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# The association between problematic smartphone use and subjective well-being in Bangladeshi youths: Mediating role of sleep quality

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ABSTRACT

Despite the remarkable contribution of smartphones in improving our lives, concerns have been raised about their uncontrolled usage, emphasizing its consequences on individual sleep and well-being. Therefore, we investigated the relationship between problematic smartphone use (PSU) and both positive and negative dimensions of subjective well-being (SWB) – subjective happiness and depressive symptoms, as well as the mediating role of sleep quality. A sample of 384 Bangladeshi youths (mean age = 18.99; 49.3 % female) were recruited through a convenience sampling technique and interviewed using a structured questionnaire that assessed PSU, sleep quality, subjective happiness, and depressive symptoms. The mediation analysis results indicated that sleep quality mediated the association between PSU and subjective happiness and depressive symptoms. The results also showed that subjective sleep quality, sleep disturbances, and daytime dysfunction were particularly responsible for the mediation effect. Thus, the findings highlight the necessity of designing sleep quality-enhancing interventions for youth to subside PSU's detrimental effects on subjective well-being.

## 1. Introduction

Technological advancements and increased affordability have led to a rapid surge in smartphone usage in recent years. While the multifunctionality of smartphones has made them a ubiquitous part of modern life, many empirical studies have raised concerns about the negative consequences associated with maladaptive smartphone usage. These studies have attributed a range of adverse outcomes, such as procrastination (Rozgonjuk et al., 2018), anxiety, depressive symptoms, stress, loneliness, impulsivity, poor academic performance, and greater alcohol consumption (Grant et al., 2019; Karsay et al., 2019; Panova & Lleras, 2016), to excessive or non-social smartphone use. These studies highlight the increasing attention to problematic smartphone usage over the last few decades, with a particular focus on the mechanisms, antecedents, correlates, and consequences involved in problematic smartphone usage (Khan & Khan, 2022).

In the literature, uncontrolled and excessive smartphone usage is often termed "compulsive smartphone use," "problematic smartphone use," "smartphone addiction," or "mobile phone addiction" (Kardefelt-Winther, 2014; Khan & Khan, 2022; Kuss et al., 2018; Lopez-Fernandez, 2017; Widyanto & Griffiths, 2006). These terminologies have led to a debate about whether maladaptive smartphone use should be considered a form of addiction or merely a problematic behavior. While some researchers viewed excessive smartphone usage as a form of behavioral addiction, others have cautioned against using the term 'addiction,' anticipating a potential overestimation of its severity by assigning a weightier term than the construct truly deserves. This latter perspective also points to a dearth of longitudinal, experimental, case-control, and case studies supporting the claimed equivalence of smartphone addiction with other established addictive disorders, starting from gaming disorders to substance abuse (Panova & Carbonell, 2018). Consequently, many recent studies are increasingly replacing the term "smartphone addiction" with "problematic smartphone use (PSU)" to conceptualize the compulsive use of smartphones "that leads to impaired daily functioning in terms of productivity, social relationships, physical health, or emotional well-being" (Horwood & Anglim, 2019, p. 2). In line with this perspective, this study will also recognize PSU as an overarching concept that encompasses a variety of features generally accessed through smartphones (Kuss & Griffiths, 2017).

PSU is often associated with impaired daily functioning, including physical discomfort (Lepp et al., 2013; Shan et al., 2013), difficulty with concentration (Gupta et al., 2016), and sleep disturbances (Yang et al.,

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2020). For instance, adolescents who engage in excessive use of telecommunication devices experience higher rates of sleep problems (Cabré-Riera et al., 2019). Problematic smartphone users are more prone to experience headaches and daytime sleepiness, showing a positive relationship between PSU and impaired sleep patterns (Demir & Sümer, 2019). Longitudinal evidence has shown that young adults' ownership of smartphones is linked to decreased sleep duration and greater reporting of sleep problems, indicating PSU as a predictor of poor sleep quality (Schweizer et al., 2017). While the immediate consequences of sleep restriction may include impaired motor and cognitive function, emotional distress, and reduced quality of life (Ferrara & Gennaro, 2001), the long-term consequences may include hypertension, heart disease, and weight-related medical conditions (Medic et al., 2017). Moreover, the long-term physical consequences may further exacerbate the experience of emotional disturbances, including stress, anxiety, and depressive symptoms (Kretchy et al., 2014). One explanation for PSU's influence on subjective well-being could be that continuous exposure to blue light limits melatonin production, causing irregular circadian rhythm, sleep problems, and psychological strain, possibly resulting in lowered subjective well-being (Cui et al., 2021; Thomée et al., 2011).

Existing literature also suggests a consistent relationship between PSU and lower subjective well-being. Subjective well-being (SWB)–evaluation of an individual's overall life–comprises cognitive and affective evaluative components. The cognitive aspect of the assessment involves people assessing their lives as a whole, whereas the affective component reflects their instantaneous moods and emotions (Busseri & Sadava, 2010; Diener et al., 2009). Moreover, positive and negative dimensions of subjective well-being are often indicated by constructs such as subjective happiness (cognitive judgment) and depressive symptoms and anxiety (affective judgment), respectively (Crego et al., 2021; Hemert et al., 2002). The relationship between subjective well-being and PSU is well-established in the existing literature, which reports that individuals with problematic use of smartphones or similar technologies are more likely to experience loneliness (Shen & Wang, 2019), depressive symptoms (Yang et al., 2020), anxiety (Elhai et al., 2017; Busch & McCarthy, 2021), hopelessness, lower satisfaction with life (Yu & Shek, 2018), and reduced happiness (Busch & McCarthy, 2021; Horwood & Anglim, 2019). Furthermore, Zhao and Lapierre (2020) demonstrated that PSU has a potential reinforcement effect on college students' perceived stress and depressive symptoms in a three-month follow-up study.

The relationship between sleep quality and SWB is well documented in the literature. The consequences of impaired sleep quality may involve reduced happiness and greater experience of negative emotions, as sleep quality demonstrates a positive association with depressive symptoms (Dinis & Bragança, 2018) and a negative association with subjective happiness (Otsuka et al., 2020). Several meta-analyses have also reviewed the relationship between sleep quality and SWB: Lovato and Gradisar (2014) reported sleep disturbances as an antecedent of youths' depressive symptoms, and Marino et al. (2021) suggested that poor sleep quality was related to depressive symptoms among youth. Furthermore, a set of longitudinal primary studies and meta-analyses have identified poor sleep quality as a significant predictor of lower positive well-being, increased emotional disturbances, and depressive symptoms (Bacaro et al., 2024; Gregory et al., 2009; Kalak et al., 2014; Palmer et al., 2024), highlighting the importance of quality sleep in an individual's well-being.

Many researchers have explored the role of sleep quality as a mediator in different contexts, such as in the relationship between problematic mobile phone use and depressive symptoms (Zou et al., 2019), adolescents' nighttime electronic media use and depressive symptoms (Lemola et al., 2015), and smartphone addiction and life satisfaction (Cao et al., 2021). These studies underscore the significance of sleep quality in explaining the association between PSU and subjective well-being. However, more research is needed to offer a holistic understanding of PSU's influences on both SWB domains and to confirm these findings across different socio-cultural contexts and age groups. Some recent studies have further emphasized this need by pointing to an increasing trend of PSU across all age groups in various regions of the world (Lu et al., 2024) while classifying preschool children and young adults as the most vulnerable to smartphone-related problematic behaviors (Csibi et al., 2019). Therefore, we aimed to assess the mediation effect of sleep quality in the relationship between PSU and subjective happiness and depressive symptoms in a Bangladeshi youth sample (Fig. 1). In addition, we aimed to assess each dimension of sleep quality as a potential mediator in the associations between PSU and subjective happiness, as well as depressive symptoms, to identify the components of sleep quality that may account for the mediating effects.

## 2. Methods

### 2.1. Participants and procedure

This cross-sectional study recruited participants through convenience sampling from January to February 2022 in the Chattogram District, Bangladesh. First, we contacted the authorities of several colleges and universities to carry out the study on their campuses. Upon receiving their approval, we obtained participants' informed consent and parental consent for minor participants. Subsequently, each participant received a questionnaire with both verbal and written instructions. We invited a total of 557 participants, applying the following inclusion criterion: Participants must own or have access to a smartphone. The final sample comprised 384 college and university-going Bangladeshi students aged 16–21 years ($M$ = 18.99 years, $SD$ = 1.50 years), with a 69 % response rate.

### 2.2. Measures

#### 2.2.1. Smartphone Addiction Scale – Short Version (SAS-SV)

We used the translated Bangla version of the ten-item Smartphone Addiction Scale – Short Version (SAS-SV: Kwon et al., 2013), adopted in Bangla to assess PSU (Hossain & Kawser, 2018). The instrument comprises five categories of statements, namely daily-life disturbances, withdrawal, cyberspace-oriented relationships, overuse, and tolerance. Each item is scored on a six-point Likert-type scale ranging from "*strongly disagree*" (1) to "*strongly agree*" (6). Total scores range from 10 to 60, with a higher score indicating more intense problematic usage. The minimum cut-off score to screen an individual as problematic is 33 for women and 31 for men. The Bangla SAS-SV demonstrated acceptable internal consistency in the current study (Cronbach's alpha = 0.82, McDonald's ω = 0.82). Additionally, the results of the confirmatory factor analysis demonstrated satisfactory model fit for a three-factor model: $\chi 2/df$ = 2.56, Comparative Fit Index (CFI) = 0.95, Tucker–Lewis Index (TLI) = 0.95, Root Mean Square Error of Approximation (RMSEA) = 0.06, and Standardized Root Mean Squared Residual (SRMR) = 0.60.

#### 2.2.2. Pittsburgh Sleep Quality Index (PSQI)

We used the Bangla version of the Pittsburgh Sleep Quality Index (PSQI-B: Singha, 2018; adopted from Buysse et al., 1989). The PSQI comprised 18 items that assess seven aspects of sleep quality: subjective sleep quality, sleep latency, habitual sleep efficiency, sleep duration, sleep disturbances, daytime dysfunction, and use of sleeping medication. Participants' responses on each component are weighted equally on a 0 to 3 Likert-type scale. Total scores range from 0 to 21, with a higher score denoting poorer sleep quality. In our sample, the Bangla PSQI had good internal consistency for PSQI components (Cronbach's alpha = 0.63, McDonald's ω = 0.64), consistent with studies using non-Western samples (Guo et al., 2016).

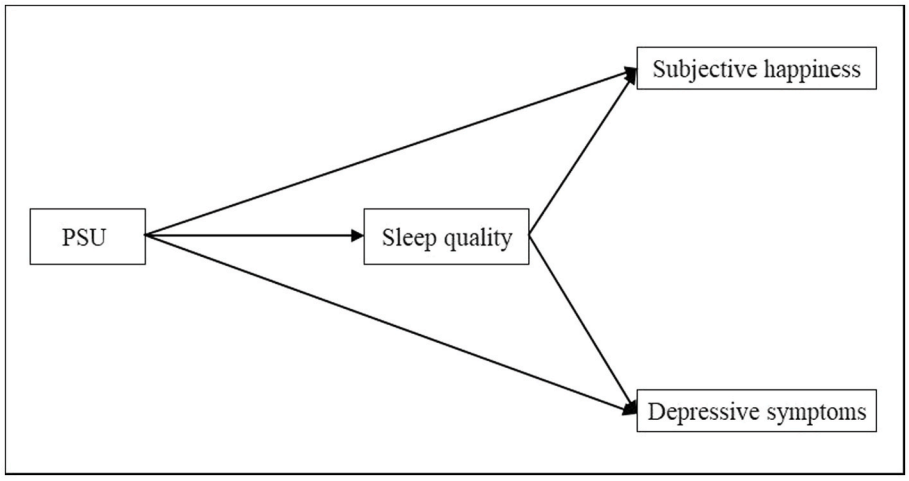


**Fig. 1.** Hypothesized model.

#### 2.2.3. Subjective Happiness Scale (SHS)

The four-item Bangla Subjective Happiness Scale (SHS: Islam et al., 2020; adopted from Lyubomirsky & Lepper, 1999) was used to assess happiness. The first two items assess the participants' happiness in general and in comparison to their peers, while the remaining two items assess the extent to which participants characterize themselves according to typical descriptions of happy and unhappy people. The items were scored on a seven-point Likert-type scale ranging from "*not a very happy person*" (1) to "*a very happy person*" (7). Total scores range from 4 to 28, with a higher score indicating a happier individual. The internal consistency of SHS in the present study was good (Cronbach's alpha = 0.67, McDonald's ω = 0.71).

#### 2.2.4. Bangla Depression Scale (BDS)

We employed the Bangla Depression Scale (BDS: Uddin & Rahman, 2005) to assess participants' depressive symptoms. The BDS consists of 30 items, each rated on a five-point Likert scale ranging from "*not applicable*" (*1*) to "*completely applicable*" (5). Total scores range from 30 to 150, where a higher score indicates greater intensity of depressive symptoms. The BDS yielded satisfactory internal consistency in the present study (Cronbach's alpha = 0.93, McDonald's ω = 0.93).

### 2.3. Statistical analysis

IBM SPSS version 26.0 and JASP version 0.18.30 were used for data cleaning, processing, and analysis. We calculated frequencies, means, standard deviations, and percentages. Univariate outliers were screened using *z*-scores [recommended cut-off: $-3.29 \leq z \leq 3.29$ (Tabachnick & Fidell, 2013)]. We assessed normality using skewness and kurtosis values [if $N > 300$, skewness value $> 2$, and kurtosis value $> 7$ suggest non-normality (Kim, 2013)]. The reliability of the measures was calculated using Cronbach's alpha and McDonald's ω [recommended cut-off: Cronbach's alpha $> 0.70$ (Nunnally, 1978)]. The group differences in PSU, sleep quality, depressive symptoms, and subjective happiness were assessed by independent sample *t*-tests and effect size (Cohen's *d*). Pearson's product-moment correlation coefficients were computed between the study variables.

We used JASP's mediation analysis (Rosseel, 2012) to assess the mediating role of sleep quality in the relationship between PSU (predictor), subjective happiness (outcome), and depressive symptoms (outcome) while controlling for participants' age and gender. Furthermore, we estimated the models by applying the bootstrapping method with 5,000 samples at a 95 % confidence interval and computed confidence intervals using the bias-corrected percentile method, as described by Biesanz et al. (2010). In addition to assessing the mediation effect of sleep quality through global PSQI scores, we analyzed which components of the PSQI account for the mediation effect in the relationships mentioned above.

### 2.4. Ethics

We followed the Declaration of Helsinki to carry out the present study. We informed participants about the nature and purpose of the study, ensured their privacy, confidentiality, and right to withdraw from the study. Participants signed the informed consent form before filling out the questionnaire. This study received ethical clearance from the Department of Psychology, University of Chittagong, Bangladesh (Ref. No.: ERB-PSY-CU-26-2021).

**Table 1**
Socio-demographic characteristics of participants.

| Variables | *n* | (%) |
|---|---|---|
| Gender | | |
| Male | 195 | 50.78 |
| Female | 189 | 49.22 |
| Family presence | | |
| Living with family | 182 | 47.4 |
| Living away from family | 202 | 52.6 |
| Family Type | | |
| Nuclear | 328 | 85.42 |
| Extended | 56 | 14.58 |
| Age | | |
| 16 years | 25 | 6.51 |
| 17 years | 62 | 16.15 |
| 18 years | 45 | 11.72 |
| 19 years | 86 | 22.4 |
| 20 years | 100 | 26.04 |
| 21 years | 68 | 17.71 |
| Duration of smartphone usage | | |
| ≤12 months | 114 | 29.69 |
| 13–24 months | 73 | 19.01 |
| 25–36 months | 73 | 19.01 |
| 37–48 months | 67 | 17.45 |
| >48 months | 57 | 14.84 |

## 3. Results

### 3.1. Descriptives

Table 1 presents participants' socio-demographic characteristics. The majority of participants were male ($n = 195$, 50.78 %), living away from their families ($n = 202$, 52 %), and belonging to nuclear families ($n = 328$, 85.42 %).

Means, standard deviations, and Pearson correlations for the four variables of interest in the current study are presented in Table 2. Skewness (ranging from −0.53 to 0.82) and kurtosis (ranging from −0.02 to 0.60) values suggest a normal distribution for all variables of interest (Table 2). In the present study, 75.4 % (n = 147) of male participants were classified as problematic smartphone users, while 68.3 % (n = 129) of female participants fell into the same category. Table 2 presents the Pearson product-moment correlations between study variables, suggesting a significant association between the study variables.

Analysis of mean differences, presented in Supplementary Table S1, demonstrated significant mean differences in PSU ($t = -3.28$, $p < 0.001$, $d = -0.34$), sleep quality ($t = -2.61$, $p < 0.05$, $d = -0.27$), and subjective happiness ($t = 2.02$, $p < 0.05$, $d = 0.21$) scores by participants' family presence. Similarly, participants from nuclear families reported higher PSU scores compared to the participants from joint families ($t = 2.63$, $p < 0.05$, $d = 0.38$). However, the difference in PSU between males and females was non-significant ($t = 1.17$, $p > 0.05$, $d = 0.12$).

### 3.2. Mediation analysis

The mediation analysis results (Fig. 2 & Table 3) showed that PSU had a significant positive association with poor sleep quality (β = 0.364, 95 % CI [0.081, 0.152]) and depressive symptoms (β = 0.374, 95 % CI [0.632, 1.141]) and had a significant negative association with subjective happiness (β = -0.187, 95 % CI [-0.167, −0.040]). Poor sleep quality mediated 25.2 % of the association between PSU and subjective happiness (indirect effect: β = -0.063, 95 % CI [-0.065, −0.011]) and 22.36 % of the association between PSU and depressive symptoms (indirect effect: β = 0.108, 95 % CI [0.156, 0.384]).

Further mediation analysis results using the seven PSQI components (Fig. 3 & Supplementary Table S3) demonstrated that PSU had a significant positive association with subjective sleep quality (β = 0.281, 95 % CI [0.013, 0.031]) and daytime dysfunction (β = 0.330, 95 % CI [0.019, 0.037]) and significant negative association with subjective happiness (β = -0.154, 95 % CI [-0.146, −0.026]). Subjective sleep quality mediated 15.2 % of the association between PSU and subjective happiness (indirect effect: β = -0.038, 95 % CI [-0.05, −0.002]), while daytime dysfunction mediated 20 % of the association between PSU and subjective happiness (indirect effect: β = -0.050, 95 % CI [-0.053, −0.009]).

The mediation analysis results with PSQI components (Supplementary Table S3) also showed that PSU was significantly positively associated with subjective sleep quality (β = 0.281, 95 % CI [0.013, 0.031]), sleep disturbances (β = 0.232, 95 % CI [0.008, 0.02]), daytime dysfunction (β = 0.330, 95 % CI [0.019, 0.037]), and depressive symptoms (β = 0.334, 95 % CI [0.56, 1.038]). Furthermore, subjective sleep quality mediated 10.6 % of the association between PSU and depressive symptoms (indirect effect: β = 0.051, 95 % CI [0.05, 0.23]), sleep disturbances mediated 4.76 % of the association between PSU and depressive symptoms (indirect effect: β = 0.023, 95 % CI [0.011, 0.124]), and daytime dysfunction mediated 11.2 % of the association between PSU and depressive symptoms (indirect effect: β = 0.054, 95 % CI [0.053, 0.223]).

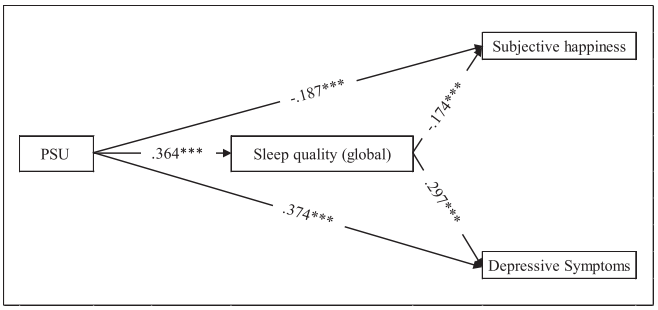


**Fig. 2.** Direct effects of problematic smartphone use on subjective happiness and depressive symptoms through sleep quality. *Note*: ***$p < 0.001$; PSU = Problematic smartphone use; Sleep quality (global) = Total PSQI score.

**Table 3**
Direct and indirect effects of problematic smartphone use on subjective happiness and depressive symptoms.

| | *B* | *SE* | β | *p*-value | LLCI | ULCI |
|---|---|---|---|---|---|---|
| Direct effects | | | | | | |
| PSU → sleep quality | 0.117 | 0.015 | 0.364 | <0.001 | 0.081 | 0.152 |
| PSU → subjective happiness | −0.105 | 0.030 | −0.187 | <0.001 | −0.167 | −0.040 |
| PSU → depressive symptoms | 0.887 | 0.108 | 0.374 | <0.001 | 0.632 | 1.141 |
| Sleep quality → subjective happiness | −0.306 | 0.093 | −0.174 | <0.001 | −0.525 | −0.084 |
| Sleep quality → depressive symptoms | 2.196 | 0.336 | 0.297 | <0.001 | 1.398 | 2.991 |
| Indirect effects | | | | | | |
| PSU → sleep quality → subjective happiness | −0.036 | 0.012 | −0.063 | 0.002 | −0.065 | −0.011 |
| PSU → sleep quality → depressive symptoms | 0.256 | 0.052 | 0.108 | <0.001 | 0.156 | 0.384 |
| Total effects | | | | | | |
| PSU → subjective happiness | −0.141 | 0.028 | −0.250 | <0.001 | −0.203 | −0.076 |
| PSU → depressive symptoms | 1.143 | 0.106 | 0.483 | <0.001 | 0.899 | 1.374 |

*Note:* PSU = problematic smartphone use; LLCI = lower limit at 95 % confidence interval; ULCI = upper limit at 95 % confidence interval.

**Table 2**
Descriptive statistics of the variables used in the study.

| Variable | *M* | *SD* | Skewness | Kurtosis | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|---|---|---|
| 1. PSU | 37.70 | 9.60 | −0.13 | 0.07 | 1 | | | |
| 2. Sleep quality | 6.33 | 3.06 | 0.82 | 0.60 | 0.38** | 1 | | |
| 3. Subjective happiness | 19.70 | 5.37 | −0.53 | 0.25 | −0.26** | −0.25** | | |
| 4. Depressive symptoms | 76.36 | 22.64 | 0.30 | −0.02 | 0.49** | 0.44** | −0.42** | 1 |

*Note:* **$p < 0.01$; PSU = problematic smartphone use.

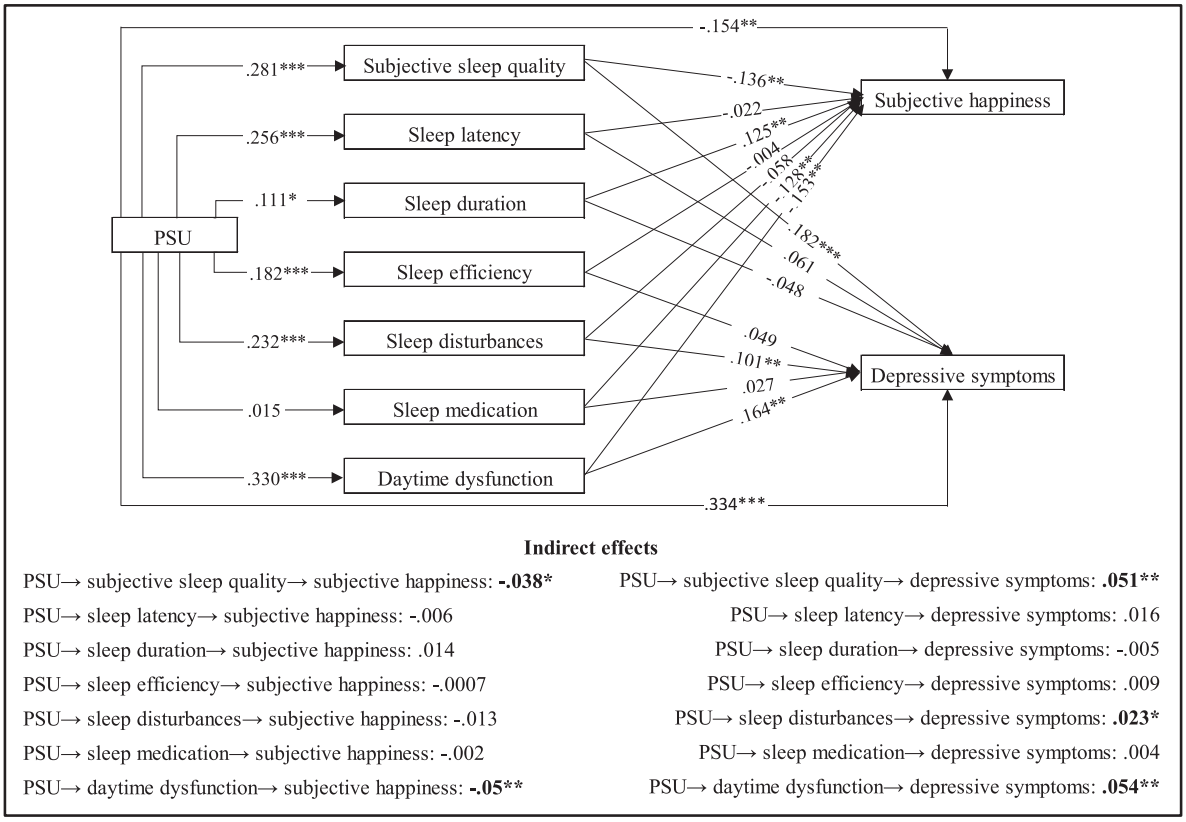


**Fig. 3.** Direct and indirect effects of problematic smartphone use on subjective happiness and depressive symptoms through PSQI components. *Note*: ***$p < 0.001$, **$p < 0.01$, *$p < 0.05$; PSU = problematic smartphone use.

## 4. Discussion

The current study aimed to understand the impact of PSU and sleep quality on SWB. Therefore, we assessed the role of sleep quality in the association between PSU and subjective happiness, as well as between PSU and depressive symptoms. The main findings were: i) PSU significantly predicted sleep quality, subjective happiness, and depressive symptoms; ii) overall sleep quality acted as a mediator in the relationship between PSU and subjective happiness and depressive symptoms; and iii) among sleep quality components, subjective sleep quality, sleep disturbances, and daytime dysfunction mediated the relationship between PSU and subjective happiness and depressive symptoms. Our study, thus, extends the existing literature by offering a holistic understanding of SWB, incorporating both cognitive and affective components of SWB that resulted in greater precision in the measurement and conceptualization of the construct (Magyar & Keyes, 2019).

Our findings regarding the relationship between PSU and depressive symptoms were consistent with previous research. For instance, Zou et al. (2019) suggested that college students' problematic mobile phone use was positively related to depressive symptoms, where sleep quality acted as a mediator. Similarly, Xie et al. (2018) cautioned against bedtime smartphone usage, emphasizing the potential role of sleep quality in translating PSU's effect on several clinical health outcomes. In contrast, our findings on the PSU-subjective happiness pathway differ from Cao et al. (2021), who found no evidence supporting sleep quality as an explanatory variable in the association between PSU and life satisfaction. Notably, the study had a small sample and different sample characteristics compared to our study, which might have contributed to the inconsistency in the findings. However, our findings align with Joshi (2022), who found that college students' nighttime phone use was positively related to increased sleep interruptions and decreased psychological well-being. These findings support the displacement hypothesis, suggesting that PSU may contribute to poor well-being by detracting individuals from activities such as physical activity and social interaction, which are generally considered crucial for well-being (David et al., 2018; Dienlin & Johannes, 2020; Karsay et al., 2019).

Our findings on the mediating role of seven sleep quality components showed that subjective sleep quality and daytime dysfunction accounted for the mediating effect between PSU and subjective happiness, whereas subjective sleep quality, sleep disturbances, and daytime dysfunction mediated the association between PSU and depressive symptoms. These findings are consistent with Liu and Lu (2022), which also suggested these components as significant mediators, although sleep latency was not a significant mediator in our study. PSU's effect on subjective sleep quality, daytime dysfunction, and sleep disturbances may be due to blue light emitted from mobile screens; Randjelović et al. (2023) showed that reducing blue light emissions improved participants' subjective sleep quality and daytime functioning. Additionally, Šmotek et al. (2020) suggested that screen exposure during the night was related to increased daytime dysfunction and decreased subjective sleep quality, as short-wavelength light rapidly modulates cortical arousal in the brain involved in cognitive processing. Disturbances in sleep may, therefore, negatively affect SWB, as evidenced by a longitudinal study that reported a positive relationship between poor sleep quality and persistent negative life evaluations (Paunio et al., 2009).

One plausible explanation for the pathways mentioned above is that blue light emitted from smartphones disrupts circadian rhythms by overstimulating retinal ganglionic cells containing melanopsin, which suppresses melatonin secretion (Randjelović et al., 2018). Furthermore, electromagnetic fields produced by smartphones may affect the physiological functions of the brain (i.e., altering brain electrical activity), resulting in disrupted sleep patterns (Demirci et al., 2015; Huber et al., 2002). Poor sleep quality, in turn, may weaken the prefrontal cortex's control over other brain regions, including sleep, and affect regulatory

systems, resulting in poorer SWB (Dahl, 1996). Additionally, the cognitive energy model suggests that when individuals face events that obstruct or support their goals, they require cognitive energy to cope with the goal-obstructive events or to capitalize on the new opportunities of goal-supporting events (Zohar et al., 2005). The availability of adequate cognitive resources in these situations enhances positive emotions, while a shortage of resources intensifies negative emotions. Sleep disruptions limit cognitive energy, hindering goal-directed behavior and leading to increased negative emotions (Zohar et al., 2005).

Besides the mediation effect, the findings showed that participants who lived away from their families had higher PSU scores than participants living with their families. This finding underscores the potential role of family dynamics in the development and maintenance of PSU (Jimeno et al., 2022). For instance, young adults living with their parents are more likely to experience parental monitoring and supervision, which may often restrict their smartphone access and usage (Sun et al., 2022). On the other hand, university students staying away from their families are deprived of their parents' affection and supervision, which may result in their greater dependence on smartphones (Li et al., 2021). Parental mediation not only protects youth from the negative effects of PSU but also enhances individual self-efficacy (Sun et al., 2022). An individual with greater self-efficacy might exert greater control over their smartphone usage pattern. Moreover, Hu and Wang (2022) observed an interaction effect between self-efficacy (internal control) and parental monitoring (external control) that predicted greater problematic use among adolescents, highlighting the potential role of parental mediation in the development and maintenance of PSU. Therefore, future research might investigate the protective role of parental mediation, including parental monitoring and self-control, against the detrimental effects of PSU on individual sleep quality and subjective well-being.

While the potential role of families is emphasized in the present study, the findings must be interpreted within the broad socio-cultural context of Bangladesh. For instance, unlike most Western societies, the majority of Bangladeshi university students do not move out of their families' homes and begin an independent life of their own until after graduation (Juárez & Gayet, 2014; Khambhaita & Bhopal, 2015). This portion of young adults who live with their parents is generally expected to conform to traditional family values and practices. As a result, they typically live under the scrutiny of their parents, which is more flexible than it is for adolescents yet tighter than expected for an independent young adult. Therefore, unlike in many nations, the family can still play a strong role against PSU, even for university students in Bangladesh.

Additionally, previous studies suggest that girls face greater parental monitoring and restrictions than boys, particularly in rural Bangladeshi societies (Chandramohan et al., 2023). However, our study did not find any gender differences in PSU, which contradicts many existing studies (Kwak et al., 2018; Kwon et al., 2013; Lee et al., 2016). Since the present study focused only on urban and semi-urban areas, where the gender gap in PSU might be smaller among students, it would be interesting for future studies to explore whether rural boys and girls engage with their smartphones differently.

### 4.1. Practical implications

This study emphasizes the critical role of sleep quality in determining youth SWB. PSU's indirect effect on SWB highlights the necessity of designing sleep quality enhancement interventions to alleviate the negative consequences of smartphones on youth SWB. Such interventions could include low-intensity sleep quality enhancement strategies, such as feedback on sleep data and sleep education, as these have already been found to be effective in improving mood and well-being (Eigl et al., 2023). The findings that some components of sleep quality are more relevant in the PSU-SWB pathways suggest important intervention points for mental health practitioners. Practitioners could also educate clients about the potential role of the different aspects of sleep quality in the PSU-SWB pathway as part of psychoeducation in the therapeutic process.

### 4.2. Limitations and future research directions

The current study had some limitations. First, we could not establish a causal relationship between the study variables due to its cross-sectional nature, indicating the need for longitudinal or experimental research to confirm these findings. Second, the non-random sampling technique limited the generalizability of the findings. Additionally, we tested a theoretical model linking PSU and SWB only in Bangladeshi-educated youth with a relatively small sample size. Therefore, more research is needed on diverse and underprivileged populations, including cross-country comparisons among low-, middle- and high-income countries with nationally representative samples. Third, due to resource constraints, our collected data did not include any objective usage statistics, making our understanding based solely on participants' self-reports. Future research should consider using objective measurement tools to explore the influence of content and patterns of smartphone consumption on subjective well-being.

## 5. Conclusion

The unique contribution of this study is that it provides a comprehensive assessment of the PSU-SWB pathway, incorporating both positive and negative dimensions of SWB. We found that sleep quality significantly mediated the link between PSU and subjective happiness and depressive symptoms. While prior studies generally treated sleep quality as a unitary construct, our study identified three critical components of sleep quality – subjective sleep quality, sleep disturbances, and daytime dysfunction – that are particularly relevant to the PSU and SWB. These findings not only advance our understanding of the PSU-SWB association but also inform targeted interventions for treating and preventing PSU-related well-being issues.

## CRediT authorship contribution statement

**Md. Rohmotul Islam:** Writing – original draft, Project administration, Methodology, Investigation, Formal analysis, Conceptualization. **Oli Ahmed:** Writing – review & editing, Methodology, Conceptualization. **Lutfun Naher:** Writing – review & editing, Investigation. **Md. Nurul Islam:** Writing – review & editing, Writing – original draft, Supervision, Methodology, Conceptualization.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.abrep.2025.100599.

## Data availability

Data will be made available on request.

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