceptions of academic pressure the following day (Medic et al., 2017; Tian & Wang, 2023).

Within the university context of Pakistan, where students often face intense academic competition alongside widespread smartphone access, understanding how the duration of mobile phone use before sleep relates to both sleep quality and academic stress is of particular practical importance. Identifying the relationship can inform digital well-being initiatives and sleep hygiene programs tailored to the lifestyle patterns of university students. The study aims to examine the effect of mobile phone usage before sleep on sleep quality and academic stress among university students in Pakistan.

Literature Review

Mobile Phone Usage among University Students

Mobile phone usage, particularly smartphone usage, has expanded dramatically over the past decade, with university students representing one of the heaviest using demographic groups (Leow et al., 2023). Mobile phones are used by students for a wide range of purposes, including academic research, communication with peers and family, entertainment, and engagement with

social media platforms. While moderate use may support academic and social functioning, a growing pattern of concern has emerged around nighttime and pre sleep phone use, which has been associated with a range of negative health outcomes, including poor sleep, increased anxiety, and depressive symptoms (Leow et al., 2023; Tian & Wang, 2023).

The amount of time spent on mobile phones before bedtime varies considerably among students, with a substantial proportion reporting more than two hours of use immediately before sleep. The pattern of behavior is often driven by social media engagement, messaging applications, and entertainment streaming, all of which provide continuous and easily accessible stimulation late into the night (Jahrami et al., 2021). Researchers have noted that the behavior is not necessarily perceived by students as harmful, even though it is associated with measurable declines in sleep quality (Tian & Wang, 2023).

Mobile phone usage before sleep is theoretically linked to disrupted sleep through two primary pathways. The first is a behavioral displacement pathway, whereby time spent using the phone directly reduces the time available for sleep, leading to shortened sleep duration (Exelmans & Van den Bulck, 2016). The second is a psychophysiological arousal pathway, whereby the content viewed on the phone, combined with the blue light emitted by the screen, increases cognitive and physiological arousal and suppresses melatonin production, making it more difficult to fall asleep even when adequate time is allocated for rest (Hirshkowitz et al., 2015; Jahrami et al., 2021).

Sleep Quality

Sleep quality is a multidimensional construct that captures the subjective experience of sleep, encompassing how long it takes to fall asleep, how often sleep is interrupted during the night, how early a person wakes, and how rested they feel upon waking, rather than simply the total number of hours slept (Buysse et al., 1989). University students are considered a high risk group for poor sleep quality due to the combined influence of academic demands, social activities, and lifestyle habits, including late-night technology use (Hershner & Chervin, 2014).

Poor sleep quality has wide ranging consequences for university students. It has been linked to impaired attention, reduced working memory capacity, and lower academic performance, as well as increased irritability, anxiety, and emotional instability (Medic et al., 2017). Within the specific context of technology use, multiple studies have documented a consistent association between higher levels of smartphone use, particularly at night, and poorer self-reported sleep quality, increased sleep latency, and reduced sleep duration among college and university populations (Leow et al., 2023; Tian & Wang, 2023).

The relationship between mobile phone use and sleep quality may also be bidirectional. While excessive phone use can directly impair sleep through the mechanisms described above, students experiencing poor sleep may also be more likely to use their phones during periods of wakefulness at night, for example, when unable to fall back asleep, thereby reinforcing a cycle of disrupted sleep and continued device use (Jahrami et al., 2021).

Academic Stress

Academic stress refers to the psychological strain experienced by students when the demands of their academic environment, such as examinations, assignments, and performance expectations, are perceived to exceed their available coping resources (Misra & McKean, 2000). University students are particularly susceptible to academic stress due to the cumulative

pressures of coursework, deadlines, and performance evaluation, compounded in many cases by sociocultural expectations regarding academic achievement (Bedewy & Gabriel, 2015).

Academic stress has been associated with a range of behavioral responses, including changes in sleep patterns, study habits, and technology use. Some students respond to high academic stress by reducing leisure activities, including mobile phone use, to focus on academic tasks, a pattern consistent with adaptive, problem-focused coping (Lazarus & Folkman, 1984). However, other students may respond to academic stress by increasing their engagement with mobile phones, particularly social media, as a form of avoidance or emotional regulation, seeking temporary relief from academic pressures through digital distraction (Jahrami et al., 2021).

There is evidence that poor sleep, which can itself result from excessive mobile phone use before bedtime, contributes to heightened perceptions of academic stress the following day, through mechanisms such as reduced cognitive resources, impaired emotional regulation, and lowered tolerance for academic demands (Medic et al., 2017; Tian & Wang, 2023). It suggests that mobile phone usage, sleep quality, and academic stress may be interconnected cyclically among university students.

Rationale

Although the individual associations between mobile phone use and sleep quality, and between sleep quality and academic stress, have been documented in the international literature, comparatively less research has directly examined how the duration of mobile phone use before sleep relates to both sleep quality and academic stress within a single study, particularly among university students in Pakistan. Given the high rates of smartphone ownership and the academically competitive environment faced by university students in Pakistan, it is important to determine whether students who use their mobile phones for longer durations before sleep differ meaningfully from those who use them for shorter durations, in terms of both their sleep quality and their levels of academic stress. The findings could provide an evidence base for digital wellbeing and sleep hygiene interventions tailored to university populations.

Research Question

Is there a significant effect of mobile phone usage before sleep on sleep quality and academic stress among university students in Pakistan?

Method

Research Design

The study employed a quantitative, cross-sectional research design to examine the effect of mobile phone usage before sleep on sleep quality and academic stress among university students.

Sample

The sample consisted of 300 university students (150 male, 150 female) drawn from public and private sector universities in the Federal and Punjab regions of Pakistan. A non-probability purposive sampling technique was used to recruit participants. The age range of participants was 18 to 25 years, corresponding to the developmental period of emerging adulthood (Arnett, 2000).

Inclusion criteria required that participants be full-time enrolled undergraduate or postgraduate university students, aged between 18 and 25 years, able to read and comprehend English, and willing to provide informed consent. Students with a self-reported history of psychiatric or sleep disorders, those currently using prescribed sleep medication, and part-time students were excluded from the study.

Instruments

In addition to a demographic information sheet that recorded participants' duration of mobile phone use before sleep, along with other background variables, the following standardized instruments were used to measure the study variables.

Pittsburgh Sleep Quality Index (PSQI)

Sleep quality was measured using the Pittsburgh Sleep Quality Index (PSQI), developed by Buysse et al. (1989). The PSQI consists of 19 items organized into seven components: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. Items are rated on a 4-point scale ranging from 0 (Not during the past month) to 3 (Three or more times a week). Component scores are combined to yield a global score ranging from 0 to 21, with higher scores indicating poorer sleep quality. The PSQI has demonstrated good internal consistency, with a reported Cronbach's alpha of .83 (Buysse et al., 1989).

Perception of Academic Stress Scale (PAS)

Academic stress was measured using the Perception of Academic Stress (PAS) Scale developed by Bedewy and Gabriel (2015). The scale consists of 18 items across three subscales: academic expectations, workload and examinations, and academic self-perception. Items are rated on a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), with items 1 to 5 reverse-coded. Total scores range from 18 to 90, with higher scores indicating greater perceived academic stress. The scale has demonstrated good psychometric properties, with reported Cronbach's alpha values ranging between .70 and .85 (Bedewy & Gabriel, 2015).

Demographic Information Sheet

A self-constructed demographic information sheet was used to gather background information about participants' average duration of mobile phone use before sleeping at night. The mobile phone usage before sleep was categorized into three groups: less than 1 hour, 1 to 2 hours, and more than 2 hours.

Procedure

Data were collected through in-person questionnaire distribution and an online survey link administered across public and private universities in the Federal and Punjab regions of Pakistan. Participants were informed about the purpose of the study and assured that their participation was voluntary, anonymous, and confidential, and that they could withdraw at any time without consequence. Informed consent was obtained from all participants before data collection. Responses were screened for completeness and eligibility before data analysis.

Results

To examine differences in sleep quality and academic stress across the duration of mobile phone use before sleep, a one-way analysis of variance (ANOVA) was conducted. The results are presented in Tables 1 and 2.

Table 1

Mean Differences across Mobile Phone Usage Before Sleep among Study Variables (N = 300).

	Less than 2 hours (*n* =49)		1-2 hours (*n* = 103)		More than 2 hours (*n* =148)				
Variables	*M*	*SD*	*M*	*SD*	*M*	*SD*	*f*	*p*	η^2
AS	49.63	6.08	49.07	6.62	52.63	11.71	4.87	.00	.03
SQ	4.82	3.09	6.84	2.93	6.71	3.73	6.88	.00	.04

*$p < .05$, **$p < .01$, ***$p < .001$.

Note: M = Mean, *SD* = Standard Deviation, *f* = Frequency, *p* = Significance Level, AS = Academic Stress, SQ = Sleep Quality.

Table 1 represents the mean differences in study variables between mobile phone use before sleep for 300 participants. The findings indicated significant differences in academic stress, $F = 4.87$, $p < .001$, $\eta^2 = .03$. The participants who used their mobile phone more than 2 hours before sleep ($M = 52.63$, $SD = 11.71$) showed a higher level of academic stress than those who used their mobile phone less than 2 hours ($M = 49.63$, $SD = 6.08$) and 1-2 hours ($M = 49.07$, $SD = 6.62$). Significant differences were also observed in sleep quality, $F = 6.88$, $p < .001$, $\eta^2 = .04$. Participants using mobile phones for 1–2 hours ($M = 6.84$, $SD = 2.93$) and more than 2 hours ($M = 6.71$, $SD = 3.73$) reported poorer sleep quality compared to those using phones for less than 2 hours ($M = 4.82$, $SD = 3.09$).

Table 2

Hochberg Post Hoc Analysis of Study Variables across Mobile Phone Usage Before Sleep (N = 300).

Groups	Groups		Mean Difference			95% *CI*	
	I	J	I-J	*SE*	*p*	*LL*	*UL*
AS	Less than one hour	1-2 hours	0.565	1.636	0.98	-3.36	4.49
	Less than one hour	More than 2 hours	-2.996	1.554	0.155	-6.73	0.73
	1-2 hours	More than 2 hours	-3.560*	1.21	0.01	-6.46	-0.66
SQ	Less than one hour	1-2 hours	-2.028*	0.586	0.002	-3.43	-0.62
	Less than one hour	More than 2 hours	-1.893*	0.556	0.002	-3.23	-0.56
	1-2 hours	More than 2 hours	0.135	0.433	0.985	-0.9	1.18

*$p < .05$, **$p < .01$, ***$p < .001$.

Note: SE = Significant Error, *p* = Significance Level, *CI* = Confidence Interval, *LL* = Lower Level, *UL* = Upper Level, AS = Academic Stress, SQ = Sleep Quality.

Table 2 represents the Hochberg post hoc analysis, which was used to compare study variables by mobile phone usage before sleep in 300 participants. The findings showed that there was a significant difference between the academic stress of those who used mobile phones for 1-2 hours and those who used them for more than 2 hours before sleep ($MD = -3.56$, $p < .05$), with

those who used mobile phones for more than 2 hours before sleep reporting higher academic stress. In terms of sleep quality, there were significant differences between those who use mobile phones less than one hour and those who use them 1-2 hours (MD = -2.03, $p < .01$) and between those who use mobile phones less than one hour and those who use them more than 2 hours (MD = -1.89, $p < .01$). Those who used their mobile phones more heavily before going to sleep had less quality sleep.

Overall, the findings indicate that the duration of mobile phone use before sleep was significantly related to both academic stress and sleep quality among university students, with longer durations of pre-sleep mobile phone use associated with higher academic stress and poorer sleep quality.

Discussion

The present study examined the effect of mobile phone usage before sleep on sleep quality and academic stress among university students in Pakistan. It was hypothesized that there would be significant differences in sleep quality and academic stress across groups defined by the duration of mobile phone use before sleep. The results provided support for this hypothesis, as significant ANOVA results were obtained for both variables.

Students who used their mobile phones for more than 2 hours before sleep reported significantly higher academic stress than those who used their phones for shorter durations. The finding is consistent with the view that excessive pre-sleep phone use, often involving social media and entertainment content, may be both a response to and a contributor to academic stress. Students experiencing high academic stress may turn to their phones as a form of distraction or emotional escape, consistent with the concept of the fear of missing out, in which individuals feel a compulsion to remain digitally connected even when this interferes with rest (Jahrami et al., 2021).

Concerning sleep quality, students who used their mobile phones for less than 1 hour before sleep reported markedly better sleep quality than those who used their phones for 1 to 2 hours or more than 2 hours. The finding is consistent with the displacement hypothesis, which proposes that time spent on mobile phones directly reduces the time available for sleep and delays sleep onset (Exelmans & Van den Bulck, 2016). It is consistent with research showing that the blue light emitted by smartphone screens suppresses melatonin production, thereby disrupting the body's natural sleep-wake cycle, and that psychologically stimulating content, such as social media, increases cognitive arousal at a time when the body should be preparing for rest (Hirshkowitz et al., 2015; Jahrami et al., 2021).

These findings align with a broader body of research linking smartphone use, particularly at night, to poorer sleep outcomes among university student populations across different cultural contexts (Leow et al., 2023; Tian & Wang, 2023). The fact that both academic stress and sleep quality were significantly poorer among students with longer durations of pre-sleep phone use also supports the possibility of a cyclical relationship, whereby excessive phone use disrupts sleep, poor sleep contributes to heightened academic stress, and academic stress may, in turn, drive further phone use as a coping or avoidance behavior (Medic et al., 2017; Tian & Wang, 2023).

Taken together, these findings suggest that the duration of mobile phone use before sleep is a meaningful behavioral factor associated with university students' sleep quality and their

experience of academic stress, and that interventions targeting pre-sleep phone use could have benefits for both outcomes.

Implications and Significance

The findings of the study carry important theoretical and practical implications. Theoretically, the results contribute to the growing literature on the displacement and arousal pathways through which mobile phone use affects sleep, and extend this literature by examining its association with academic stress within a non-Western, academically competitive context such as Pakistan.

Practically, the findings suggest that university counseling centers and student wellness programs should incorporate sleep hygiene education that specifically addresses pre-sleep mobile phone use, given that students who used their phones for more than 1 hour before sleep reported notably poorer sleep quality. Universities may consider promoting digital well-being initiatives, such as encouraging phone-free periods before bedtime, particularly among students who report high academic stress, as these students may be at greater risk of using their phones as a maladaptive coping strategy.

Furthermore, given that students using their phones for more than 2 hours before sleep also reported the highest academic stress, academic support services could benefit from screening for problematic pre-sleep technology use as part of broader student mental health assessments, allowing for early identification of students who may benefit from combined sleep hygiene and stress management support.

Conclusion

The study examined the effect of mobile phone usage before sleep on sleep quality and academic stress among 300 university students in Pakistan. The findings demonstrated that the duration of mobile phone use before sleep was significantly associated with both variables. Students who used their mobile phones for more than 2 hours before sleep reported the highest academic stress, while students who used their phones for less than 1 hour before sleep reported the best sleep quality, with those using their phones for 1 hour or more reporting notably poorer sleep. These findings highlight pre-sleep mobile phone use as an important, modifiable behavioral factor associated with university students' sleep quality and academic stress, and underscore the need for sleep hygiene and digital well-being interventions within university settings in Pakistan.

Limitations

The study has several limitations that should be acknowledged. First, the cross-sectional design does not allow for causal inferences to be drawn regarding the direction of the relationship between mobile phone usage, sleep quality, and academic stress; longitudinal designs would be needed to clarify whether mobile phone use leads to poorer sleep and higher stress, or whether stressed and poorly sleeping students are more likely to use their phones at night. Second, mobile phone usage was assessed through a single self-reported item categorizing duration of use before sleep, which does not capture the type of phone activity engaged in, nor does it capture objective screen time data. Third, the sample was drawn using a non-probability purposive sampling technique, which may limit the generalizability of the findings to the broader population of university students in Pakistan. Finally, other potentially relevant factors, such as caffeine consumption, living arrangements, and the number of roommates, were not

controlled for in the analyses examining mobile phone usage, and future research should consider examining these factors more systematically.

Recommendations

Based on the findings of the study, it is recommended that universities in Pakistan incorporate sleep hygiene education into student orientation and wellness programs, with specific guidance on reducing mobile phone use for an hour or more before sleep. Digital wellbeing campaigns that raise awareness of the displacement and arousal effects of pre-sleep phone use may be beneficial, particularly for students who report high academic stress. Future research should employ objective measures of smartphone use, such as screen time tracking applications, and should examine the specific types of phone activity that are most strongly associated with poor sleep and academic stress. Longitudinal and experimental designs, such as interventions that limit pre-sleep phone use, would also help to clarify the causal relationships among these variables.

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