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Nocturnal Behavior and Mental Well-Being in University Students: Perceived Stress as a Mediating Mechanism

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Abstract

In this study, the relationships between the variables of bedtime procrastination, night-time smartphone use, chronotype, perceived stress and mental well-being were examined, with a specific interest in the mediating role of perceived stress. A cross sectional correlational design was employed. The sample comprised 227 university students aged 18 to 36 years (M = 22.46, SD = 3.63), including 70 males and 157 females. Participants completed measures of bedtime procrastination, night-time smartphone use, chronotype, perceived stress, and mental well-being. Descriptive statistics, reliability analysis, Pearson correlations, hierarchical regression, and mediation analysis using PROCESS Model 4 were used to analyze the data. Bedtime Procrastination was found to be negatively associated with mental health and positively correlated with night-time smartphone use and perceived stress. Smartphone use at night was not directly linked to mental health, although it was positively correlated with perceived stress. Bedtime procrastination, smartphone use at night, chronotype, and perceived stress together accounted for 23.4% of the variance in mental well-being, according to hierarchical regression. The most powerful negative predictor of mental health was found to be perceived stress. The association between bedtime procrastination and mental health was found to be partially mediated by perceived stress, according to mediation analysis. Perceived stress also significantly mediated the link between night-time smartphone use and mental well-being, although this model showed an inconsistent mediation pattern because the total effect was non-significant while the indirect effect through perceived stress was significant. The findings highlight perceived stress as a key pathway linking nocturnal behaviors with students' mental well-being. Student well-being programs may benefit from addressing bedtime procrastination, stress appraisal, and stress-inducing patterns of night-time digital engagement. Perceived stress may help promote better mental well-being among university students.

Keywords: bedtime procrastination, night-time smartphone use, perceived stress, mental well-being, university students, chronotype

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Introduction

University students are exposed to overlapping academic, social, and digital demands that may influence their daily routines, stress experiences, and psychological well-being (Karaman et al., 2019; Luqman et al., 2020). Mental well-being during university life is especially important because it reflects positive affect, psychological functioning, optimism, interpersonal connectedness, and the ability to manage everyday challenges (Tennant et al., 2007). Rather than being shaped only by major stressful events, students' well-being may also be affected by routine behavioral patterns, including bedtime delay, night-time digital engagement, and perceived stress (Dissing et al., 2022; Sirois & Pychyl, 2016).

Bedtime procrastination has recently emerged as an important behavioral concern among students and young adults. It refers to delaying going to bed despite having the opportunity to sleep and despite anticipating negative consequences from the delay (Kroese et al., 2014). This construct is different from insomnia, as it is not the inability to sleep that is the primary issue, but the failure to start sleep at the intended time (Nauts et al., 2019). A self-regulation perspective would suggest that bedtime procrastination stems from the problems individuals experience in prioritizing long-term restorative sleep over short-term gratification, distraction, and/or emotional relief (Kroese et al., 2016). This could be especially true of university students, who often engage in late-night studying, socializing, and online activities (Azeem et al., 2026).

The procrastination–health model offers a convenient theoretical framework to consider bedtime procrastination as a health-related behavior. In accordance with this model, procrastination can impact health and well-being via stress-related pathways, and by postponing health-enhancing behaviors (Sirois, 2007). Bedtime procrastination is a good case in point as it's a postponement of a behavior that helps with daily functioning and emotional regulation. Other procrastination studies also indicate that procrastination could be a temporary respite for mood and lead to future stress and higher health related expenses (Tice & Baumeister, 1997). As part of bedtime, students can be late to sleep to stay up and enjoy some fun or finish some work or to stay engaged with the smartphone, but this postponement can cause greater long-term psychological burden (Sirois & Pychyl, 2016).

There is growing empirical evidence of the relevance of bedtime procrastination to student mental health. A recent systematic review and meta-analysis found that

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bedtime procrastination was positively associated with psychological distress indicators among university students, including stress, anxiety, and depressive symptoms (Azeem et al., 2026). Similarly, recent work among college students has shown that perceived stress is closely linked with bedtime procrastination, suggesting that stress may weaken self-regulation and increase avoidance-based bedtime delay (He et al., 2025). In a Pakistani student sample, bedtime procrastination was also associated with mental health problems, sleep disturbance, and fatigue among female university students, indicating that this construct has local relevance in South Asian academic contexts (Yasin et al., 2024).

Night-time smartphone use is another behavioral pattern that may shape students' stress and well-being. Smartphones provide continuous access to social interaction, entertainment, information, academic communication, and emotional distraction, making them highly likely to enter bedtime routines (Dissing et al., 2022). Unlike general smartphone use, night-time smartphone use occurs during a period that should ideally support psychological disengagement and preparation for rest. Late night digital exposure might then keep the mind active, extend bedtime rituals, and expose the child to social or informational demands (Thomée et al., 2011). In the context of university students in Pakistan, late night use of social networking applications through smartphones has been correlated with a reduction in cognitive functioning, sleep quality deterioration and a decline in academic performance (Luqman et al., 2020).

The stressor–strain–outcome framework can be helpful in understanding how nighttime telephone use could correlate with poor functioning. This theory suggests that stressors (environmental or technological) create psychological or behavioral strain and that these strains will ultimately affect outcomes (Koeske & Koeske, 2005). In digital where connectivity, information overload, prompt responses and social needs can be stressors (Tarafdar et al., 2007). If these demands are present at night, they can also impact recovery and contribute to strain, particularly for students who use a smartphone for social, hedonic, and/or cognitive activities before sleep (Luqman et al., 2020). This reasoning is also upheld by the ego-depletion theory which proposes that self-regulatory demands in late-night, which might involve lessening cognitive and emotional resources required for functioning effectively (Baumeister et al., 1998; Lanaj et al., 2014).

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But there might not be a consistent negative relationship between night-time smartphone usage and mental health. Studies on the relationship between mobile phone use and mental health and well-being of young adults suggest that these associations may be stress-related, sleep-disruptive, and depressive; while longitudinal tracking studies reveal that night-time use of smartphones may have low or mixed effects on mental health and well-being (Thomée et al., 2011; Dissing et al., 2022). This lack of uniformity could be due to the fact that there is a risk and resource function associated with the use of the smartphone. It can cause engagement and stress for some students and social connection, relaxation, entertainment, or emotional support for others. Hence the negative consequences of night time use of a smartphone could be mediated via perceived stress, which is a greater theoretical fit to ask this question than assuming that there is a linear negative relationship with well-being.

Nocturnal behaviors could be a psychological pathway between perceived stress and mental health. Perceived stress is the way in which people think about life situations as being unpredictable, out of control, or overwhelming (Cohen et al., 1983). For university students, sources of stress can be an excessive workload, time pressure, social expectations, and constant digital engagement (Karaman et al., 2019). Perceived stress can decrease well-being through decreases in coping capacity, increased negative affect, and decreases in psychological resources to engage in positive functioning (Cohen et al., 1983; Tennant et al., 2007). In the procrastination–health model, stress is also an important link in the chain between procrastination and health and well-being outcomes (Sirois, 2007).

Both the self-regulation and resource-based approaches support the notion of perceived stress as a mediating factor. Procrastination before bed can add to student's perceived stress, as the student may feel less prepared, less rested, and less capable of handling demands of the day. The link between night-time smartphone use and the perception of stress can also be explained by the tendency to keep the mind constantly active and the exposure to social or information stimuli before sleeping that may occur during night-time use (Luqman et al., 2020; Thomée et al., 2011). When perceived stress is raised, students may suffer reduced mental health due to the negative impact of stress on students' optimism, relaxation, thinking clearly, confidence and emotional balance (Cohen et al, 1983; Tennant et al, 2007). Therefore, the relationship between nocturnal behaviors and reduced well-being may be due to perceived stress.

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The chronotype is also important for the investigation of the behaviors related to bedtime. A chronotype corresponds to the variation of sleep, activity and alertness between individuals, often perceived as being "morning" or "evening" (Adan & Almirall, 1991). Those who study in the evening might be more prone to staying up late, being physically active at night, and using smartphones in the evening. Recently, chronotype has been associated with smartphone addiction and bedtime procrastination, indicating that the chronotype is a potential factor influencing susceptibility to nocturnal behaviors (Liu et al., 2025). However, when mental health is examined in terms of both behavioral and stress-related factors, chronotype appears to be more of a correlate than a true predictor.

Although a great deal of research has been conducted into bedtime procrastination, the use of smart phones, and student mental health, significant areas of uncertainty remain. Most of the evidence has been directed at sleep quality, while positive mental health is comparatively less studied as an outcome (Dissing et al., 2022; Tennant et al., 2007). Bedtime 'procrastination' and evening phone usage are also treated separately from one another, though these two behaviors can occur together in students' pre-sleep activities. Additionally, mixed findings on night-time smartphone use indicate that its relationship with wellbeing may be mediated by psychological factors, like perceived stress. There is also a need for more evidence from student samples in South Asia as academic pressure may influence the nocturnal behaviors and well-being of students, while they are also becoming more engaged with digital devices (Luqman et al., 2021; Yasin et al., 2024).

The aim of the present study was to investigate the phenomenon of bedtime procrastination, night-time use of mobile phones in university students, along with their chronotype, perceived stress and mental well-being. Based on the procrastination–health model, self-regulation theory, and stressor–strain–outcome model, this study posits that perceived stress acts as a psychological mechanism between nocturnal behaviors and mental well-being. Specifically, bedtime procrastination and night-time smartphone use are expected to be associated with higher perceived stress, which in turn is expected to predict lower mental well-being. Chronotype is included as a relevant circadian variable because of its empirical links with bedtime delay and smartphone-related behaviors. By focusing on perceived stress as a mediator, the study aims to clarify how nocturnal behaviors may translate into poorer mental well-being among university students.

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Methodology

❖ Research Design

The present study used a quantitative, cross-sectional correlational design to examine the associations among bedtime procrastination, night-time smartphone use, chronotype, perceived stress, and mental well-being among university students. It was suitable for the purpose of this study since the investigators wanted to measure naturally occurring relationships between behavioral, circadian, stress-related and psychological well-being variables without experimental manipulation.

❖ Participants

A sample of 227 university students was used. Participants ranged in age from 18 to 36 years (M = 22.46, SD = 3.63). There were 70 male students and 157 female students. Out of a total of 133 participants, 133 were enrolled at the undergraduate level, 47 were enrolled at the graduate level, 46 were enrolled at the MPhil level and one participant was enrolled at the PhD level. University environments were used as a convenience sampling to recruit the participants. Students had to be on a university program and use a smartphone to participate.

❖ Measures

Demographic Information
A demographic information sheet was filled out by participants, which included data on age, gender and level of university. These variables were used to describe the sample and were also included as control variables in the hierarchical regression analysis.

Bedtime Procrastination
Bedtime procrastination was measured with Bedtime Procrastination Scale (Kroese et al., 2014). The scale has nine items that assess delayed sleep onset when there is no need to delay sleep. Responses are given on a 5-item scale from 1 (almost never) to 5 (almost always). Examples of such items are: "Go to bed later than intended," "Do not go to bed on time. Four items with positive wording were reverse coded: Item 2, Item 3, Item 7, and Item 9. Bedtime procrastination was reverse coded, with higher scores reflecting more bedtime procrastination. The mean score was

calculated for analysis. The corrected scale had a good internal consistency (α = .76) for the present sample.

Night-Time Smartphone Use

A smartphone use scale was developed during the night using items that indicate smartphone-related behaviors in the sleep environment, adapted from previous studies on mobile phone use, sleep quality, and sleep–smartphone hygiene (Mohammadbeigi et al., 2016; Shoval et al., 2021). Items assessed sleep-related behaviors including sleeping with the smartphone in the bedroom, having the smartphone in the bed, leaving the smartphone on overnight, scrolling through the smartphone before going to bed, checking the smartphone during the night, using the smartphone as an alarm clock, and immediately checking the smartphone upon waking. Responses were captured on a 5-point frequency scale from never to always, with the higher the score, the more the participants used their smartphones at night. One item, "Switches smartphone to silent mode at night," was dropped due to poor consistency with the remaining items, and due to the fact that it seemed to be related to a phone-management or protective behavior, as opposed to problematic night-time smartphone use. The remaining items were used to compute a refined mean score. The internal consistency of the refined scale was acceptable at α = .79.

Chronotype

The Reduced Morningness–Eveningness Questionnaire developed by Adan and Almirall (1991) was used to assess chronotype. The scale measures individual preferences for morningness and eveningness by measuring factors related to preferred awakening time, morning alertness, evening tiredness, preferred time of functioning best, and self-identification as a morning or evening type. Scores are higher for morningness and lower for eveningness. One item was removed due to lack of internal consistency of the scale. The remaining four were used to develop a refined mean score. The internal consistency of the refined chronotype score was modest (α = .64) and thus findings with regard to chronotype were treated with caution.

Mental Well-Being

The Warwick-Edinburgh Mental Well-being Scale (Tennant et al., 2007) was used to assess mental well-being. This is a 14-item positively worded scale of positive affect and psychological functioning that have been rated over the past two weeks. The statements include: “I've been feeling optimistic about the future”, “I've been

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feeling useful", "I've been thinking clearly", and "I've been cheered up." Responses are scored with 1 = none of the time and 5 = all of the time. The higher the score, the more mental well-being. The mean was used to calculate a mean score for analysis. The present sample had good internal consistency of scale α = .84.

Perceived Stress

Cohen et al. (1983) Perceived Stress Scale was used to measure perceived stress. The scale is a measure of how stressful, unpredictable, uncontrollable or overwhelming people perceive life to be over the past month. Some of the questions are: 'How often have you been irritated by someone doing something unexpected?', 'How often have you been nervous and stressed?'. Responses are usually scored on a 5-point scale ranging from 0 = never to 4 = very often; in this set of responses the score was 1–5. The four positively worded items were reverse coded: item 4, item 5, item 7, and item 8. Reverse coding indicated higher scores indicated more perceived stress. Analyses were conducted on a mean score. In this sample, the scale demonstrated slight, but acceptable internal consistency (α = .65).

- **Procedure**

Informed consent was obtained from the University students and data were gathered. Participants were informed of the aim of the study; its voluntary nature and answers would be kept confidential. They filled out a questionnaire booklet that included the demographic information and the study measures. No ID data was gathered. All participants were told they could stop participating in the study at any time. Responses that were missing or incomplete were screened prior to analysis. The final sample was 227 valid responses.

- **Data Preparation and Scoring**

Scale scores were examined prior to analyses. For the Bedtime Procrastination Scale items were reverse coded to ensure that higher scores on all items were consistent with higher overall scores in the direction of bedtime procrastination consistent with the direction of the construct (Kroese et al., 2014). Items from the Perceived Stress Scale were also reverse coded with higher scores representing higher perceived stress (Cohen et al., 1983). One item was removed for night-time use because it did not fit as well with the other items and did not conceptually fit with problematic night-time smartphone use. One item was deleted from the scale for

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chronotype due to lack of internal consistency. All study variables had mean scores calculated to preserve the original scale of the responses to ease interpretation.

❖ Data Analysis

The analysis of the collected data was done in SPSS. Demographic data and distribution of the study variables were summarized by descriptive statistics. Cronbach's alpha was used to assess internal consistency. Pearson correlation analysis was conducted to examine bivariate associations among bedtime procrastination, night-time smartphone use, chronotype, perceived stress, and mental well-being. Hierarchical regression analysis was then used to examine the incremental contribution of demographic variables, nocturnal/circadian variables, and perceived stress in predicting mental well-being. Gender, age, and university level were entered in the first step; bedtime procrastination, night-time smartphone use, and chronotype were entered in the second step; and perceived stress was entered in the final step. Mediation analyses were conducted using PROCESS Model 4 with 5,000 bootstrap samples (Hayes, 2022). Two separate mediation models were tested. In the first model, bedtime procrastination was entered as the predictor, perceived stress as the mediator, and mental well-being as the outcome. In the second model, night-time smartphone use was entered as the predictor, perceived stress as the mediator, and mental well-being as the outcome. Indirect effects were considered significant when the 95% bootstrap confidence interval did not include zero.

Results

The final sample consisted of 227 university students. Participants ranged in age from 16 to 36 years (M = 22.46, SD = 3.63). The sample included 70 male students and 157 female students. Most participants were enrolled at the undergraduate level, followed by graduate and MPhil students. Detailed demographic characteristics are presented in Table 1. The sample was predominantly female, with females comprising more than two-thirds of the participants. Most students were enrolled at the undergraduate level, whereas PhD representation was minimal.

Table 1. Demographic Characteristics of Participants

Variable	Category	*n*	%
Gender	Male	70	30.8
	Female	157	69.2
University level	Undergraduate	133	58.6
	Graduate	47	20.7
	MPhil	46	20.3
	PhD	1	0.4

Note. N = 227.

Table 2. Descriptive Statistics and Internal Consistency of Study Variables

Variable	Min	Max	*M*	*SD*	Skewness	Kurtosis	α
Bedtime procrastination	1.22	5.00	3.12	0.75	−0.06	−0.09	.76
Night-time smartphone use	1.00	5.00	3.64	0.81	−0.43	−0.43	.79
Chronotype	1.00	4.00	2.74	0.74	−0.27	−0.69	.64
Mental well-being	1.00	4.71	3.19	0.63	−0.25	0.80	.84
Perceived stress	1.60	4.90	3.09	0.52	0.20	0.96	.65

Note. N = 227. Mean scores were used for all study variables. Higher scores indicate greater levels of the respective construct. Night-time smartphone use was computed after removing one poorly performing item. Chronotype was computed after removing one poorly performing item. α = Cronbach's alpha.

Descriptive statistics and reliability estimate for the main study variables are presented in Table 2. Mean scores were computed for all study variables. Bedtime procrastination showed an acceptable reliability coefficient after reverse coding the positively worded items. Night-time smartphone uses also demonstrated acceptable reliability after removing one poorly performing item. Mental well-being showed good internal consistency. Perceived stress and chronotype showed modest internal consistency and were therefore interpreted with caution. Descriptive statistics indicated moderate levels of bedtime procrastination (M = 3.12, SD = 0.75), night-time smartphone use (M = 3.64, SD = 0.81), perceived stress (M = 3.09, SD = 0.52),

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and mental well-being (M = 3.19, SD = 0.63). The distribution of the study variables was acceptable, as skewness and kurtosis values were within the commonly acceptable range. Internal consistency estimates ranged from modest to good, with bedtime procrastination, night-time smartphone use, and mental well-being showing acceptable to good reliability, while perceived stress and chronotype showed comparatively modest reliability.

Table 3. Pearson Correlations Among Study Variables

Variable	1	2	3	4	5
1. Bedtime procrastination	—				
2. Night-time smartphone use	.475**	—			
3. Chronotype	.434**	.370**	—		
4. Mental well-being	−.215**	.067	−.040	—	
5. Perceived stress	.274**	.303**	.101	−.338**	—

Note. N = 227. p < .01.

Pearson correlation analysis was conducted to examine the bivariate associations among bedtime procrastination, night-time smartphone use, chronotype, perceived stress, and mental well-being. Bedtime procrastination showed a significant positive correlation with night-time smartphone use, r = .475, p < .001, indicating that students who reported greater bedtime procrastination also tended to report greater night-time smartphone use. Bedtime procrastination was also positively associated with chronotype, r = .434, p < .001, and perceived stress, r = .274, p < .001, while it was negatively associated with mental well-being, r = −.215, p = .001. Night-time smartphone use was significantly and positively correlated with chronotype, r = .370, p < .001, and perceived stress, r = .303, p < .001. However, its correlation with mental well-being was not statistically significant, r = .067, p = .312. Chronotype was not significantly associated with perceived stress, r = .101, p = .129, or mental well-being, r = −.040, p = .553. Finally, perceived stress showed a significant negative correlation with mental well-being, r = −.338, p < .001, suggesting that higher perceived stress was associated with lower mental well-being.

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Table 4. Hierarchical Regression Predicting Mental Well-Being

Predictor	Model 1 β	Model 2 β	Model 3 β
Gender	.005	−.002	.050
Age	.066	.040	.029
University level	.200*	.201*	.173*
Bedtime procrastination	—	−.311***	−.247**
Night-time smartphone use	—	.189*	.271***
Chronotype	—	.010	−.022
Perceived stress	—	—	−.340***
R	.247	.368	.483
R^2	.061	.136	.234
Adjusted R^2	.048	.112	.209
ΔR^2	.061	.075	.098
ΔF	4.815**	6.350***	27.979***

Note. N = 227. Outcome variable = mental well-being. Model 1 included gender, age, and university level. Model 2 added bedtime procrastination, night-time smartphone use, and chronotype. Model 3 added perceived stress. $p < .05$. $p < .01$. $p < .001$.

A hierarchical regression analysis was conducted to examine the incremental contribution of demographic variables, nocturnal/circadian variables, and perceived stress in predicting mental well-being. Gender, age, and university level were entered in Model 1. Bedtime procrastination, night-time smartphone use, and chronotype were added in Model 2. Perceived stress was entered in Model 3. The results are presented in Table 4. Demographic variables explained a small but significant proportion of variance in mental well-being. The addition of bedtime procrastination, night-time smartphone use, and chronotype significantly improved the model. Perceived stress added further significant explanatory power and emerged as the strongest negative predictor of mental well-being in the final model. In Model 1, demographic variables significantly predicted mental well-being, $R^2 = .061$, adjusted $R^2 = .048$, $F(3, 223) = 4.82$, $p = .003$. Among the demographic variables, university level was a significant positive predictor of mental well-being, $B = 0.153$, $\beta = .200$, $p = .021$, whereas gender and age were not significant predictors.

In Model 2, the addition of bedtime procrastination, night-time smartphone use, and chronotype significantly increased the explained variance, $\Delta R^2 = .075$, $\Delta F(3, 220) = 6.35$, $p < .001$. Bedtime procrastination significantly and negatively predicted mental well-being, $B = -0.259$, $\beta = -.311$, $p < .001$. Night-time smartphone use emerged as a significant positive predictor, $B = 0.147$, $\beta = .189$, $p = .011$. Chronotype did not significantly predict mental well-being, $B = 0.009$, $\beta = .010$, $p = .889$. In Model 3, perceived stress was added and explained an additional 9.8% of the variance in mental well-being, $\Delta R^2 = .098$, $\Delta F(1, 219) = 27.98$, $p < .001$. The final model explained 23.4% of the variance in mental well-being, $R^2 = .234$, adjusted $R^2 = .209$, $F(7, 219) = 9.54$, $p < .001$. In the final model, perceived stress was the strongest negative predictor of mental well-being, $B = -0.413$, $\beta = -.340$, $p < .001$. Bedtime procrastination also remained a significant negative predictor, $B = -0.206$, $\beta = -.247$, $p = .001$. University level remained a significant positive predictor, $B = 0.133$, $\beta = .173$, $p = .029$. Chronotype remained non-significant, $B = -0.019$, $\beta = -.022$, $p = .749$. Night-time smartphone use showed a positive adjusted association with mental well-being in the regression model, $B = 0.211$, $\beta = .271$, $p < .001$. However, because its zero-order correlation with mental well-being was non-significant, this result should be interpreted cautiously as a possible suppression effect rather than evidence that night-time smartphone use directly enhances well-being.

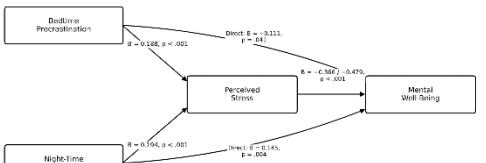
Table 5. Direct and Indirect Effects of Bedtime Procrastination and Night-Time Smartphone Use on Mental Well-Being Through Perceived Stress

Model	Effect	B	SE / BootSE	95% CI	Decision
Bedtime procrastination model	Total effect	−0.179	0.054	[−0.286, −0.073]	Significant
	Direct effect	−0.111	0.054	[−0.217, −0.005]	Significant
	Indirect effect via perceived stress	−0.069	0.023	[−0.117, −0.028]	Significant
Night-time smartphone use model	Total effect	0.052	0.052	[−0.050, 0.154]	Not significant
	Direct effect	0.145	0.050	[0.046, 0.245]	Significant
	Indirect effect via perceived stress	−0.093	0.025	[−0.146, −0.047]	Significant

Note. N = 227. SE is reported for total and direct effects; BootSE is reported for indirect effects. Bootstrap confidence intervals were based on 5,000 samples. The indirect effect is significant when the 95% bootstrap confidence interval does not include zero.

PROCESS Model 4 was used to examine whether perceived stress mediated the associations of bedtime procrastination and night-time smartphone use with mental well-being. Two separate mediation models were tested using 5,000 bootstrap samples; indirect effects were considered significant when the 95% bootstrap confidence interval did not include zero. The results are presented in Table 5. In the first mediation model, bedtime procrastination significantly predicted higher perceived stress, B = 0.188, SE = 0.044, t = 4.268, p < .001. Perceived stress, in turn, significantly predicted lower mental well-being, B = –0.366, SE = 0.079, t = –4.649, p < .001. The total effect of bedtime procrastination on mental well-being was significant, B = –0.179, SE = 0.054, t = –3.310, p = .001. After perceived stress was included in the model, the direct effect remained significant but weaker, B = –0.111, SE = 0.054, t = –2.054, p = .041. The indirect effect through perceived stress was significant, B = –0.069, BootSE = 0.023, 95% Boot CI [–0.117, –0.028]. These findings indicate that perceived stress partially mediated the association between bedtime procrastination and mental well-being. In the second mediation model, night-time smartphone uses significantly predicted higher perceived stress, B = 0.194, SE = 0.041, t = 4.772, p < .001. Perceived stress significantly predicted lower mental well-being, B = –0.479, SE = 0.079, t = –6.083, p < .001. The total effect of night-time smartphone use on mental well-being was not significant, B = 0.052, SE = 0.052, t = 1.013, p = .312. However, the indirect effect through perceived stress was significant and negative, B = –0.093, BootSE = 0.025, 95% Boot CI [–0.146, –0.047]. This pattern suggests inconsistent mediation, indicating that night-time smartphone use was associated with lower mental well-being through increased perceived stress, although its direct effect became positive after perceived stress was controlled.

Figure 1. Mediating Role of Perceived Stress in the Associations of Bedtime Procrastination and Night-Time Smartphone Use with Mental Well-Being



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Note. Values represent unstandardized coefficients from PROCESS Model 4. The indirect effect was significant for bedtime procrastination, B = −0.069, 95% CI [−0.117, −0.028], and night-time smartphone use, B = −0.093, 95% CI [−0.146, −0.047]. BP = bedtime procrastination; NSU = night-time smartphone use; PS = perceived stress; MWB = mental well-being.

Discussion

The present study examined bedtime procrastination, night-time smartphone use, chronotype, perceived stress, and mental well-being among university students. The findings show that perceived stress is a key psychological pathway linking nocturnal behaviors with well-being. Bedtime procrastination was associated with higher perceived stress and lower mental well-being, whereas night-time smartphone use was associated with higher perceived stress but not directly with mental well-being at the zero-order level. Chronotype was related to bedtime procrastination and night-time smartphone use but did not directly predict mental well-being.

The negative association between bedtime procrastination and mental well-being supports the view that bedtime delay is not only a sleep-related habit but also a self-regulatory behavior with psychological implications. Bedtime procrastination reflects difficulty in going to bed at the intended time despite having the opportunity to sleep (Kroese et al., 2014). This finding is consistent with the procrastination–health model, which suggests that procrastination may undermine well-being through stress-related pathways (Sirois, 2007). It also aligns with recent evidence showing that bedtime procrastination is associated with psychological distress among university students, particularly perceived stress (Azeem et al., 2026).

Perceived stress partially mediated the relationship between bedtime procrastination and mental well-being. This suggests that, in part, the association between bedtime procrastination and decreased wellbeing is due to the increased stress that is associated with bedtime procrastination. The direct effect was still substantial however, and this indicates that stress cannot entirely account for the association. Other mechanisms, such as fatigue, inadequate sleep restoration, ruminating and emotional dysregulation can also play a role. This interpretation aligns with the self-regulation perspectives that proposed that when individuals

repeatedly struggle with regulating their behavior, their psychological resources can be depleted, thus creating strain (Baumeister et al., 1998; He et al., 2025).

There was a more complex pattern of night time smartphone use. It was positively correlated with perceived stress, but not directly related to mental well-being in the correlation analysis. This means that the negative impact of night-time smartphone use on health might not be straightforward. Smartphones can cause tensions in terms of constant connectivity, notifications, academic checking, information overload, but can also offer relaxation, entertainment, social support and emotional distraction. Cross-sectional studies have also yielded mixed results regarding the association between night-time smartphone use and mental health among young people (Dissing et al., 2022).

This pattern was confirmed by the mediation result. There was a significant negative indirect effect of night time smartphone use on mental well-being via perceived stress. The overall mediation effect was not significant, however, and the direct effect turned positive when the mediation effect of stress was controlled for, suggesting an inconsistent or suppression-type mediation. The bad news is that the stress-related parts of using a smartphone at night seem to be dangerous, while other components of smartphone use are neutral or even psychologically rewarding. Thus, the discovery shouldn't be taken as proof that using a mobile phone during the night time enhances well-being. However, it demonstrates that the mental consequence of the smartphone use relies on the way and the motivation that is used.

The stressor–strain–outcome framework is useful in understanding these results. The use of smartphones at night could be a digital stressor, such as heightened thinking, emotional arousal, and the need to be socially or academically “on call” (Koeske & Koeske, 1993; Tarafdar et al., 2007). A sample of university students in Pakistan showed that late night social networking on smartphones was associated with poor sleep quality and depletion of cognitive function, reflecting the notion that late night digital engagement can place a strain (Luqman et al., 2021). The present study builds on this argument by demonstrating that night-time use of a smartphone is a mechanism by which perceived stress relates to decreases in mental well-being.

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Perceived stress was the most negative predictor of mental well-being. This result is not surprising as perceived stress is a gauge of how much people perceive their lives to be stressful, unpredictable and difficult to manage (Cohen et al., 1983). High stress levels can lead to lower levels of optimism, emotional balance, concentration, and coping among students, which are key factors in mental health (Tennant et al., 2007). This indicates that interventions should not just take a one-dimensional approach to sleep timing and phone use, but also include a component of stress appraisal and coping.

There was no direct association between chronotype and mental well-being, but when controlling for the aforementioned factors, the relationships between chronotype and both bedtime procrastination and night-time smartphone usage remained. This indicates that students' nocturnal behaviors may be influenced by their circadian preference, and that behavioral and stress-related factors may be more proximal to students' well-being. In recent years, chronotype has been found to be associated with smartphone addiction and bedtime procrastination, thus justifying its use as a contextual factor (Liu et al., 2025). However, chronotype should not be regarded as the primary explanatory factor in the present study.
The research in this study has three contributions to the literature. Rather than looking exclusively at the quality of sleep or distress, it first investigates mental well-being as a positive psychological result. Second, it combines the two common behaviors of students that converge at bedtime – procrastination and evening technology, in one model. Third, it identifies perceived stress as a common pathway between nocturnal behaviors and wellbeing, and further reveals that there are mixed direct implications of night-time smartphone use.

The findings are of importance to the practice of student counselling and well-being programs. Bedtime procrastination can be addressed by bedtime planning, implementation intentions, time management, and restructuring evening routines. For smartphone use, recommendations should be balanced, not restrictive. Students may find it helpful to practice lowering stressful patterns like late night academic checking, compulsive scrolling, emotionally intense conversations, and notification-driven use. Perceived stress was the most powerful predictor of well-being, so stress-management techniques (e.g., relaxation training, cognitive reframing, planning workload) should continue to be a key focus.

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There are a number of caveats that should be mentioned. First of all, causal conclusions are not possible in the cross-sectional design. Theoretical mediation was applied but the study should be longitudinal to establish directionality. Second, all variables were self-reported, which can cause recall bias and common method variance. Third, the amount of smartphone use at night was assessed overall; future studies should differentiate between academic use, social interaction, entertainment, passive scrolling, and emotional support seeking. Fourth, chronotype was not measured with objective circadian measures. Longitudinal (daily diary or objective) designs should be used in future research to test the prediction of next day stress and well-being from nightly behaviors.

To sum up, the present study shows that, bedtime procrastination and night-time smartphone use are important night-time behaviors that are influential in the mental health of university students, primarily through the link with perceived stress. Bedtime procrastination was more directly negatively related to well-being, while night-time smartphone use was more indirectly, stress-related. Nocturnal behaviors were associated with chronotype, but not to the level of wellbeing. These results underscore that perceived stress is a key mechanism and indicate that making better evening routines and coping with stress a possibility to enhance students' mental health.

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