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Smartphone Addiction, Sleep Quality and Symptoms of Depression, Anxiety and Stress among Young Adults: The Mediating Role of Sleep Quality

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Abstract: ***Smartphone ownership among Indian young adults is close to universal, and concern has grown that habitual, difficult-to-control use may be associated with disturbed sleep and psychological distress. This study examined the relationships among smartphone addiction, sleep quality and symptoms of depression, anxiety and stress in young adults, and tested whether sleep quality mediates the association between smartphone addiction and distress. A cross-sectional correlational design was used. One hundred and twenty young adults aged 18 to 25 years (65 women, 55 men; M age = 21.57, SD = 2.35) completed the Smartphone Addiction Scale – Short Version, the Pittsburgh Sleep Quality Index and the Depression Anxiety Stress Scales – 21. Smartphone addiction correlated positively with poor sleep quality (r = .27, p = .003), depression (r = .31), anxiety (r = .31) and stress (r = .34, all p < .001). Sleep quality showed stronger associations with depression (r = .43), anxiety (r = .38) and stress (r = .41, all p < .001). Together the two predictors accounted for 19.2% to 22.9% of the variance in distress, with sleep quality the stronger predictor in every model. Bootstrapped mediation indicated that sleep quality partially mediated the smartphone addiction–distress relationship, carrying 27.2% to 31.8% of the total effect. Disturbed sleep appears to be one route through which problematic smartphone use relates to psychological distress, though a substantial direct association remains. Night-time device habits and sleep hygiene merit attention in campus wellbeing programmes.***

Keywords: smartphone addiction, sleep quality, depression, anxiety, stress, young adults, mediation

1. Introduction

The smartphone has become the defining technology of the present generation of young adults, and India has been central to that shift. For a person currently aged between 18 and 25, there has been no adult life without a smartphone within reach. High usage is not in itself pathological; what has drawn clinical attention is a narrower pattern marked by preoccupation, loss of control over time spent, distress when the device is unavailable, and interference with sleep, study and relationships. Griffiths (2005) argued that behavioural addictions can be identified through salience, mood modification, tolerance, withdrawal, conflict and relapse, and problematic smartphone use has been held to satisfy these criteria in a proportion of users. The classification remains contested (Billieux et al., 2015), and neither smartphone addiction nor internet addiction appears as a formal diagnostic category. The construct is therefore treated here as a dimensional risk marker rather than a diagnosis.

Prevalence estimates in Indian samples are substantial: Devi et al. (2025) found 39.9% of 1,067 Kerala college students exhibiting excessive or addictive use, with night-time usage behaviours the strongest independent predictors, and Singh and Singh (2025) reported 54.1% among 314 Bihar medical undergraduates alongside poor sleep quality in 66.6%. Two mechanisms have been proposed to explain how such use disturbs sleep. Displacement holds that night-time device use directly consumes sleep opportunity; arousal holds that engaging content and close-range screen light delay sleep onset physiologically and cognitively. Harvey's (2002) cognitive model of insomnia describes how pre-sleep cognitive activity maintains arousal and prevents sleep initiation, and the smartphone is an efficient generator of precisely such activity.

The link from disturbed sleep to psychological distress is well established. Ramírez-Vélez et al. (2026) found poorer sleep quality strongly associated with anxiety symptoms in 1,125 Colombian university students, and Angelillo et al. (2024) found severe depression and stress associated with poorer sleep in an Italian student sample. The association between problematic smartphone use and distress is likewise consistent: Augner et al. (2023), meta-analysing 27 studies and 120,895 participants, reported pooled correlations of r = .28 with depression and r = .29 with anxiety, and Elhai et al. (2017) found depression more strongly related to problematic use than anxiety across 23 studies.

If both links hold, sleep quality is a candidate mediator. Several studies have tested versions of this model, though not consistently in the same direction. Li et al. (2025) found negative emotions mediating 33.7% of the effect of smartphone addiction on sleep disorder in 933 Chinese students, and Xie et al. (2026) found perceived stress mediating 47.51% of the effect on sleep quality in 2,317 students. Both place distress before sleep in the causal chain; Nikolic et al. (2023) and Sarhan (2024), by contrast, treat distress as the outcome. Cross-sectional data cannot distinguish these orderings, and the present study adopts the sleep-as-mediator model on theoretical grounds while acknowledging the alternative.

Three gaps motivate the present study. Most research examining all three variables together has been conducted outside India. Indian studies have focused heavily on medical

and nursing undergraduates, whose schedules and accommodation are unrepresentative of young adults generally. And where all three variables have been measured, analysis has usually stopped at bivariate association without testing a mechanism. The study therefore aimed to examine the relationships among smartphone addiction, sleep quality and symptoms of depression, anxiety and stress in Indian young adults, and to test whether sleep quality mediates the association between smartphone addiction and distress. It was hypothesised that smartphone addiction would relate positively to poor sleep quality and to distress, that poor sleep quality would relate positively to distress, that the two predictors would jointly predict distress, and that sleep quality would mediate the smartphone addiction–distress relationship.

2. Method

Participants and Design

A cross-sectional correlational design was used. One hundred and twenty young adults aged 18 to 25 years (M = 21.57, SD = 2.35) were recruited by purposive sampling supplemented by snowball sampling. The sample comprised 65 women (54.2%) and 55 men (45.8%); 83.4% were students and 51.7% resided in urban areas. Living arrangements were with family (46.7%), hostel (29.2%), paying guest or shared rented accommodation (20.0%) and living alone (4.2%). Participants were required to own and personally use a smartphone. Those currently receiving treatment for a diagnosed sleep disorder or psychiatric condition, and those in night or rotating shift work, were excluded at screening, since these conditions independently determine the outcome measures.

Measures

Smartphone Addiction Scale – Short Version (SAS-SV). The SAS-SV (Kwon et al., 2013) comprises 10 items rated from 1 (strongly disagree) to 6 (strongly agree). Total scores range from 10 to 60, with cut-offs of 31 for men and 33 for women. Internal consistency in the present sample was α = .94.

Pittsburgh Sleep Quality Index (PSQI). The PSQI (Buysse et al., 1989) comprises 19 self-rated items generating seven components, each scored 0 to 3, summing to a global score of 0 to 21. Higher scores indicate poorer sleep, and a score above 5 identifies a poor sleeper. Internal consistency across components was α = .88. Permission to use the instrument was obtained from the University of Pittsburgh.

Depression Anxiety Stress Scales – 21 (DASS-21). The DASS-21 (Lovibond & Lovibond, 1995) assesses three dimensions with seven items each, rated 0 to 3 with reference to the preceding week. Subscale sums are multiplied by two before comparison against published severity norms. Internal consistency was α = .89, .88 and .88 for depression, anxiety and stress respectively.

A researcher-constructed schedule recorded socio-demographic details and 10 smartphone usage items covering daily screen time, checking frequency, bedtime use and phone location during sleep. No composite score was derived from this schedule.

Procedure

Institutional Ethics Committee approval was obtained before data collection. The questionnaire was administered online in eight sections, beginning with an information sheet and consent and ending with a debriefing message listing mental health support resources. No identifying information was collected. The form was piloted on ten respondents not included in the final sample. Mean completion time was approximately 14 minutes.

Data Analysis

Data were analysed using descriptive statistics, Cronbach's alpha, Pearson product-moment correlation, independent samples t-tests, one-way analysis of variance with Tukey HSD post hoc comparisons, and multiple linear regression. Mediation was tested using 5,000 bootstrap resamples to construct bias-corrected 95% confidence intervals around the indirect effect. Significance was set at .05. Skewness ranged from −0.22 to 1.34 and kurtosis from −0.71 to 0.92, within the ±2 range conventionally accepted for parametric analysis; Spearman correlations computed in parallel yielded closely comparable coefficients.

3. Results

Descriptive statistics and reliability coefficients are presented in Table 1. Two-thirds of the sample (67.5%) scored at or above the SAS-SV cut-off, and 55.8% were classified as poor sleepers. On the DASS-21, 42.5% reported depression symptoms above the normal range, 55.8% anxiety and 17.5% stress.

Table 1: Descriptive Statistics and Internal Consistency of the Study Variables (N = 120)

Variable	M	SD	Range	Skewness	Kurtosis	α
Smartphone addiction (SAS-SV)	36.9	11.99	10–60	−0.22	−0.65	0.94
Sleep quality (PSQI global)	6.92	4.63	0–18	0.36	−0.71	0.88
Depression (DASS-21)	10.15	9.79	0–40	1.16	0.9	0.89
Anxiety (DASS-21)	10.67	10	0–36	0.82	−0.22	0.88
Stress (DASS-21)	6.57	7.94	0–32	1.34	0.92	0.88

Note. Higher PSQI scores indicate poorer sleep quality. DASS-21 subscale scores are reported after multiplication by two.

Correlations among the study variables are presented in Table 2. Smartphone addiction correlated significantly and positively with poor sleep quality, r(118) = .27, p = .003, and with depression, anxiety and stress (r = .31 to .34, all p < .001). Poor sleep quality showed consistently stronger associations with the three distress outcomes (r = .38 to .43, all p < .001). The DASS-21 subscales inter-correlated strongly (r = .70 to .72), consistent with the range reported by Sarhan (2024).

Table 2: Pearson Correlations among the Study Variables (N = 120)

Variable	1	2	3	4	5
1. Smartphone addiction	—				
2. Sleep quality (PSQI)	.27**	—			
3. Depression	.31***	.43***	—		
4. Anxiety	.31***	.38***	.72***	—	
5. Stress	.34***	.41***	.70***	.72***	—

Note. Higher PSQI scores indicate poorer sleep quality. ** p < .01. *** p < .001.

Women reported significantly higher stress than men, t(117.2) = −2.94, p = .004, d = −0.53. No other gender difference reached significance, although the difference in smartphone addiction approached it (p = .086, d = −0.32) in the direction reported by Nikolic et al. (2023). One-way analysis of variance showed a significant difference in sleep quality by living arrangement, F(2, 112) = 5.57, p = .005, η^2 = .09; Tukey HSD comparisons indicated that hostel residents slept significantly worse than those living with family (mean difference = 3.20, p = .004). No corresponding difference was found in smartphone addiction, F(2, 112) = 0.46, p = .630.

Multiple regression results are presented in Table 3. All three models were significant, and in each model both predictors contributed uniquely, with sleep quality the stronger predictor throughout. Variance inflation factors were 1.08 and Durbin–Watson statistics ranged from 2.02 to 2.10, indicating no violation of the multicollinearity or independence assumptions.

Table 3: Multiple Regression Predicting Depression, Anxiety and Stress (N = 120)

Criterion	Predictor	B	SE	β	t	p	R^2
Depression	Smartphone addiction	0.173	0.069	0.212	2.5	0.014	0.224
	Sleep quality	0.784	0.179	0.371	4.39	< .001	
Anxiety	Smartphone addiction	0.187	0.072	0.224	2.6	0.011	0.192
	Sleep quality	0.696	0.186	0.322	3.74	< .001	
Stress	Smartphone addiction	0.164	0.056	0.248	2.95	0.004	0.229
	Sleep quality	0.597	0.144	0.348	4.13	< .001	

Note. Depression: F (2, 117) = 16.87, p < .001. Anxiety: F (2, 117) = 13.93, p < .001. Stress: F(2, 117) = 17.34, p < .001.

Mediation results are presented in Table 4. For each outcome, the indirect effect through sleep quality was significant, with bias-corrected bootstrap confidence intervals excluding zero, while the direct effect remained significant. Mediation was therefore partial in every case, with sleep quality carrying 31.8% of the total effect on depression, 27.7% on anxiety and 27.2% on stress.

Table 4: Mediation of Smartphone Addiction on Psychological Distress through Sleep Quality (N = 120)

Outcome	a	b	c (total)	c′ (direct)	ab [95% CI]
Depression	0.103**	0.784***	0.253***	0.173*	0.081 [0.031, 0.146]
Anxiety	0.103**	0.696***	0.258***	0.187*	0.071 [0.026, 0.134]
Stress	0.103**	0.597***	0.226***	0.164**	0.061 [0.023, 0.112]

Note. a = smartphone addiction → sleep quality; b = sleep quality → outcome controlling for smartphone addiction; ab = indirect effect, bias-corrected bootstrap 95% CI, 5,000 resamples. * p < .05. ** p < .01. *** p < .001.

4. Discussion

This study examined the relationships among smartphone addiction, sleep quality and psychological distress in Indian young adults, and tested sleep quality as a mediator. All three sets of bivariate hypotheses were supported, both predictors contributed uniquely to distress, and sleep quality partially mediated the smartphone addiction–distress relationship.

The association between smartphone addiction and poor sleep quality (r = .27) falls between the r = .17 reported by Singh and Singh (2025) in an Indian sample and the r = .26 reported by Xie et al. (2026) in a large Chinese sample. The associations with distress (r = .31 to .34) correspond closely to the pooled meta-analytic estimates of Augner et al. (2023) and fall within the range reported by Sarhan (2024). The convergence of the present estimates with a meta-analysis of 120,895 participants lends confidence to them.

The practical magnitude of these associations deserves emphasis. A correlation of .31 corresponds to roughly 10% of shared variance, and the regression models left between 77% and 81% of the variance in distress unexplained. Smartphone addiction is a genuine but minor correlate of psychological distress in this population, and framing it as a principal cause of young adults' mental health difficulties would considerably overstate what these data show.

Sleep quality was more strongly associated with distress than smartphone addiction was, and was the stronger predictor in every model. This ordering replicates Ramírez-Vélez et al. (2026) and Angelillo et al. (2024). The finding that hostel residents slept significantly worse than those living with family, while showing no difference in smartphone addiction, replicates Singh and Singh (2025) and suggests that the residential environment operates on sleep independently of device habits, through shared rooms, uncontrolled light and noise, and irregular schedules.

Two conclusions follow from the mediation results, and the second is as important as the first. Disturbed sleep is one route through which problematic smartphone use is connected to psychological distress, which identifies sleep as a legitimate intervention target. But the mediation was only partial: approximately seven-tenths of the association operated through other paths. Candidate mechanisms include social comparison, displacement of face-to-face contact, fear of missing out, and the possibility that distress drives problematic use rather than the reverse- Feng and Zhou

(2025) found social anxiety predicting smartphone addiction through loneliness, which is precisely the reverse ordering.

The direction of the mediation model must be stated plainly as a theoretical choice rather than an empirical finding. Li et al. (2025) and Xie et al. (2026) tested the reverse ordering and obtained comparably good fit. Cross-sectional data cannot distinguish between these models.

5. Limitations

The cross-sectional design precludes causal inference. All measures were self-reported, and subjective sleep assessment correlates only moderately with actigraphy. Purposive and snowball sampling limits representativeness, and self-selection may have introduced bias. The sample of 120 was underpowered for small effects, as the near-significant gender difference in smartphone addiction illustrates. Administration in English excluded young adults not comfortable reading English. The DASS-21 subscales inter-correlated at r = .70 to .72, so the subscale-specific findings are not independent. Several relevant variables, including caffeine intake, physical activity, academic workload and social media use specifically, were not measured.

6. Implications and Conclusion

Sleep is a viable intervention target for improving psychological wellbeing among young adults, and one likely to be more acceptable than being asked to reduce smartphone use. Sleep hygiene interventions focused on night-time device habits, such as establishing a cut-off time and keeping the phone outside the bedroom, are concrete and measurable. The finding concerning hostel residents indicates that institutional attention to the sleep environment may yield benefits independent of any change in device behaviour. Practitioners working with young adults presenting with depression, anxiety or stress should routinely assess sleep quality and night-time smartphone habits, while remaining cautious about attributing distress primarily to device use. Future research should employ longitudinal designs, incorporate objective measures of both sleep and smartphone use, and differentiate categories of use rather than treating the smartphone as a single construct.

Declarations

Ethical approval. The study was approved by the Institutional Ethics Committee of JAIN (Deemed-to-be University). Informed consent was obtained from all participants.

Conflict of interest. The author declares no conflict of interest.

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Data availability. The data supporting the findings of this study are available from the author on reasonable request.

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