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Smartphone Addiction and Its Relationship with Sleep Quality among University Students

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Research Article

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Abstract

Background/purpose. Smartphone addiction is widespread among adolescents. Recent literature reports a strong link between excessive use of smart devices and declines in sleep quality. This study investigated smartphone addiction and sleep quality among adolescents at a university and examined differences by demographic variables (gender and academic level).

Materials/methods. Using a descriptive correlational approach, a sample of 295 male and female students was selected from a Saudi university using stratified random sampling. Data were collected using the Smartphone Addiction and Sleep Quality Scales.

Results. University students suffer from high levels of smartphone addiction symptoms. Multidimensional sleep disturbances were prevalent, with the most common being difficulty initiating sleep and reduced overall sleep duration. Next, addiction levels significantly differed by gender, favoring males. However, no differences were observed by academic level. Correlation analysis results showed significant relationships between some addiction dimensions and sleep quality, particularly a negative relationship between loss of control and sleep duration, and a positive relationship between psychological distress and difficulty initiating sleep. Linear regression analysis indicated that addiction dimensions like social withdrawal, relationship deterioration, distress, and negative emotions significantly contribute to predicting sleep quality decline. However, the model explains a limited amount of variance.

Conclusion. Smartphone addiction negatively affects sleep quality among university adolescents, with detailed effects from two dimensions: social action and negative beliefs.

1. Introduction

Smartphone usage has become an integral part of the daily routines of university students and teenagers, providing them with immediate access to entertainment, communication, and academic materials (Emanuel et al., 2015). However, when smartphone use becomes excessive, compulsive, and challenging to control, it can develop into smartphone addiction (Santoro et al., 2025). This type of behavioral addiction is characterized by a loss of control, persistent use despite adverse consequences, and significant interference with psychological and social functioning (Gori & Topino, 2024). Recent reviews and empirical studies show that problematic smartphone use is linked to elevated stress and anxiety, depressive symptoms, and diminished self-regulation among young people (Karaaziz & Keskindağ, 2015). Clearly, smartphone addiction needs to be considered as a significant mental health concern rather than a temporary habit.

Notably, one study reported excessive smartphone dependence among some students, with 20% of sampled students exhibiting complete dependence (Emanuel et al., 2015). Some scholars reported that compared to those not suffering from smartphone addiction, those who did spent twice as much time and used apps twice as often, especially for email, texting, Facebook, and online surfing (Tossell et al., 2015). Besides technology, addiction involves knowledge, entertainment, and social interactions (Karaaziz et al., 2015). However, Gao et al. (2025) found that among adolescents with depression who exhibited smartphone addiction, those with insomnia felt nervous and tired during the day, worsening their sleep issues.

Worryingly, a growing literature has documented the high prevalence of smartphone addiction among adolescents and university students worldwide. Some studies even report that a substantial proportion of students meet the criteria for problematic or addictive use (Aftab & Khyzer, 2023). In the Saudi and broader Arab context, studies report addiction-like patterns of smartphone use, including excessive preoccupation, emotional dependence, and functional impairment, among a considerable percentage of sampled high school and university students (Alahdal et al., 2023). These patterns have been linked to both physical and mental health problems, particularly sleep, suggesting that smartphone addiction has become a salient public health issue in the region and warrants systematic investigation in university settings (Elamin et al., 2024). For instance, some scholars even suggest a 36% incidence rate of smartphone addiction among Saudi college students (Alahdal et al., 2023).

The adverse effects of smartphone addiction on sleep become even more important as teens have more sleep challenges than other age groups. Insomnia is the best-known; difficulties falling asleep or waking early without falling asleep may hinder daytime performance. A study reports an incidence rate of approximately 20–30% among the youth. Adolescent circadian rhythm changes contribute to these issues. Melatonin, produced later in the evening, prepares the body for long nights; young individuals with insufficient sleep syndrome have habits or behaviors that typically prevent them from sleeping sufficiently. Quality sleep encompasses being well-rested, the feeling of relaxation and rejuvenation when one gets up, and how long and well one sleeps. However, some adolescents struggle to get "adequate" sleep (Delahoyde et al., 2024). Some studies have shown that not getting enough or good sleep can cause mood disorders, including anxiety and depression, poor school performance and thinking, and even obesity and high blood pressure. Researchers found that teens and young adults who do not sleep sufficiently or poorly can experience disruptions in their hormones and metabolism, affecting their heart health and immune systems (Alam et al., 2024).

Clearly, the issue of smartphone addiction's influence on sleep, and thus, on health and other factors, is substantial. Indeed, while numerous studies report smartphone addiction incidence rates of 31-58% among university students (Kılıç et al., 2025; Ozkaya et al., 2020; Samat et al., 2020), some also show that this affects academic performance and physical activity (Hangouche et al., 2018;

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Rathakrishnan et al., 2021). Still, research in Saudi universities suggests that frequent exercise may mitigate the consequences of poor sleep quality among students (Mahfouz et al., 2020).

2. Literature Review

The literature highlights smartphone addiction as a complex public health issue among the youth, with sleep quality modulating its effects on psychological distress, anxiety, and academic performance.

2.1. Smartphone addiction

Smartphone addiction is a behavioral pattern characterized by excessive, compulsive, and uncontrollable smartphone usage. It is frequently detrimental to psychological well-being, daily functioning, and interpersonal relationships. While not formally recognized as a psychiatric condition, researchers are progressively framing it within the context of behavioral addictions owing to its symptomatic parallels, including withdrawal, tolerance, mood disorders, and the neglect of other activities (Mac Cárthaigh et al., 2020). According to empirical studies, university students are heavily addicted to smartphones. In an extensive Saudi Arabian survey, most students reported problematic smartphone use, which affected sleep, mental health, and academic performance (Alosaimi et al., 2016). Moreover, excessive smartphone use has been consistently associated with impaired sleep, shorter sleep duration, delayed sleep onset, frequent awakenings, and poor overall sleep quality. These findings underscore the urgency of addressing smartphone addiction as a public health concern, especially among youth and students who are particularly vulnerable (Nikolic et al., 2023).

Recent studies show that smartphone addiction is rising among teenagers and young people, and negatively impacts their sleep, mental health, and academic performance. Regional studies in Saudi Arabia show an increased risk among high school and university students. Alahdal et al. (2023) found high smartphone addiction and short sleep duration among Makkah secondary school students. Alshoaibi et al. (2023) observed poor sleep quality among 52.5% of sampled teenagers and young adults in Riyadh, with excessive screen use of more than 6 hours per day being a prominent contributor. These regional tendencies match the international findings. Some studies show that smartphone use before bedtime affects circadian rhythms, delays the onset of sleep, and lowers sleep quality (Nikolic et al., 2023; Ütük et al., 2025). Moreover, longitudinal and regression-based studies show that smartphone addiction is linked to insomnia, daytime fatigue, and a bidirectional relationship with sleep disturbances, where poor sleep worsens addictive behaviors and vice versa.

2.2. Sleep quality

Sleep quality is a multidimensional construct that incorporates various factors, including the sleep time, the length of time it takes to fall asleep, the number of times a person wakes up during the night, the presence of physiological disturbances during sleep, nightmares, and the level of functioning experienced during the day (Delahoyde et al., 2024). Notably, adolescence and young adulthood are stages of growth marked by increased demands on the cognitive, emotional, and physiological systems. Hence, getting enough sleep is essential during these life stages. However, sleep problems are common among adolescents and university students, according to several studies (Hangouche et al., 2018). These disturbances can include trouble falling asleep, insufficient sleep duration, and daytime drowsiness. Indeed, impaired academic performance, emotional dysregulation, metabolic and cardiovascular risk, and decreased overall well-being have all been associated with poor sleep quality (Mahfouz et al., 2020).

Several theoretical frameworks provide insight into the mechanisms linking reduced sleep quality to smartphone addiction (Espie, 2002). According to the cognitive arousal theory, the onset of sleep can be delayed and sleep continuity disrupted by cognitive and emotional activation that occurs prior to sleep. This activation includes experiences such as rumination, stress, and emotional involvement

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with digital content (Reisenzein, 2017). In addition, exposure to the blue light emitted by smartphone screens interferes with melatonin secretion, further delaying circadian rhythms. Drawing on the concept of behavioral addiction, the increased nocturnal smartphone usage is a result of emotional reinforcement and obsessive engagement. These factors create a loop in which addictive behaviors and poor sleep quality intensify one another. Together, these theories highlight that the primary contributors to the disruption of standard sleep patterns are the presence of emotional discomfort, experiencing negative emotions, and a loss of control over one's actions (Alam et al., 2024).

However, several research gaps exist in extant research. Most studies on smartphone addiction and sleep quality have focused on overall addiction levels or global sleep quality, and not on the specific dimensions of smartphone addiction or their effects on different sleep components.

Most studies have used simple correlational designs, making it difficult to determine how addiction dimensions, such as loss of control, negative emotions, and social withdrawal, affect sleep quality. Scholars have rarely used advanced explanatory statistical models such as multiple regression or structural modeling to comprehensively investigate these links. Moreover, while smartphone addiction and sleep problems have been extensively studied internationally, research in Arab and Saudi university contexts is minimal. Few studies analyze addiction aspects, demographic variables (e.g., gender and academic level), and the predicted effect of smartphone addiction on sleep quality in a coherent analytical framework. To address these gaps, this study conducts a comprehensive explanatory analysis of smartphone addiction and sleep quality among university students. The findings can inform evidence-based therapies to improve sleep and digital well-being in university populations by investigating smartphone addiction characteristics and their predictive functions.

3. Methodology

3.1. Research design

This study adopted a descriptive correlational research design, incorporating both correlational and comparative approaches. By gathering data that represent the current state of the phenomenon under study, the descriptive correlational approach is commonly used to examine the relationships between two or more variables in natural settings without modifying the conditions (Khattab, 2007, p. 235).

3.2. Participants

The target demographic comprised undergraduate students registered at a public university in Riyadh, Saudi Arabia. The Deanship of Admissions and Registration reported that the overall enrolment of undergraduate students for the academic year 2024 was 78,441. A preliminary sample of 75 students was recruited to assess the psychometric features of the tests. A stratified random sampling method stratified by academic level was subsequently used to select the primary study sample.

A total of 320 students participated in the online questionnaire; 25 replies were eliminated due to incomplete or inconsistent data, yielding a final analytical sample of 295 students (193 males, 65.4%; 102 females, 34.6%; 245 undergraduate students, 83.1%; 50 postgraduate students, 16.9%). The sample size was determined using Morgan's table, which confirmed that the chosen size was sufficient for the population under examination. Data were collected via a structured survey administered using Google Forms. The questionnaire link was disseminated through official university emails and academic communication groups. Explicit instructions were provided, and the system was configured to allow only a single submission per participant to prevent duplicate responses and improve data integrity. The inclusion criteria mandated that participants (a) be full-time undergraduate students at the specified university, (b) be aged between 18 and 25 years, (c) possess proficiency in Arabic (as all study materials were composed in Modern Standard Arabic), and (d)

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provide informed consent prior to participation. The research adhered to the ethical standards for psychological and social inquiry. Ethical approval was obtained from the pertinent university committee. The consent form clearly delineated the study's goal, anticipated duration, and measures to safeguard anonymity and ensure voluntary participation. No names or university identification numbers were collected, and all comments were used exclusively for scientific research.

The statement outlined the study's objectives, questions, duration, and how participants' data would be kept confidential and used solely for the study. The online form stated that participation was voluntary and that users might withdraw at any moment without penalty. Since no names or university ID numbers were obtained, all comments were kept private. As with scientific research, the data would be used only to analyze the study's outcomes. Table 1 reports the distribution of participants by academic level and gender.

Table 1. Distribution of participants by academic level and gender

Variable	Category	Number of individuals	Percentage
Academic Level	Bachelor	245	83.1%
	Postgraduate	50	16.9%
Gender	Male	193	65.4%
	Female	102	34.6%

Clearly, the majority of participants were pursuing a bachelor's degree, whereas the remaining were pursuing graduate studies. This disparity indicates that the majority of the study sample comprised young people in their early university years, a group that is often more engaged with current social issues but may lack the academic depth and professional experience of graduate students. Therefore, the results need to be understood in light of the age and school settings. Next, by gender, 65.4% of the sample was male and 34.6% was female. This uneven distribution raises questions about how well women were represented in the study, whether there was bias in the study population, or how the data were collected. This gap could shift the balance of opinions, especially if the issues raised concern personal or societal experiences that differ between men and women. Figure 1 illustrates the distribution of participants by academic level and gender.

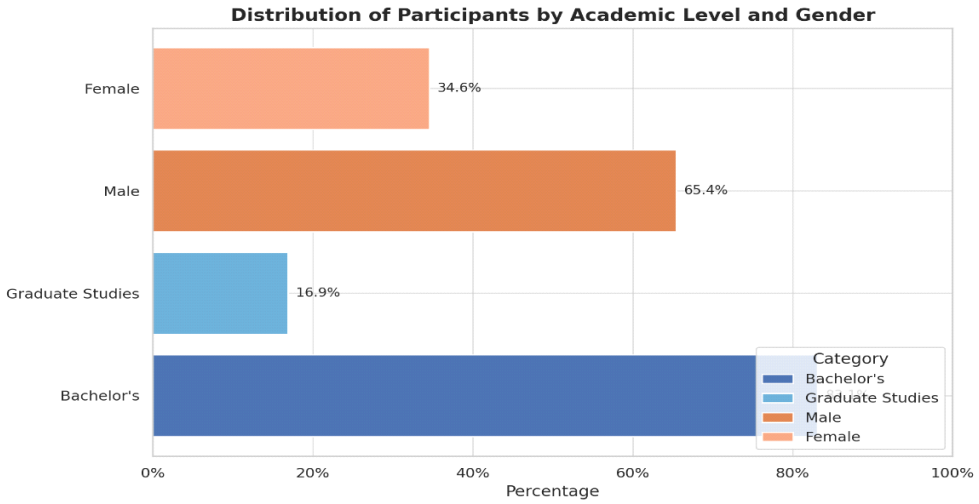

Figure 1. Distribution of participants by academic level and gender

3.3. Instruments

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3.3.1. Smartphone Addiction Scale

Smartphone addiction was assessed utilizing the Smartphone Addiction Scale created by Di Blasi et al. (2016), which was subsequently translated and converted into Arabic by Al-Zoubi (2020). The scale comprises 24 items categorized into five dimensions: (1) excessive preoccupation (items 1, 3, 5, 14, 19, and 23), (2) loss of control (items 6, 10, 11, 20, and 21), (3) distress and negative emotions (items 2, 4, 13, 16, and 22), (4) social isolation and relationship deterioration (items 7, 12, and 17), and (5) negative impact on daily life (items 8, 9, 15, 18, and 24). Responses were evaluated using a four-point Likert scale, with 1 indicating strong disagreement and 4 indicating strong agreement.

The face and content validity of the Arabic version were assessed by a panel of nine experts in educational psychology and counseling, who affirmed the suitability and clarity of item phrasing. Construct validity was assessed through an exploratory factor analysis, which confirmed the anticipated five-factor structure with adequate factor loadings. The initial adaptation had an internal consistency (Cronbach's alpha) of 0.89 for the total score, whereas the subscale coefficients varied between 0.76 and 0.84.

Further, supplementary psychometric assessments were performed. The item-total correlations varied from 0.53 to 0.81, signifying strong internal consistency. Cronbach's alpha for the overall score was 0.89, whereas those for the subscales were 0.78, 0.82, 0.79, 0.76, and 0.74, respectively. The split-half reliability (Spearman–Brown adjusted) for the total score was 0.85, indicating strong internal consistency and affirming the scale's appropriateness for research applications.

3.3.2. Quality of Sleep Scale

The Sleep Quality Scale, created by Al-Zariqat (2016), was used to evaluate sleep quality and was culturally altered to align with the attributes of the current sample and setting. The scale comprises 17 items categorized into five dimensions: (1) total sleep quantity (items 1, 3, and 4), (2) challenges in sleep onset and nocturnal awakenings (items 2, 7, an d8), (3) physiological issues during sleep (items 9, 10, 11, 12, 13, and 15), (4) nightmares and sleep disruptions (items 14 and 16), and (5) diurnal sleepiness and diminished activity (item 17).

Expert reviewers in psychology and mental health validated both face and content validity. Exploratory factor analysis validated the five-dimensional structure, which was consistent with the scale's theoretical foundation. In previous validation studies, the overall Cronbach's alpha was 0.87, whereas the subscale Cronbach's alphas varied from 0.72 to 0.83.

In the current sample, item–total correlations for each dimension ranged from 0.48 to 0.77, all of which were statistically significant, demonstrating sufficient internal consistency. Cronbach's alpha coefficients for the dimensions were 0.81, 0.77, 0.80, 0.73, and 0.71, respectively, while the total score was 0.87. The split-half reliability was 0.83, indicating a stable and internally consistent assessment of sleep quality among university students.

3.4. Statistical Analysis Methods

We adopted statistical methods appropriate for the nature of the data and study objectives. Descriptive statistics were used to analyze the general characteristics of the study sample, and normality was assessed prior to conducting parametric analyses. For illustrative purposes, normality tests for the first and second key variables indicated acceptable distributions (Shapiro–Wilk test: Variable 1, $W = 0.97$, $p = .081$; Variable 2, $W = 0.96$, $p = .064$). Similarly, the Kolmogorov–Smirnov test results were not significant ($p > .05$), supporting the assumption of approximate normality. Accordingly, parametric tests, including independent sample t-tests and one-way analysis of variance (ANOVA), were conducted. The actual test values are reported in the revised Statistical Analysis section. Appropriate hypothesis tests were also used, such as the t-test for comparing two groups

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and one-way ANOVA for comparing more than two groups. Multiple linear regression analysis was performed using the direct entry method (Enter Method), which simultaneously entered all independent variables into the model to assess their collective predictive power. Pearson's correlation coefficient was used to measure the strength and direction of the relationships between the continuous variables. All analyses were performed using SPSS version 26 and the AMOS program for structural analysis.

4. Results

4.1. Smartphone addiction and sleep quality among university students

Table 2. Descriptive statistics and one-sample t tests for smartphone addiction dimensions

Distance	Mean	Standard Deviation	*t*	*df*	*p*	Effect Size (*Cohen's d*)
Excessive preoccupation	20.719	4.927	72.222	294	< .001	4.205
Loss of control	15.725	4.629	58.353	294	< .001	3.397
Distress and negative emotions	16.098	4.507	61.348	294	< .001	3.572
Social isolation	9.203	3.307	47.796	294	< .001	2.783
Negative impact on daily life	16.071	4.856	56.840	294	< .001	3.309
Total score (TSAS)	77.817	20.281	65.903	294	< .001	3.837

The results in Table 2 indicate that the university students in the sample showed high levels of smartphone addiction symptoms across all five dimensions, as all means significantly exceeded the reference values ($p < .001$). The highest mean was recorded in the preoccupation dimension (20.72), followed by negative impact on daily life (16.07) and distress and negative emotions (16.10), which represent the core of compulsive smartphone use. The dimensions of loss of control and social isolation also showed relatively high means (15.73 and 9.20, respectively), with huge effect sizes (Cohen's d between 2.78 and 4.20). This indicates that these symptoms are not only common but are also severe and have a tangible impact on students' lives. Overall, the mean for the smartphone addiction scale was 77.82, with a standard deviation of 20.28, consistent with the high t-value (65.90) and large effect size ($d = 3.84$), suggesting that students experience very high levels of smartphone addiction.

Table 3. Descriptive statistics and one-sample t-test results for sleep disturbance dimensions

Dimension	Mean	Standard Deviation	*t*	*df*	*p*	Effect Size (*Cohen's d*)
General Symptoms	4.780	1.318	62.289	294	< .001	3.627
Difficulty Sleeping	4.278	2.056	35.731	294	< .001	2.080
1. Physiological Symptoms	4.319	3.309	22.413	294	< .001	1.305
Nightmares	1.451	1.488	16.746	294	< .001	0.975
Daytime Impact	1.163	1.057	18.901	294	< .001	1.100
Total	13.051	5.847	38.335	294	< .001	2.232

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The results in Table 3 showed statistically significant differences across all sleep disturbance dimensions. Further, most dimensions recorded very large effect sizes according to Cohen's d. The "general symptoms" dimension recorded the highest mean (4.78) and effect size (3.63), indicating a high awareness of sleep-related difficulties. The "difficulty falling asleep" dimension also showed a high mean (4.28) and large effect size (2.08), reflecting the prevalence of problems with sleep onset and maintenance. The "physiological symptoms" dimension (such as a fast heartbeat and night sweats) had a high mean (4.32); however, its standard deviation was also high (SD = 3.31). The dimensions related to the effects of poor sleep, like "nightmares" and "daytime impact," had relatively low means (1.45 and 1.16, respectively). However, all exhibited statistically significant differences, with effect sizes ranging from medium to large. Thus, a significant number of students were affected by these symptoms. The scale's total score had a mean of 13.05 (SD = 5.85), a high t-value (38.34), and a huge effect size (2.23). This clearly shows that sleep problems are common in the study sample.

4.2. Relationship between smartphone addiction and sleep quality among university students

Table 4. Pearson correlations between smartphone addiction dimensions and sleep quality

	Sum of Squares	df	Mean Square	F	p	Effect Size
Overall model	363.63	14	25.97	2.2478	0.010	
Age	2.49	2	1.24	0.0901	0.914	-0.014
Employment	44.11	1	44.11	3.1980	0.077	0.017
Educational Level	7.87	2	3.93	0.2853	0.752	-0.011
Economic Level	41.12	2	20.56	1.4908	0.230	0.008
Number of Children	39.32	2	19.66	1.4256	0.245	0.007
Child Order in Family	175.74	2	87.87	6.3709	0.002	0.082
Services Provided	52.98	3	17.66	1.2805	0.285	0.006

Table 4 revealed statistically significant correlations between some dimensions of smartphone addiction and sleep quality. Loss of control is negatively correlated with the overall quantity of sleep ($r=-0.169, p<0.01$). This suggests that an increase in loss of control was associated with a decrease in sleep duration. The negative impact on daily life and sleep quantity was even more pronounced ($r=-0.190$, $p<0.01$), suggesting that phone use interferes with daily activities, reducing available sleep time. Regarding aspects of sleep disturbance, a significant positive correlation was observed between distress and negative emotions, and between difficulty in initiating sleep and nocturnal waking ($r=0.197$, $p<0.01$), as well as between negative impact on daily life and the same difficulty ($r=0.158$, $p<0.01$). This suggests that compulsive use, accompanied by negative emotions, contributes to delayed sleep onset and increased nocturnal waking.

A significant positive correlation was also found between distress and negative emotions, and the overall sleep quality index ($r=0.117, p<0.05$). This may be explained by the greater awareness among individuals who are psychologically affected by poor sleep quality. Other dimensions, such as excessive preoccupation, nightmares, sleep-related physiological disturbances, and daytime sleepiness, did not show statistically significant correlations with sleep quality indicators. This suggests they may be influenced by factors other than digital use. In general, the results showed that specific dimensions of digital addiction, especially loss of control and emotional distress, clearly

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contribute to the deterioration of sleep quality. As such, interventional programs are needed to reduce compulsive smartphone use among university students.

4.3. Differences in smartphone addiction among university students by demographic variables

Table 5. Between-subjects effects of gender and academic level on smartphone addiction dimensions

Source	Dependent Variable	Sum of squares (Type III SS)	df	Mean squares	F	Sig.
Academic Level	Excessive Preoccupation	1.654	1	1.654	0.069	0.793
	Loss of Control	30.996	1	30.996	1.447	0.230
	Distress and Negative Emotions	23.344	1	23.344	1.173	0.280
	Social Isolation and Deterioration of Relationships	4.352	1	4.352	0.403	0.526
	Negative Impact on Daily Life	22.920	1	22.920	0.992	0.320
	Total Score	255.578	1	255.578	0.632	0.427
Gender	Excessive Preoccupation	170.973	1	170.973	7.149	0.008
	Loss of Control	26.617	1	26.617	1.243	0.266
	Distress and Negative Emotions	140.073	1	140.073	7.040	0.008
	Social Isolation	65.609	1	65.609	6.080	0.014
	Negative Impact on Daily Life	168.012	1	168.012	7.273	0.007
	Total Score	2614.474	1	2614.474	6.461	0.012
Error	All Dimensions	3140 117761	291	—	—	—

The results in Table 5 for the Between-Subjects Effects test indicated that the academic level variable did not have a statistically significant effect on any of the smartphone addiction dimensions or on the total score of the scale. The F-values ranged from 0.069 to 1.447, and all associated P-values exceeded 0.05, suggesting that smartphone addiction among students at different academic levels did not significantly differ. Thus, the academic stage, whether advanced or early, is not a decisive factor in explaining the variation in smartphone addiction scores in the studied sample.

In contrast, statistically significant differences attributable to the gender variable were observed for several smartphone addiction dimensions: "excessive preoccupation" ($F=7.149, p=0.008$), "distress and negative emotions" ($F=7.040, p=0.008$), "social isolation and relationship deterioration" ($F=6.080, p=0.014$), and "negative impact on daily life" ($F=7.273, p=0.007$). Besides, the total score of the scale also significantly differed ($F=6.461, p=0.012$). However, the "loss of control" dimension was not statistically significant ($p=0.266$), which indicates a similarity between genders on this specific dimension.

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4.4. Differences in sleep quality among university students by demographic variables

Table 6. Between-subjects ANOVA results for sleep disturbance dimensions by gender and academic level

Source	Sleep Dimension	F	Sig.
Academic Level	Total Sleep Quantity	3.224	.074
	Difficulty Sleeping, Initiating, and Nighttime Awakenings	0.200	.655
	Physiological Sleep Disorders	1.670	.197
	Nightmares and Sleep Disorders	1.070	.302
	Daytime Sleepiness and Low Energy	0.407	.524
	Total Sleep	0.982	.323
Gender	Total Sleep Quantity	1.192	.276
	Difficulty Sleeping, Initiating, and Nighttime Awakenings	1.257	.263
	Physiological Sleep Disorders	4.664	.032
	Nightmares and Sleep Disorders	0.080	.777
	Daytime Sleepiness and Low Energy	0.040	.841
	Total Sleep	2.992	.08

The results from Table 6 of the Between-Subjects ANOVA showed that gender and academic specialization had limited effects on sleep disturbance dimensions among participants, as no statistically significant differences were found across most dimensions. However, a statistically significant difference was attributable to gender on the "physiological disturbances during sleep" dimension (F=4.664, p=.032). In contrast, the differences were not statistically significant in other dimensions, such as overall sleep quantity, sleep-onset difficulties, nightmares, and daytime sleepiness, regardless of gender or academic specialization.

4.5. Predicting sleep quality through the level of smartphone addiction among university students

A multiple linear regression analysis was used to identify the relative contribution of each explanatory variable in predicting the dependent variable. A baseline model (M_o) was built without independent variables. Then, a comprehensive model (M_1) was implemented, including five variables: Excessive use (Excessive), Feeling of loss (Loss), Distress (Distress), Social interaction (Social), and Negative beliefs (Negative). The complete model (M_1) achieved a coefficient of determination (R2) of 0.047, meaning that it explains 4.7% of the variance in the dependent variable. Meanwhile, the adjusted coefficient of determination (Adjusted R2) was 0.031, indicating a slight improvement given the number of independent variables and observations. The root mean square error (RMSE) also decreased from 5.847 in the baseline model to 5.756 in the expanded model, indicating improved predictive accuracy.

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Table 7. ANOVA results for the multiple linear regression model

Source	Sum of Squares	df	mean squares	F	P
Regression	476.497	5	95.299	2.876	0.015
Residual	9575.741	289	33.134		
Total	10052.237	294			

Table 7 shows that the F-value was 2.876 (df = 5, 289), while the p-value was 0.015. Thus, the model as a whole was statistically significant. Hence, the model with the five independent variables did a much better job of explaining the differences in the dependent variable than the model without these variables.

Table 8. Regression coefficients for the extended model

Variable	B (unstandardized)	Standard error	β (standardized)	T	P
(Intercept)	10.860	1.498		7.249	< .001
Excessive	0.215	0.141	0.181	1.527	0.128
Loss	0.063	0.133	0.050	0.474	0.636
Distress	-0.148	0.164	-0.114	-0.901	0.368
Social	-0.714	0.212	-0.404	-3.362	< .001
Negative	0.355	0.146	0.295	2.435	0.016

Table 8 shows that the "Social" variable had a statistically significant adverse effect (B = -0.714, β = -0.404, p < .001). Thus, lower quality of social interaction was associated with a significant decrease in the dependent variable. Meanwhile, the "Negative" variable had a significant positive effect (B = 0.355, β = 0.295, p = 0.016). Thus, higher levels of negative beliefs are linked to an increase in the dependent variable. The variables "Excessive" (p = 0.128), "Loss" (p = 0.636), and "Distress" (p = 0.368) did not have statistically significant effects. This implies that their contributions to the model were insufficient to have a meaningful effect on the dependent variables.

4.6. The effect of the independent variables (academic level, gender, and smartphone addiction) on sleep quality

Table 9. Parameter estimates for predictor variables

Independent Variable	Estimate	Std. Error	Z	P	Lower limit of confidence interval 95%	upper limit of confidence interval 95%
Academic Level	-0.313	0.179	-1.750	0.080	-0.663	0.037
Gender	0.127	0.126	1.002	0.317	-0.121	0.374
Smartphone Addiction	-0.013	0.008	-1.616	0.106	-0.028	0.003

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The results in Table 9 show that academic level negatively affected sleep quality; however, this effect did not reach an accepted level of statistical significance (p = 0.080). This may suggest a link between academic pressure and deterioration in sleep. Gender showed no statistically significant relationship, indicating no substantial differences in sleep quality between males and females within this sample.

Smartphone addiction negatively affected sleep quality, but not statistically significantly (p = 0.106). This suggests that these personal and behavioral variables were not sufficiently strong to directly predict sleep quality, highlighting the importance of exploring potential mediating or interacting variables in future research.

Table 10. Estimated coefficients of the indicators for the latent variable (Sleep Quality Indicators)

Index	Estimate	Std. Error	Z	P	Lower limit of confidence interval 95%	upper limit of confidence interval 95%
General Sleep Quality	1.018	0.334	3.044	0.002	0.363	1.673
Difficulty Sleeping	-0.333	0.134	-2.482	0.013	-0.596	-0.070
Physiological Symptoms	-0.919	0.353	-2.606	0.009	-1.610	-0.228
Nightmares	-0.402	0.199	-2.017	0.044	-0.793	-0.011
Daytime Sleepiness	≈ 0	0.062	-0.014	0.989	-0.123	0.121

The results in Table 10 indicate that the indicators of general sleep quality, sleep difficulties, nightmares, and physiological signs were central components in shaping the construct of sleep quality; all were statistically significant. Among these, the "General" indicator was the strongest predictor of the latent variable (β = 1.018, p = 0.002), followed by the physiological indicator.

However, daytime sleepiness (Daytime) was not statistically significant (p = 0.989), suggesting that it may not reliably reflect sleep quality in this model and may instead be influenced by other factors, such as diet or daily activities. Overall, these findings highlight that the subjective and physiological signs of sleep are more reliable in explaining sleep quality than daytime behavioral indicators.

5. Discussion

This study revealed a substantial prevalence of high levels of smartphone addiction among university students and a significant incidence of multidimensional sleep disruptions. Similarly, studies have demonstrated that problematic smartphone use is prevalent among adolescents and young adults, and is linked to reduced sleep quality and daily functioning (Alahdal et al., 2023; Alshoaibi et al., 2023; Nikolic et al., 2023). Moreover, the elevated scores on excessive attention and the negative influence on daily life are in line with previous research describing smartphone use as a compulsive behavior that interferes with academic routines and psychological well-being (Aftab & Khyzer, 2023; Santoro et al., 2025).

Next, the findings on sleep quality are consistent with those of previous research, which reported a significant prevalence of challenges with falling asleep, decreased sleep duration, and physiological sleep abnormalities among university students (Hangouche et al., 2018; Mahfouz et al., 2020).

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Furthermore, the results lend credence to the idea that exposure to screens and blue light during the overnight hours disrupts sleep patterns by delaying circadian rhythms and melatonin production (Alam et al., 2024; Delahoyde et al., 2024).

Meanwhile, contrary to studies that identified loss of control or overall addiction severity as the primary predictors of sleep disturbances (Ozkaya et al., 2020; Samat et al., 2020), this study identified social withdrawal and negative beliefs as the most significant predictors of diminished sleep quality. Other characteristics of addiction had diminished or non-significant predictive effects when concurrently incorporated into the model. This partial deviation from previous findings aligns with Li et al. (2025), who highlighted the pivotal role of emotional and cognitive pathways in moderating the connection between smartphone addiction and sleep disturbances.

Correlation analyses further substantiated this distinct pattern: The inverse correlation between loss of control and sleep length, including the direct correlation between distress and challenges in sleep onset, aligns with the findings of Nikolic et al. (2023) and Sohn et al. (2021). However, the poor correlations with daily drowsiness diverge from the findings of Rathakrishnan et al. (2021), who identified more robust connections with daytime performance. These inconsistencies may indicate contextual or cultural variations, together with unmeasured variables, such as physical activity and lifestyle behaviors, as proposed by Zhu et al. (2024). Regarding demographic variables, the identified gender disparities in various addiction dimensions align with studies suggesting greater problematic smartphone use among males (Kılıç et al., 2025; Yogesh et al., 2024). Meanwhile, they contradict research reporting negligible or absent gender differences (Samat et al., 2020). The lack of notable changes in sleep characteristics across academic levels aligns with previous research indicating that sleep issues are widespread among university populations, irrespective of academic stage (Mahfouz et al., 2020). Theoretically, these findings corroborate cognitive arousal theory and behavioral addiction models (Espie, 2002; Reisenzein, 2017). Meanwhile, they provide new evidence that the social and cognitive aspects of smartphone addiction are more significant for sleep disturbance than the sheer amount of use.

Overall, by explicitly identifying areas of agreement and divergence with earlier studies, this research refines existing theoretical models and contributes context-specific evidence from a Saudi university setting, where such dimension-specific analyses remain limited. The main contribution is to show that the relationship between smartphone addiction and poor sleep quality is not uniform, but driven by certain psychosocial aspects. Extant research has shown consistent findings in this area. When looking at addiction-related factors within an integrated regression model, the results revealed that social withdrawal and negative thoughts were the most potent predictors of sleep impairment. This finding is underrepresented in the literature, indicating that, in addition to focusing on smartphone usage rates, studying the qualitative psychological and social aspects of digital engagement is important.

6. Conclusion

This study revealed a substantial prevalence of smartphone addiction among Saudi university students, who experience multidimensional sleep disruption. Specifically, poor sleep quality in students is more strongly linked to psychosocial addiction aspects than smartphone use intensity. Further, social withdrawal and negative views are the strongest predictors of deteriorating sleep quality, while other addiction components have a weaker effect. Additionally, smartphone addiction and sleep disturbances are common across academic levels, with gender disparities in addiction dimensions and physiological sleep symptoms. Clearly, smartphone addiction and sleep quality are nuanced and determined by the qualitative nature of digital involvement rather than by generic usage.

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Overall, smartphone addiction is a major behavioral risk factor for university students' sleep health. Besides screen time limits, social functioning, cognitive processes, and emotional regulation must be targeted to reduce their harmful effects. This study provides a dimension-specific and context-sensitive knowledge of the addiction–sleep link at Saudi universities, laying the groundwork for future research and evidence-based prevention interventions.

7. Suggestions

Targeted programs should be implemented to reduce nighttime smartphone use and promote healthy sleep habits among university students, along with integrating sleep hygiene education into campus activities. Future studies should explore the causal links and mediating factors using gender-sensitive strategies to address the observed differences. Using self-monitoring tools, encouraging physical activity, collaborating with counseling services, and policies limiting late-night digital demands can also improve sleep quality and overall well-being.

Declarations

Author Contributions. Motaz Thaieb Alotaibi. Conceptualization, literature review, methodology design, data collection, statistical analysis drafting, critical review, and final editing of the manuscript. The author has read and approved the final version of the manuscript.

Conflicts of Interest. The author declares no conflicts of interest.

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Ethical Approval. Ethical approval for this study was obtained in accordance with the official procedures of the Imam Mohammad Ibn Saud Islamic University, and the study adhered to the principles outlined in the Declaration of Helsinki. All participants provided informed consent, and their privacy and confidentiality were fully respected throughout the study.

Data Availability Statement. The datasets generated and analyzed in the current study are available from the author upon reasonable request.

References

Aftab, T., & Khyzer, E. (2023). Smartphone addiction and its association with hypertension and quality of sleep among medical students of Northern Border University, Arar, Saudi Arabia. *Saudi Medical Journal*, *44*(10), 1013. https://doi.org/10.15537/SMJ.2023.44.10.20230402

Alahdal, W. M., Alsaedi, A. A., Garrni, A. S., Alharbi, F. S., Alahdal Jr, W. M., Alsaedi, A., Al-Garrni, A. S., & Alharbi, F. (2023). The impact of smartphone addiction on sleep quality among high school students in Makkah, Saudi Arabia. *Cureus*, *15*(6). https://doi.org/10.7759/cureus.40759

Alam, M., Abbas, K., Sharf, Y., & Khan, S. (2024). Impacts of blue light exposure from electronic devices on circadian rhythm and sleep disruption in adolescent and young adult students. *Chronobiology in Medicine*, *6*(1), 10–14. https://doi.org/10.33069/cim.2024.0004

Alosaimi, F. D., Alyahya, H., Alshahwan, H., Al Mahyijari, N., & Shaik, S. A. (2016). Smartphone addiction among university students in Riyadh, Saudi Arabia. *Saudi Medical Journal*, *37*(6), 675. https://doi.org/10.15537/smj.2016.6.14430

Alshoaibi, Y., Bafil, W., & Rahim, M. (2023). The effect of screen use on sleep quality among adolescents in Riyadh, Saudi Arabia. *Journal of family medicine and primary care*, *12*(7), 1379–1388. https://doi.org/10.4103/jfmpc.jfmpc_159_23

Delahoyde, M.-K., Tyack, C., Kugarajah, S., & Joseph, D. (2024). Insomnia and other sleep disorders in adolescence. *BMJ Paediatrics Open*, *8*(1), e001229. https://doi.org/10.1136/bmjpo-2021-001229

Elamin, N. O., Almasaad, J. M., Busaeed, R. B., Aljafari, D. A., & Khan, M. A. (2024). Smartphone addiction, stress, and depression among university students. *Clinical Epidemiology and Global Health*, *25*, 101487. https://doi.org/10.1016/j.cegh.2023.101487

Emanuel, R., Bell, R., Cotton, C., Craig, J., Drummond, D., Gibson, S., Harris, A., Harris, M., Hatcher-Vance, C., & Jones, S. (2015). The truth about smartphone addiction. *College Student Journal*, *49*(2), 291–299.

Espie, C. A. (2002). Insomnia: conceptual issues in the development, persistence, and treatment of sleep disorders in adults. *Annual Review of Psychology*, *53*(1), 215–243. https://doi.org/10.1146/annurev.psych.53.100901.135243

Gao, T., Zhang, H., Shi, Y., Xu, Y., Zhou, C., & Meng, X. (2025). The co-occurrence between depressive symptoms and smartphone addiction: a network analysis. *Behaviour & Information Technology*, 1–13. https://doi.org/10.1080/0144929X.2025.2525300

Gori, A., & Topino, E. (2024). Theoretical Perspectives and Empirical Evidence on the Association Between Alexithymia and Social Media Addiction. *Handbook of the Behavior and Psychology of Disease* (pp. 1–20).

Hangouche, A. J. E., Jniene, A., Aboudrar, S., Errguig, L., Rkain, H., Cherti, M., & Dakka, T. (2018). Relationship between poor quality sleep, excessive daytime sleepiness, and low academic performance in medical students. *Advances in Medical Education and Practice*, 631–638. https://doi.org/10.2147/AMEP.S162350

Karaaziz, M., & Keskindağ, B. (2015). "I love my smartphone": A review study of smartphone addiction and related psychological risk factors. *Journal of Dependence*, *16*(2), 78-85.

Karaaziz, M., Keskindağ, B., & Dergisi, B. (2015). I love my smartphone: a review study of smartphone addiction and related psychological risk factors. *Bağımlılık Dergisi*, *16*(2), 78-85.

Kılıç, F. E., Küçükkelepçe, O., & Konyalıoğlu, F. S. (2025). The role of smartphone addiction and family dynamics in sleep quality among earthquake-affected adolescents. *BMC Psychiatry*, *25*(1), 481. https://doi.org/https://doi.org/10.1186/s12888-025-06926-w

Li, S., Deng, Y., Cai, L., & Wu, L. (2025). The relationship between smartphone addiction and sleep disorder among college students: negative emotions as a mediator and gender as a moderator. *Frontiers in Psychiatry*, *16*, 1542243. https://doi.org/doi.org/10.3389/fpsyt.2025.1542243

Mac Cárthaigh, S., Griffin, C., & Perry, J. (2020). The relationship between sleep and problematic smartphone use among adolescents: A systematic review. *Developmental Review*, *55*, 100897. https://doi.org/10.1016/j.dr.2020.100897

Mahfouz, M. S., Ali, S. A., Bahari, A. Y., Ajeebi, R. E., Sabei, H. J., Somaily, S. Y., Madkhali, Y. A., Hrooby, R. H., & Shook, R. a. N. (2020). Association between sleep quality and physical activity in Saudi Arabian University students. *Nature and Science of Sleep*, 775–782. https://doi.org/doi.org/10.2147/NSS.S267996

Nikolic, A., Bukurov, B., Kocic, I., Vukovic, M., Ladjevic, N., Vrhovac, M., Pavlović, Z., Grujicic, J., Kisic, D., & Sipetic, S. (2023). Smartphone addiction, sleep quality, depression, anxiety, and stress among medical students. *Frontiers in Public Health*, *11*, 1252371. https://doi.org/10.3389/fpubh.2023.1252371

Ozkaya, H., Serdar, M., Acar, H., Pekgor, S., & Arica, S. G. (2020). Evaluation of the frequency/addiction of smartphone use and its effect on sleep quality in university students. , , . https://doi.org/10.5455/annalsmedres.2019.11.737

Rathakrishnan, B., Bikar Singh, S. S., Kamaluddin, M. R., Yahaya, A., Mohd Nasir, M. A., Ibrahim, F., & Ab Rahman, Z. (2021). Smartphone addiction and sleep quality on academic performance of university students: An exploratory research. *International Journal of Environmental Research and Public Health*, *18*(16), 8291. https://doi.org/10.3390/ijerph18168291

Reisenzein, R. (2017). Varieties of cognition-arousal theory. *Emotion Review*, *9*(1), 17–26. https://doi.org/https://doi.org/10.1177/1754073916639665

Samat, F., Mokhtar, M., & Wahab, S. (2020). The Relationship between smartphone addiction, sleep quality, and stress among university students. *Journal Personalia Pelajar, 23(1)*.

Santoro, G., Musetti, A., Costanzo, A., & Schimmenti, A. (2025). Self-discontinuity in behavioral addictions: A psychodynamic framework. *Addictive Behaviors Reports*, 100601. https://doi.org/https://doi.org/10.1016/j.abrep.2025.100601

Sohn, S. Y., Krasnoff, L., Rees, P., Kalk, N. J., & Carter, B. (2021). The association between smartphone addiction and sleep: a UK cross-sectional study of young adults. *Frontiers in Psychiatry*, *12*, 629407. https://doi.org/doi.org/10.3389/fpsyt.2021.629407

Tossell, C., Kortum, P., Shepard, C., & Rahmati, A. (2015). Exploring smartphone addiction: insights from long-term telemetric behavioral measures. *International Journal of Interactive Mobile Technologies*, *9*(2). https://doi.org/http://dx.doi.org/10.3991/ijim.v9i2.4300

Ütük, F. A., Yücel, O., Asadi, M., Yücel, M., Yanık, D., Demirhindi, H., Mete, B., & Mete, E. D. (2025). A Mediational Evaluation of Smartphone Addiction Effect on Insomnia and Sleepiness in Adolescents and Young Adults. *Turkish Journal of Sleep Medicine,*. https://doi.org/ 10.4274/jtsm.galenos.2024.30074

Yogesh, M., Ladani, H., & Parmar, D. (2024). Associations between smartphone addiction, parenting styles, and mental well-being among adolescents aged 15–19 years in Gujarat, India. *BMC Public Health*, *24*(1), 2462. https://doi.org/https://doi.org/10.1186/s12889-024-19991-9

Zhu, W., Liu, J., Lou, H., Mu, F., & Li, B. (2024). Influence of smartphone addiction on sleep quality of college students: The regulatory effect of physical exercise behavior. *PLOS One*, *19*(7), e0307162. https://doi.org/10.1371/journal.pone.0307162

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