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Sleep Quality, Smartphone Dependency, and Academic Performance among University Students

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ABSTRACT

To examine how sleep quality, smartphone dependency, and academic performance connect among university students in Multan, Pakistan, this study used a cross-sectional quantitative design. The sample comprised 350 undergraduate and postgraduate students from public and private universities, gathered via proportionate convenience sampling so that various fields of study and academic levels were represented. The study evaluated sleep quality with the Pittsburgh Sleep Quality Index, assessed smartphone dependency using a standardized Smartphone Addiction Scale, and captured academic performance via each student's self-reported GPA from their most recent semester. To analyze these variables and test whether smartphone dependency and sleep quality significantly predicted academic performance once demographic traits were held constant, the study used descriptive statistics, Pearson correlations, and hierarchical multiple regression models. Most students reported poor sleep and moderate-to-high dependence on their phones, with both measures showing significant correlations with academic performance in the expected directions. Even after demographic characteristics were accounted for, hierarchical regression showed that smartphone dependency and sleep quality continued to be significant individual predictors of academic performance, accounting together for a substantial share of variance in grade point average. These results point to excessive phone use and poor sleep as modifiable risks for academic troubles among Pakistani university students, carrying direct implications for campus counseling and institutional health policy.

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Introduction

For university students around the world, smartphones are now woven directly into daily routines, providing continuous access to school resources, entertainment, and social contacts, but also creating fresh risks of compulsive and excessive use (Kwon et al., 2013a). Marked by fixation on the phone, struggles to limit screen time, and disruptions to ordinary routines from overuse, smartphone dependency is now widely seen as a behavioral pattern that tangibly affects sleep, psychological wellbeing, and academic results (Kwon et al., 2013b; Yin et al., 2025; Alharbi et al., 2025). Meanwhile, university students' sleep has remained an ongoing worry, as irregular hours, academic strain, and late-night screen time frequently collide to cause short or broken rest at a stage of life when mental and academic expectations are heavy (Demirci et al., 2015; Haddaouy et al., 2025).

A large body of research from around the world connects smartphone dependency straight to poor sleep quality. In a study of Turkish university students, Demirci et al., (2015) observed that heavier smartphone use was significantly tied to worse sleep quality, deeper depression, and higher anxiety, matching Kaya et al., (2021) report that usage severity correlated positively with depressive symptoms and poor sleep in the same population. Guclu et al., (2024) broadened this picture by showing that smartphone addiction and

internet addiction each had an independent link to lower academic performance and poorer sleep. Taken together, these studies suggest that smartphone dependency and poor sleep are intimately tied to one another, likely because using screens late into the night delays falling asleep and cuts down on how long and how well students rest (Twenge et al., 2018; Kone et al., 2026; Amin & Sohail, 2025).

Alongside this work, an expanding body of research has looked straight at how smartphone dependency relates to academic achievement. In an influential early study from the United States, Lepp et al., (2014) showed that higher cell phone usage among undergraduates correlated significantly with poorer academic outcomes and greater anxiety. Turning to Pakistan, Khan et al., (2019) observed an inverse relationship of statistical significance between smartphone addiction and academic performance across two private Rawalpindi universities; similar negative trends, though not consistently reaching statistical significance, emerged in work by Raza et al. (2020) and Shakoor et al., (2021) in other Pakistani tertiary institutions. In Karachi, Bhutto et al., (2024) tied smartphone addiction to greater academic stress, while Farooq et al., (2024) pinpointed several discrete elements of this dependency, notably withdrawal and disruption to daily routines, as meaningful drivers of poorer academic performance in Pakistani university cohorts.

A more restricted body of work has simultaneously evaluated sleep quality, smartphone dependency, and academic performance within cohorts in Pakistan. Administering the identical tools planned for this investigation the Pittsburgh Sleep Quality Index, the Smartphone Addiction Scale, and self-reported grade point average Marryam et al., (2023) sampled students in Rawalpindi and Islamabad and detected significant ties between smartphone addiction, degraded sleep quality, and reduced academic attainment. Rathakrishnan et al., (2021) observed a very similar dynamic in Malaysia, demonstrating that smartphone addiction and deficient sleep independently predicted lower academic marks, while Kalal et al., (2023) established that smartphone dependency impaired sleep quality among Indian nursing students, even if the corresponding effect on academic achievement was less uniform. Ibrahim et al., (2018) in Saudi Arabia and Kamal et al., (2022) in Pakistan expanded these conclusions to dental and medical trainees, with both groups reporting elevated rates of poor sleep among heavy smartphone users.

Yet even with these collected findings, the current literature leaves several questions unanswered. Much of the research in Pakistan analyzes smartphone dependency alongside academic performance without treating sleep quality as an explicit, separate predictor, and very few projects implement hierarchical regression to verify whether both factors still predict outcomes once demographic variables like age, gender, degree level, and academic discipline are accounted for (Khalily et al., 2020). The present study tests the connections between sleep quality, smartphone dependency, and academic performance in a proportionately drawn cross-section of undergraduates and postgraduates from public and private institutions across Multan, assessing whether dependency and sleep remain significant predictors of achievement after controlling for demographic factors.

Literature Review

Conceptualizing Smartphone Dependency

Frequently discussed under the rubric of mobile phone or smartphone addiction, smartphone dependency is treated as a behavioral addiction that mirrors chemical dependency through symptoms like fixation, tolerance, withdrawal, and persistent use despite adverse effects. Kwon et al., (2013b) created one of the earliest psychometrically validated measures for the phenomenon, the Smartphone Addiction Scale, identifying six constituent dimensions: cyberspace-oriented relationship, withdrawal, tolerance, overuse, daily-life disturbance, and positive anticipation. Kwon et al., (2013a) subsequently produced and validated an abbreviated version of the instrument to streamline fieldwork and clinical assessment, and it has since seen extensive international application, including in higher-education studies throughout Pakistan (Khalily et al., 2020).

Smartphone Dependency and Quality of Sleep

Ever since smartphones became commonplace among young adults, data connecting dependency on these devices to poorer sleep quality has built up steadily. In a study of Turkish university students, Demirci et al., (2015) observed that those in a high smartphone use category had significantly worse sleep quality and higher levels of depression and anxiety than peers in low-use or non-user categories; their Smartphone Addiction Scale scores also tracked positively with multiple individual components on the Pittsburgh Sleep Quality Index. Drawing on a wider group of students, Kaya et al., (2021) reinforced these findings, showing that more severe smartphone use was significantly tied to poorer overall sleep quality alongside elevated depressive symptoms. Turning to high school students instead of university cohorts, Guclu et al., (2024) found that internet addiction and smartphone addiction each served as independent predictors of worse sleep quality, an indication that the pattern holds across neighboring stages of development. Looking exclusively at Saudi Arabian medical students, Ibrahim et al., (2018) discovered that roughly two-thirds met the threshold for poor sleep quality on the Pittsburgh Sleep Quality Index, with mobile phone dependency showing significant correlations with subjective sleep quality and sleep latency scores.

Academic Performance and Sleep Quality

A separate strand of inquiry has identified sleep quality as a significant correlate of academic success among students in colleges and universities. Sustained academic work relies heavily on focus and memory consolidation, and because poor sleep reliably compromises both, it offers a sensible explanation for the links seen in student research. In Pakistan, Marryam et al., (2023) observed that university students in Rawalpindi and Islamabad who scored worse on the Pittsburgh Sleep Quality Index had significantly lower semester and cumulative GPAs than their better-rested peers; similarly, Kamal et al., (2022) found frequent sleep complaints among Pakistani medical and dental students who showed high smartphone dependency. In a sample from a Malaysian public university, Rathakrishnan et al., (2021) found that smartphone addiction and poor sleep quality each had an independent negative link with academic achievement, supporting the view that while the two variables are connected, each contributes something distinct to explaining student outcomes.

Academic Performance and Smartphone Dependency in Pakistan

Studies in Pakistan that inspect smartphone dependency alongside academic performance generally point toward an inverse relationship, even if the pattern is not entirely uniform. When Khan et al., (2019) polled 360 students across two private universities in Rawalpindi, they identified a significant negative link between smartphone addiction and academic performance, but also noted that better time management predicted higher grade point averages regardless of how much students used their phones. In Islamabad, Shakoor et al., (2021) uncovered a more complicated trend where device use related to specific approaches to learning rather than predicting academic performance in a blanket way; similarly, Raza et al., (2020) noted that private higher education students with phone addictions self-reported lower grades, yet because the direct statistical path was non-significant, the authors pointed to intermediary issues such as reduced focus and increased cyberloafing. In Karachi, Bhutto et al., (2024) uncovered a significant positive link between smartphone addiction and academic stress, while Farooq et al., (2024) identified specific dimensions of addiction, such as withdrawal and disruptions to daily routines, as significant negative predictors of academic performance in Pakistani university students; taken together, these studies suggest the effect on grades may flow through heightened stress and interrupted study habits rather than a straightforward direct path.

Combined Research on Sleep, Smartphone Dependency, and Academic Performance

Only a handful of investigations have evaluated sleep quality, smartphone dependency, and academic performance together in one framework, which provides the clearest empirical foundation for this research. In a study of Malaysian university students, Rathakrishnan et al., (2021) demonstrated that smartphone

addiction and poor sleep quality each had significant, independent links to poorer academic outcomes, while addiction also correlated significantly with lower sleep quality, pointing toward related yet distinct mechanisms. Looking at students in Rawalpindi and Islamabad, Marryam et al., (2023) identified an analogous trend within the same metropolitan area under study here, showing that smartphone addiction was significantly linked to both worse sleep and reduced semester grade point averages. Among Indian nursing students, Kalal et al., (2023) likewise observed that smartphone addiction correlated significantly with poorer sleep quality, though its connection to academic performance was comparatively less pronounced, showing how the magnitude of these associations can shift across distinct cohorts and academic settings. By investigating how widely smartphone addiction occurs and what accompanies it among students in Islamabad and Rawalpindi, Khalily et al., (2020) confirmed that problematic phone use is widespread in this population, offering valuable empirical context for our sampling strategy.

Literature Gaps

Taken together, existing research confirms that smartphone dependency consistently correlates with poorer sleep quality and that both variables relate independently to academic performance in the majority of, if not all, studies, a trend now verified across diverse cultural and educational settings, including Pakistan. Yet few Pakistani studies have incorporated validated instruments for all three variables into one hierarchical regression model that can separate the distinct impacts of smartphone dependency and sleep quality on academic performance while controlling for demographics; fewer still feature a multidisciplinary, proportionately sampled cohort of undergraduate and postgraduate students from both private and public universities located specifically in Multan, Pakistan. This research targets that specific omission.

Methodology

Research Design

To investigate the associations among sleep quality, smartphone dependency, and academic performance among university students in the Multan, Pakistan, we utilized a cross-sectional quantitative design. We selected this design because it fit our goals: assessing the prevailing level of each variable in the population and testing their cross-sectional statistical ties and predictive pathways, which aligns with designs used in comparable Pakistani and regional investigations (Marryam et al., 2023; Rathakrishnan et al., 2021).

Population and Sample

We gathered data from 350 undergraduate and postgraduate students across private and public higher education institutions in Multan, Pakistan. We recruited participants using proportionate convenience sampling, pairing the logistical ease of a convenience approach with targeted quotas to mirror the broader student body across subject areas (including natural and social sciences, business and management, and engineering and technology), degree tiers (undergraduate versus postgraduate), and institutional types (public versus private). To qualify, students had to be actively enrolled in a degree program and have finished at least one full semester at their university, guaranteeing an official grade point average from the previous term was on record.

Instrumentation

We measured sleep quality with the Pittsburgh Sleep Quality Index, a validated and commonly applied 19-item self-report questionnaire that yields seven sub scores (subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction); these combine into an overall score between 0 and 21, where higher totals indicate worse sleep and a standard clinical cutoff separates good from poor sleepers. Smartphone dependency was evaluated with a standardized Smartphone Addiction Scale based on the tool validated by Kwon et al., (2013b) and its subsequent short form (Kwon et al., 2013a), capturing dimensions such as daily-life disturbance, withdrawal, tolerance, and overuse through a Likert-style scale where higher aggregated scores reflect

stronger dependency. To measure academic performance, participants self-reported their grade point average from the most recent semester; these marks were noted down in each institution's native scale, then converted to a single four-point metric so that universities with different grading setups could be directly compared and analyzed together. Along with those three main variables, a structured demographic form handed out at the same time gathered details on age, gender, degree level, academic discipline, and typical daily hours on a phone.

Data Collection Procedure

A single, self-administered survey packet brought together the background questions, the Pittsburgh Sleep Quality Index, and the Smartphone Addiction Scale for data collection. Surveys were handed out in person across the participating campuses; fieldworkers approached students in lecture halls, libraries, and common areas, briefed them on the project and response privacy, and invited them to take part voluntarily. Those who chose to join signed an informed consent form before answering the questions, and the survey gathered no identifying details past the demographic items already noted.

Data Analysis

The Statistical Package for the Social Sciences (SPSS) was used for all data analyses. The data were first broken down with descriptive statistics, producing means, standard deviations, counts, and percentages for each variable, including how students were distributed between good and poor sleep categories and across low, moderate, and high brackets of smartphone dependence. Bivariate links between sleep quality, phone dependency, and academic performance were tested using Pearson correlation coefficients. A two-step hierarchical multiple regression was run next: age, gender, academic level, and discipline were entered in block one, followed by smartphone dependency and sleep quality in block two, checking whether those two predictors contributed significantly to grades once demographic differences had already accounted for their share. Before the final regression model was run, residual normality, predictor collinearity, and homoscedasticity were checked through standard diagnostics, turning up no violations severe enough to undermine the findings. All inferential tests were judged against the standard 0.05 threshold for statistical significance.

Analysis and Results

Table 1 outlines the demographic profile of the 350 student participants, sampled proportionately across undergraduate and postgraduate tiers, public and private sectors, and several disciplines in Multan district.

Table 1: Demographic Characteristics of Respondents

Characteristic	Category	Frequency	Percentage
Gender	Male	184	52.6
	Female	166	47.4
Academic level	Undergraduate	231	66.0
	Postgraduate	119	34.0
University sector	Public	203	58.0
	Private	147	42.0
Field of study	Natural/applied sciences	88	25.1
	Social sciences	94	26.9
	Business/management	97	27.7
	Engineering/technology	71	20.3

Descriptive statistics for the primary variables in this study are reported in Table 2. The mean global Pittsburgh Sleep Quality Index score surpassed the standard threshold for poor sleep, categorizing just over three-fifths of participants as poor sleepers. Daily smartphone use surpassed five hours on average, and

average Smartphone Addiction Scale scores landed in the moderate dependency bracket, aligning broadly with rates documented in previous twin-cities research (Khalily et al., 2020; Marryam et al., 2023).

Table2: Descriptive Statistics for Sleep Quality, Smartphone Dependency, and Academic Performance

Variable	M	SD	Category (%)
Pittsburgh Sleep Quality Index (global score)	7.84	3.12	Poor sleepers: 61.4%
Smartphone Addiction Scale (total score)	38.6	9.47	Moderate–high dependency: 57.1%
Average daily smartphone use (hours)	5.42	1.86	--
Semester GPA (4.0 scale)	2.98	0.54	--

To evaluate the two-way associations between sleep quality, smartphone dependency, and academic performance, a Pearson correlation analysis was run. As detailed in Table 3, smartphone dependency correlated positively and significantly with Pittsburgh Sleep Quality Index scores, showing that heavier smartphone dependency went hand in hand with poorer sleep, just as earlier work with Turkish and Pakistani students showed (Demirci et al., 2015; Marryam et al., 2023). Semester GPA showed significant negative correlations with both smartphone dependency and Pittsburgh Sleep Quality Index scores, revealing that worse sleep and higher smartphone dependency were both tied to lower grades.

Table 3: Pearson Correlations among Sleep Quality, Smartphone Dependency, and Academic Performance

Variable	1	2	3
1. PSQI global score	--		
2. Smartphone Addiction Scale score	0.47**	--	
3. Semester GPA	-0.39**	-0.44**	--

Note: PSQI = Pittsburgh Sleep Quality Index; higher PSQI scores indicate poorer sleep quality. **$p < 0.01$.

To predict semester GPA, we ran a two-step hierarchical multiple regression. We entered the demographic factors (age, gender, academic level, and field of study) in Step 1, introducing smartphone dependency and sleep quality at Step 2. As shown in Table 4, demographic characteristics accounted for a modest and only partially significant share of variance in academic performance, whereas the addition of smartphone dependency and sleep quality in Step 2 produced a substantial and statistically significant increase in explained variance, with both variables retaining significant, negative standardized coefficients in the final model, indicating that each predicted academic performance independently of the other and of the demographic characteristics controlled in Step 1.

Table 4: Hierarchical Multiple Regression Predicting Semester GPA

Predictor	B	SE	β	p	ΔR^2
Step 1: Age	0.02	0.02	0.05	0.312	--
Step 1: Academic level	0.09	0.06	0.08	0.118	0.04
Step 2: Smartphone dependency (SAS)	-0.014	0.003	-0.28	0.000	--
Step 2: Sleep quality (PSQI)	-0.041	0.009	-0.24	0.001	.21
Constant	3.62	0.18	--	0.001	--

Note: Total model $R^2 = 0.25$, $F(6, 343) = 19.1$, $p < 0.001$. Only selected demographic predictors are shown for brevity; gender and field of study did not reach significance in the final model.

Discussion and Findings

Both poor sleep quality and moderate-to-high smartphone dependency were widespread across the sampled undergraduate and postgraduate cohort in Multan. Just over three-fifths met the threshold for poor sleep, a figure that aligns closely with previous estimates from Pakistani and regional student cohorts assessed using the Pittsburgh Sleep Quality Index (Ibrahim et al., 2018; Marryam et al., 2023). Higher smartphone

dependency was significantly and positively linked to worse sleep quality, echoing trends observed in Turkish, Malaysian, and Indian student cohorts (Demirci et al., 2015; Kalal et al., 2023; Rathakrishnan et al., 2021) and lending weight to the view that routine device use, especially around bedtime, interferes with the behavioral and physiological prerequisites of restful sleep.

In the hierarchical regression model, smartphone dependency and sleep quality each maintained a significant, independent link to academic performance after controlling for demographic factors, broadening the empirical picture established by Khan et al., (2019) and Marryam et al., (2023) in comparable Pakistani cohorts. These results match the conclusion of Rathakrishnan et al., (2021) that smartphone addiction and sleep quality offer separate predictive power regarding academic performance instead of one fully explaining the other, while further reinforcing Lepp et al., (2014) core finding that heavier mobile technology engagement correlates with lower college performance overall. Because smartphone dependency yielded a larger standardized coefficient than sleep quality in the final model, routine device use may function as a somewhat more immediate obstacle to student performance in this cohort than disturbed sleep on its own, even though the two issues remain tightly connected.

These results need to be considered against the mixed empirical trends currently visible in the Pakistani literature. Khan et al., (2019) and Bhutto et al., (2024) identified unambiguous negative associations between smartphone dependency and academic outcomes, but Raza et al., (2020) observed a weaker, non-significant direct relationship in an alternate campus setting. That divergence implies the association may hinge on local conditions, including institutional academic culture, field of study, or how academic performance was measured. By utilizing validated, standardized instruments for each variable alongside a proportionate, multidisciplinary cohort, this study limits some of the methodological discrepancies that may account for earlier contradictions, and finding significant, independent contributions from both smartphone dependency and sleep quality reinforces the practical importance of these factors for Pakistani university students.

This study is subject to several limitations that need noting. Because the design is cross-sectional, one cannot draw causal inferences about directionality. Lower grades might just as well spur heavier smartphone use or poorer sleep because of increased stress, acting alongside or even instead of the reverse process. Relying on convenience sampling, even with a proportionate distribution, limits how far these observations can be generalized outside the sampled institutions in Multan, and self-reported grade point averages, though conventional and convenient, remain susceptible to recall and reporting inaccuracies. Subsequent studies using longitudinal tracking, objective mobile device metrics, and confirmed institutional records would help untangle the causal mechanisms underlying the patterns reported here.

Conclusion and Recommendations

This study investigated how sleep quality, smartphone dependency, and academic performance relate to one another within a cross-sectional sample of 350 undergraduate and postgraduate students from public and private institutions across Multan, Pakistan, relying on validated instruments for all three areas. Poor sleep quality and moderate-to-high smartphone dependency appeared widely within the cohort, and each factor was significantly and independently linked to academic performance, combining to explain a substantial share of variance in semester grade point average after adjusting for demographic traits. These outcomes suggest that excessive phone use and deficient sleep operate as modifiable behavioral risks for academic difficulties among Pakistani university students, rather than merely reflecting harmless features of student life. These findings warrant several practical steps: universities in Multan and similar urban areas should add sleep hygiene and digital wellbeing education to their orientation and counseling services, academic advisors should be trained to spot problematic phone use and sleep loss in struggling students, and institutions should track these behaviors over time as phone technology and student habits shift.

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