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Smartphone Dependency and Its Impact on Emotional Fatigue: Mediated by Sleep Disturbance

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A B S T R A C T

Objective: This study aimed to investigate the impact of smartphone dependency on emotional fatigue among Indian university students, with sleep disturbance examined as a potential mediating variable.

Methods and Materials: The study employed a descriptive correlational design involving 433 participants selected based on the Morgan and Krejcie sampling table. Standardized tools were used to measure the variables: the Smartphone Addiction Scale–Short Version for smartphone dependency, the Pittsburgh Sleep Quality Index for sleep disturbance, and the Emotional Exhaustion subscale of the Maslach Burnout Inventory–General Survey for emotional fatigue. Data analysis included Pearson correlation using SPSS-27 to assess bivariate relationships, and Structural Equation Modeling (SEM) via AMOS-21 to test direct and indirect effects and evaluate model fit. All assumptions for correlation and SEM, including normality, linearity, and absence of multicollinearity, were confirmed prior to analysis.

Findings: The results indicated that smartphone dependency was significantly correlated with both sleep disturbance ($r = .51$, $p < .001$) and emotional fatigue ($r = .48$, $p < .001$), and that sleep disturbance was significantly associated with emotional fatigue ($r = .56$, $p < .001$). SEM analysis showed that smartphone dependency had a significant direct effect on sleep disturbance ($\beta = .51$, $p < .001$) and emotional fatigue ($\beta = .23$, $p = .005$), while sleep disturbance also had a significant direct effect on emotional fatigue ($\beta = .46$, $p < .001$). The indirect effect of smartphone dependency on emotional fatigue via sleep disturbance was also significant ($\beta = .23$, $p < .001$), confirming partial mediation. The model fit indices indicated good model fit ($\chi^2/df = 2.28$, CFI = .97, RMSEA = .054).

Conclusion: The findings highlight the detrimental effects of smartphone dependency on emotional fatigue, both directly and indirectly through its impact on sleep disturbance, suggesting the need for targeted interventions to manage digital behaviors and promote healthy sleep among young adults.

Keywords: *Smartphone Dependency, Emotional Fatigue, Sleep Disturbance, University Students, Structural Equation Modeling, Digital Behavior*

1. Introduction

The proliferation of smartphones in the 21st century has dramatically reshaped human behavior, particularly in terms of communication, entertainment, and information access. While smartphones have brought undeniable convenience, their overuse has also sparked concerns about mental health, emotional functioning, and sleep quality. This dual nature of digital engagement has been especially pronounced among younger populations, where increased screen time has become intertwined with academic, social, and personal domains. Recent research suggests that excessive smartphone use may be closely associated with emotional fatigue—defined as a state of psychological depletion arising from sustained cognitive and affective engagement—which may be exacerbated by underlying sleep disturbances (Zhu, 2025). As the boundaries between online and offline life continue to blur, understanding the psychological consequences of smartphone dependency has become an urgent research imperative.

The concept of smartphone dependency refers not merely to frequent use but to a compulsive pattern of engagement that interferes with daily functioning and emotional regulation. Emerging studies have identified that such dependency often leads to disruptions in cognitive attention, emotional control, and interpersonal relationships (Rabbani et al., 2025). The compulsive checking of devices, constant notifications, and reliance on social media platforms are known to overstimulate the brain's reward system, leading to heightened emotional sensitivity and increased vulnerability to exhaustion (Hidayat, 2025). Research conducted among university students has highlighted that smartphone overuse contributes to anxiety, cognitive fatigue, and a decreased ability to manage stress effectively (Lavanya, 2023). In particular, emotionally demanding environments combined with digital overload can heighten the risk of developing emotional fatigue—a condition characterized by chronic emotional strain and a diminished capacity to engage in meaningful social or academic activities.

Several psychological models suggest that sleep plays a mediating role in the link between digital dependency and emotional well-being. Sleep is a fundamental biological function critical for emotional regulation, memory consolidation, and recovery from daily stressors (Rodman et al., 2024). However, screen exposure—particularly at night—has been found to delay melatonin production and disrupt circadian rhythms, thereby reducing both sleep quantity and quality (Chun et al., 2024). Sleep disturbances, in turn, are associated with increased irritability, reduced frustration tolerance, and persistent emotional exhaustion (Berglund et al., 2022). These findings indicate that sleep may act as a conduit through which smartphone overuse exacerbates emotional fatigue, making it an important variable to explore in the current study.

Beyond the individual-level impact, the growing normalization of smartphone dependency has broader implications for emotional and social well-being. Research has shown that smartphone-related behaviors are strongly linked to emotional dysregulation, particularly among young adults transitioning through critical developmental stages (Sari et al., 2024). Emotional fatigue can impair academic performance, strain interpersonal relationships, and diminish life satisfaction. In contexts where cultural expectations emphasize high academic achievement and technological integration, such as in India, the pressure to stay digitally connected can further compound these emotional challenges (F. & P., 2024). For instance, studies indicate that students may continue to engage with smartphones late into the night for both academic and non-academic purposes, which contributes to poor sleep hygiene and emotional instability (Cheung, 2022).

The relationship between smartphone dependency and emotional fatigue is also influenced by contextual and behavioral factors. For example, within-person fluctuations in smartphone use have been associated with real-time changes in emotional states, including mood volatility and emotional exhaustion (Rodman et al., 2024). Furthermore, machine learning analysis of smartphone app usage has identified specific behavioral predictors—such as late-night scrolling or compulsive app switching—that significantly forecast mental health outcomes (Cruz et al., 2023). These findings underscore the need for nuanced models that incorporate not only behavioral frequency but also emotional and psychological correlates. Moreover, emotional fatigue does not exist in isolation; it is intertwined with subjective well-being, self-perception, and environmental stressors (Zhoc et al., 2022). Understanding how these factors interact within the framework of smartphone use can offer valuable insight into the mechanisms of digital-age fatigue.

In recent years, there has been increasing interest in identifying demographic and psychosocial correlates of emotional well-being. For example, wellbeing among civil service aspirants has been found to correlate significantly with both social media use and emotional resilience,

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indicating that digital behavior can act as both a risk and protective factor depending on contextual nuances (F. & P., 2024). Similarly, gender and age differences have been reported in how smartphone usage influences emotional states, with young females reporting higher levels of emotional fatigue related to online social comparison and fear of missing out (Golds et al., 2024). These findings are particularly relevant in densely populated countries like India, where digital penetration is high, and cultural norms regarding emotional expression may influence how fatigue is experienced and reported (Zhang et al., 2023).

The COVID-19 pandemic further accelerated digital dependency, especially in education, work, and social interaction. Lockdowns and remote learning led to a sharp rise in screen time, resulting in increased reports of sleep disturbances and emotional burnout, particularly among youth (Asambang, 2023). A study on the pandemic's psychological toll revealed that constant digital exposure without sufficient downtime contributed to a significant decline in emotional well-being among adolescents and young adults (Saikia et al., 2021). Moreover, the increased emotional labor required during this period—especially among healthcare professionals and students—intensified experiences of fatigue and psychological exhaustion (Sweeney & Hynes, 2024). Consequently, examining emotional fatigue in the post-pandemic context requires a deeper understanding of the digital behaviors that may contribute to or mitigate psychological distress.

Theoretical frameworks in digital psychology also highlight the role of smartphone dependency in altering emotional processing. The concept of "connected but overwhelmed" has gained traction in explaining how the hyper-connectivity afforded by smartphones can paradoxically erode emotional well-being (Chun et al., 2024). Adolescents, in particular, are at heightened risk due to their still-developing emotion regulation systems and increased sensitivity to peer feedback (Callender et al., 2022). When digital interactions replace restorative behaviors like sleep or offline socializing, emotional fatigue becomes more likely. Additionally, studies in cross-cultural settings have shown that the emotional impact of smartphone dependency can vary depending on societal values related to productivity, rest, and emotional expression (Onur et al., 2022; Terzimehić et al., 2023).

Importantly, the current body of literature also suggests the existence of individual differences in susceptibility to smartphone-related emotional fatigue. Factors such as emotional intelligence, coping styles, and personality traits have been identified as moderators in the relationship between smartphone use and mental health outcomes (Manzoor & Safdar, 2022). For example, individuals with higher emotional intelligence may be better able to regulate their smartphone use, thus protecting themselves against fatigue and sleep disruption (Zhu, 2025). Furthermore, studies have highlighted the role of leadership and organizational culture in shaping digital habits, especially in work-related smartphone use, which can spill over into personal emotional wellbeing (Tanko et al., 2024).

Despite growing empirical interest in this topic, there remains a gap in understanding how smartphone dependency, sleep disturbance, and emotional fatigue interact as part of a broader psychological process. Few studies have employed comprehensive models that test both direct and indirect pathways, particularly within non-Western contexts. For instance, although there is robust evidence linking screen time to reduced sleep quality and emotional exhaustion, the mediating role of sleep remains underexplored in many high-digital-use countries such as India (Cali et al., 2024). Additionally, cultural differences in sleep norms and emotional regulation strategies necessitate context-specific research (Zhang et al., 2023). In response to these gaps, the present study aims to investigate the direct effect of smartphone dependency on emotional fatigue and the mediating role of sleep disturbance in this relationship.

2. Methods and Materials

2.1. Study Design and Participants

This study employed a descriptive correlational design to examine the relationship between smartphone dependency and emotional fatigue, with sleep disturbance considered as a potential mediating variable. The target population consisted of university students and young adults from various regions of India. Based on the sample size determination table by Morgan and Krejcie, a sample of 433 participants was selected through stratified random sampling to ensure adequate representation across demographic groups. All participants were informed of the study's purpose and provided consent prior to data collection. Inclusion criteria required participants to be aged between 18 and 30 years, own a smartphone, and have no diagnosed sleep or psychological disorders that could confound the results.

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2.2. Measures

2.2.1. Emotional Fatigue

Emotional fatigue in this study was assessed using the Emotional Exhaustion subscale of the Maslach Burnout Inventory–General Survey (MBI-GS), developed by Maslach, Jackson, and Leiter in 1996. This subscale is specifically designed to evaluate feelings of being emotionally overextended and exhausted by one's work or daily responsibilities. The Emotional Exhaustion subscale comprises 5 items, each rated on a 7-point Likert scale ranging from 0 (never) to 6 (every day). Higher scores indicate greater emotional fatigue. The tool has been widely used across diverse populations and settings, and its psychometric properties have been confirmed in multiple studies, demonstrating high internal consistency (Cronbach's alpha values typically exceeding 0.85) and strong construct validity (Cheung, 2022; Rodman et al., 2024).

2.2.2. Sleep Disturbance

To measure sleep disturbance, the Pittsburgh Sleep Quality Index (PSQI), developed by Buysse, Reynolds, Monk, Berman, and Kupfer in 1989, was used. The PSQI is a widely accepted self-report questionnaire designed to assess sleep quality and disturbances over a one-month interval. It consists of 19 self-rated items grouped into seven component scores: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. Each component is scored from 0 to 3, and the global PSQI score (ranging from 0 to 21) is obtained by summing the seven components, with higher scores indicating worse sleep quality. The PSQI has demonstrated excellent reliability (Cronbach's alpha > 0.80) and validity across clinical and non-clinical populations (Khpalwak & Hamidi, 2024; Liu et al., 2023; Miner et al., 2023).

2.2.3. Smartphone Dependency

Smartphone dependency was assessed using the Smartphone Addiction Scale–Short Version (SAS-SV), developed by Kwon, Kim, Cho, and Yang in 2013. This scale is a widely used instrument designed to screen for problematic smartphone use and dependency. It includes 10 items rated on a 6-point Likert scale from 1 (strongly disagree) to 6 (strongly agree), with higher total scores indicating a higher level of smartphone dependency. The SAS-SV encompasses aspects such as daily-life disturbance, withdrawal, tolerance, and positive anticipation. The scale has shown high internal consistency (Cronbach's alpha typically reported around 0.91) and has been validated in numerous cross-cultural studies, confirming its strong psychometric properties in both adolescent and adult populations (Cali et al., 2024; Hidayat, 2025; Lavanya, 2023).

2.3. Data Analysis

Data analysis was conducted in two stages. First, descriptive statistics were calculated to summarize the demographic characteristics and main variables of the study. Pearson correlation analysis was then performed using SPSS version 27 to assess the bivariate relationships between smartphone dependency, sleep disturbance, and emotional fatigue. In the second stage, Structural Equation Modeling (SEM) was employed using AMOS version 21 to examine the direct and indirect effects among the variables and to test the mediating role of sleep disturbance in the relationship between smartphone dependency and emotional fatigue. Model fit indices, including CFI, RMSEA, and Chi-square/df, were used to evaluate the adequacy of the proposed model.

3. Findings and Results

The study sample consisted of 433 participants from various regions of India. Among them, 239 participants (55.2%) identified as female, while 194 participants (44.8%) identified as male. In terms of age distribution, 127 participants (29.3%) were between 18 and 21 years old, 185 participants (42.7%) were between 22 and 25 years old, and 121 participants (27.9%) were between 26 and 30 years old. Regarding educational status, 251 participants (58.0%) were undergraduate students, and 182 participants (42.0%) were pursuing or had completed postgraduate studies. The majority of participants (278 individuals, 64.2%) reported using their smartphones for more than 5 hours per day, while the remaining 155 participants (35.8%) reported usage of less than 5 hours daily.

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Table 1

Descriptive Statistics for Study Variables

Variable	Mean (M)	Standard Deviation (SD)
Smartphone Dependency	37.84	6.21
Sleep Disturbance	9.47	3.36
Emotional Fatigue	19.12	4.85

The descriptive statistics for the three main variables are presented in Table 1. Participants reported a mean smartphone dependency score of 37.84 (SD = 6.21), suggesting moderate to high engagement with smartphones based on the Smartphone Addiction Scale – Short Version. The average score for sleep disturbance was 9.47 (SD = 3.36), as measured by the Pittsburgh Sleep Quality Index, indicating considerable variability in sleep quality. Emotional fatigue, measured through the emotional exhaustion subscale of the MBI-GS, had a mean score of 19.12 (SD = 4.85), reflecting a moderately high level of emotional fatigue among the sample.

Prior to conducting the main statistical analyses, all necessary assumptions for Pearson correlation and Structural Equation Modeling were examined and met. The assumption of normality was confirmed by evaluating skewness and kurtosis values for each variable, all of which fell within the acceptable range of ±2 (e.g., emotional fatigue: skewness = 0.31, kurtosis = –0.48; smartphone dependency: skewness = 0.67, kurtosis = 0.12; sleep disturbance: skewness = 0.53, kurtosis = –0.33). Linearity and homoscedasticity were visually inspected through scatterplots, which indicated consistent linear patterns between the variables. Multicollinearity was assessed using variance inflation factors (VIF), with all values below the threshold of 5 (e.g., VIF = 1.36 for smartphone dependency, VIF = 1.41 for sleep disturbance), confirming that multicollinearity was not a concern. The Mahalanobis distance test also identified no significant multivariate outliers at $p < .001$, indicating that the dataset was suitable for SEM analysis.

Table 2

Pearson Correlation Coefficients and p-values Among Variables

Variable	1	2	3
1. Smartphone Dependency	—		
2. Sleep Disturbance	.51** ($p < .001$)	—	
3. Emotional Fatigue	.48** ($p < .001$)	.56** ($p < .001$)	—

Table 2 displays Pearson correlation coefficients among the study variables. Smartphone dependency was significantly and positively correlated with sleep disturbance ($r = .51$, $p < .001$) and emotional fatigue ($r = .48$, $p < .001$). Sleep disturbance also showed a significant positive correlation with emotional fatigue ($r = .56$, $p < .001$). These findings suggest that higher levels of smartphone dependency are associated with increased sleep disturbances and emotional fatigue, and that sleep issues are strongly related to emotional exhaustion.

Table 3

Fit Indices of the Structural Model

Fit Index	Value	Acceptable Threshold
χ^2 (Chi-square)	118.73	—
df	52	—
χ^2/df	2.28	< 3.00
GFI	.96	≥ .90
AGFI	.92	≥ .90
CFI	.97	≥ .90
TLI	.95	≥ .90
RMSEA	.054	≤ .08

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Table 3 presents the model fit indices for the structural equation model. The model demonstrated good fit across all indices: Chi-square (χ^2) = 118.73 with 52 degrees of freedom, resulting in χ^2/df = 2.28. The Goodness-of-Fit Index (GFI = .96), Adjusted GFI (AGFI = .92), Comparative Fit Index (CFI = .97), and Tucker-Lewis Index (TLI = .95) all exceeded the recommended threshold of .90. The Root Mean Square Error of Approximation (RMSEA = .054) also fell within acceptable limits (< .08), indicating a well-fitting structural model.

Table 4

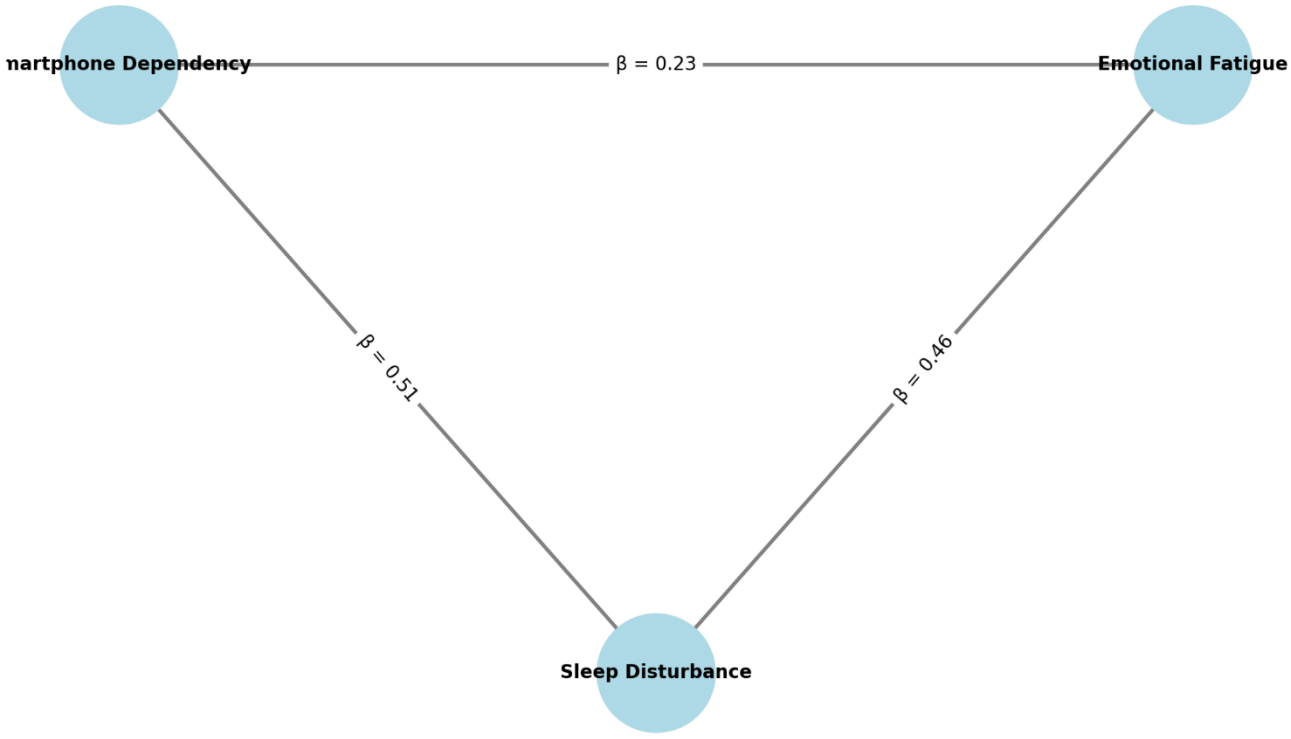
Standardized Total, Direct, and Indirect Effects in the Structural Model

Path	B	S.E.	Beta	p
Smartphone Dependency → Sleep Disturbance	0.38	0.06	.51	< .001
Sleep Disturbance → Emotional Fatigue	0.42	0.05	.46	< .001
Smartphone Dependency → Emotional Fatigue	0.19	0.07	.23	.005
Smartphone Dependency → Sleep Disturbance → Emotional Fatigue (Indirect)	0.16	0.04	.23	< .001
Smartphone Dependency → Emotional Fatigue (Total)	0.35	0.06	.46	< .001

Table 4 shows the results of the structural model, including direct, indirect, and total effects. The direct effect of smartphone dependency on sleep disturbance was significant (B = 0.38, SE = 0.06, β = .51, p < .001), indicating that increased smartphone use significantly predicted higher sleep disturbance. In turn, sleep disturbance significantly predicted emotional fatigue (B = 0.42, SE = 0.05, β = .46, p < .001). The direct path from smartphone dependency to emotional fatigue was also significant (B = 0.19, SE = 0.07, β = .23, p = .005), although weaker than the indirect effect through sleep. The mediation analysis revealed a significant indirect effect (B = 0.16, SE = 0.04, β = .23, p < .001), suggesting that sleep disturbance partially mediated the relationship. The total effect of smartphone dependency on emotional fatigue (B = 0.35, SE = 0.06, β = .46, p < .001) confirms the cumulative influence of both direct and indirect pathways.

Figure 1

Standardized Total, Direct, and Indirect Effects in the Structural Model



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4. Discussion and Conclusion

The findings of this study provide important insights into the complex relationship between smartphone dependency, sleep disturbance, and emotional fatigue among university students in India. Using both Pearson correlation and structural equation modeling (SEM), the results revealed a significant positive correlation between smartphone dependency and emotional fatigue, indicating that higher levels of digital reliance are associated with greater psychological exhaustion. Furthermore, sleep disturbance was shown to significantly mediate this relationship, highlighting the role of disrupted sleep patterns as a crucial pathway through which excessive smartphone use leads to emotional fatigue.

The positive correlation between smartphone dependency and emotional fatigue aligns with prior research that has linked compulsive digital behaviors to emotional depletion and psychological distress. For instance, Zhu (2025) reported that smartphone addiction is significantly associated with increased emotional exhaustion and reduced life satisfaction in post-pandemic populations, a pattern consistent with the current findings. This relationship can be explained by the overstimulation of cognitive and emotional systems due to persistent digital engagement, particularly on social media and messaging platforms, which demand constant attention and emotional involvement (Zhu, 2025). Similarly, Rabbani et al. (2025) found that frequent smartphone use in educational settings may impair students' emotional intelligence and cognitive regulation, supporting the idea that emotional fatigue may stem from both behavioral and cognitive overload (Rabbani et al., 2025).

Moreover, the mediating role of sleep disturbance confirms growing evidence that disrupted sleep functions as a key mechanism linking technology use to negative mental health outcomes. The present study found that smartphone dependency was significantly associated with poorer sleep quality, which in turn was positively related to emotional fatigue. These findings resonate with the work of Chun et al. (2024), who emphasized the neurobiological implications of screen exposure on brain development and sleep-wake cycles, particularly during critical periods of adolescent and early adult growth (Chun et al., 2024). In another study, Berglund et al. (2022) demonstrated that irregular sleep patterns lead to increased emotional volatility and lower emotional responsiveness, thereby increasing susceptibility to fatigue and burnout in high-stress situations (Berglund et al., 2022). The findings of this study affirm these results and extend them by illustrating how sleep acts not merely as an outcome of digital behavior but as a bridge between smartphone use and emotional dysfunction.

Additionally, the structural model tested in this study provides a robust framework for understanding how these constructs interact. The significant direct path from smartphone dependency to emotional fatigue suggests that emotional exhaustion can emerge from persistent digital exposure even without the influence of sleep, although the indirect path via sleep disturbance strengthens the model and offers a more comprehensive explanation. These findings support the assertions of Rodman et al. (2024), who observed within-person emotional fluctuations corresponding to changes in smartphone usage among adolescents, emphasizing the emotional toll of hyperconnectivity (Rodman et al., 2024). Likewise, Cruz et al. (2023) employed machine learning methods to show that behavioral predictors, such as nighttime smartphone use, strongly correlate with self-reported fatigue and psychological discomfort (Cruz et al., 2023).

The emotional consequences of digital behavior are not confined to sleep and fatigue alone but are also tied to broader constructs of well-being and emotional regulation. Sari et al. (2024) explored the effect of smartphone intensity on emotion regulation among university students and reported a decline in emotional clarity and self-control with increased usage, mirroring the emotional fatigue outcomes observed in this study (Sari et al., 2024). This is further supported by Lavanya (2023), who identified a significant negative relationship between smartphone usage and psychological well-being among Indian college students, reinforcing the idea that digital overuse diminishes emotional reserves over time (Lavanya, 2023). Moreover, the mediating influence of sleep disturbances was also identified in studies such as Cheung (2022), which highlighted the role of emotional exhaustion in moderating the effects of work-related smartphone use on job satisfaction, thereby demonstrating similar patterns of emotional disruption in adult working populations (Cheung, 2022).

In understanding emotional fatigue as a psychological outcome, it is important to contextualize it within broader models of subjective well-being and digital behavior. Terzimehić et al. (2023) framed the smartphone-user relationship as emotionally complex and bidirectional, where devices act both as sources of comfort and emotional strain (Terzimehić et al., 2023). The results of the current study suggest that the strain may outweigh the comfort when

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usage becomes compulsive, especially in academic settings with high cognitive demands. Similarly, Onur et al. (2022) noted that adolescents with higher levels of emotional eating—a proxy for emotional dysregulation—also reported lower subjective well-being, suggesting a link between emotional depletion and maladaptive coping strategies (Onur et al., 2022). These findings resonate with the emotional fatigue reported by participants in this study, who may be using smartphones not just for practical functions but also as emotional coping tools.

Other studies have also demonstrated that digital dependency affects more than just individual users—it also disrupts social dynamics and relational health. For example, Golds et al. (2024) explored the effects of maternal smartphone use and found that it negatively influenced mother-infant responsiveness, indicating that emotional disconnection resulting from digital absorption can manifest in interpersonal relationships (Golds et al., 2024). This disconnection can contribute to emotional fatigue by reducing access to social support, an important buffer against stress. Manzoor and Safdar (2022) similarly reported that the overuse of smartphones compromises emotional behavior and social cohesion among youth, further corroborating the detrimental interpersonal implications of dependency (Manzoor & Safdar, 2022).

Sleep disruption, as a mediator, has also been examined in pandemic contexts, where digital behaviors surged due to lockdowns and social isolation. Saikia et al. (2021) noted that increased smartphone use during the COVID-19 pandemic significantly impaired individual well-being and contributed to emotional burnout through poor sleep hygiene (Saikia et al., 2021). Asambang (2023) echoed these concerns, reporting a rise in emotional fatigue and reduced social engagement among school-aged children following excessive screen exposure during remote learning (Asambang, 2023). The current study builds upon these findings by confirming that similar patterns persist even in the post-pandemic recovery phase, indicating the long-term psychological effects of sustained digital dependence.

This study also contributes to growing evidence on cross-cultural implications of smartphone behavior. Zhang et al. (2023) emphasized that subjective well-being varies significantly across societies and may shape how digital fatigue is experienced and reported (Zhang et al., 2023). In the Indian context, where digital education, career pressure, and high smartphone penetration coexist, emotional fatigue may be intensified by cultural expectations around academic excellence and social conformity. The findings are particularly relevant in this context and suggest that psychological models must consider cultural and systemic variables when interpreting the impact of digital dependency.

Finally, this study reinforces the notion that smartphone dependency should not be seen solely as a behavioral issue but as a multi-dimensional phenomenon with cognitive, emotional, and biological implications. Cali et al. (2024) found that adolescent smartphone addiction in Southern Italy was linked with other risky behaviors, such as substance use and impulsivity, highlighting how emotional exhaustion may co-occur with broader psychosocial dysfunctions (Cali et al., 2024). Additionally, Alsop et al. (2024) examined how cultural and community engagement influence emotional well-being, suggesting that alternative emotional outlets may serve as protective factors against digital fatigue (Alsop et al., 2024).

5. Limitations & Suggestions

While the study provides valuable contributions, several limitations must be acknowledged. First, the cross-sectional design restricts the ability to make causal inferences between smartphone dependency, sleep disturbance, and emotional fatigue. Longitudinal or experimental designs would be better suited to assess temporal precedence. Second, the data relied entirely on self-report measures, which are subject to biases such as social desirability and inaccurate recall. Third, although the study was conducted in India and provides important cultural insights, the findings may not be generalizable to other populations with different digital behavior norms or sleep patterns. Lastly, potential confounding variables such as academic workload, mental health history, or physical activity were not controlled for in the analysis and may have influenced the results.

Future studies should consider adopting longitudinal designs to explore how smartphone dependency and its emotional consequences evolve over time. Including objective measures of sleep, such as actigraphy or mobile usage tracking apps, could also improve the accuracy of the data. Researchers are encouraged to explore moderating factors such as gender, academic stress, or emotional intelligence, which may affect the strength or direction of the relationships among variables. Cross-cultural comparisons would be particularly valuable in identifying how societal norms influence the digital-fatigue relationship. In addition, future research could examine intervention strategies, such

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as digital detox programs or sleep hygiene education, to mitigate emotional fatigue and promote well-being.

Practitioners and educators should prioritize awareness campaigns highlighting the emotional risks of excessive smartphone use, particularly among students. Institutions can incorporate sleep education and digital wellness into university orientation programs to encourage healthy behavioral habits. Counseling centers should assess for smartphone dependency when addressing emotional complaints, and consider sleep-focused interventions as part of emotional fatigue treatment. Families can also support healthier tech habits by modeling balanced smartphone use and fostering offline social engagement. Finally, app developers and technology designers should consider integrating features that promote screen-time awareness and support users in managing digital overload.

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Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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Authors' Contributions

All authors equally contributed to this article.

References

Alsop, M. A., Hambrick, M. E., Heitz, H. K., & Batley, P. N. (2024). Effects on Personal and Cultural Wellbeing of Attending Free Community Outreach Concerts Given by a Professional Orchestra. *Musicae Scientiae*. https://doi.org/10.1177/10298649241296499

Asambang, D. A. (2023). The Impact of Covid-19 on the Social and Emotional Wellbeing Among School-Aged Children in Minnesota, USA. *Texila International Journal of Academic Research*, *10*(3), 128-135. https://doi.org/10.21522/tijar.2014.10.03.art011

Berglund, E., Olsson, E., Jönsson, M., Svensson, L., Hollenberg, J., Claesson, A., Nordberg, P., Lundgren, P., Högstedt, Å., & Ringh, M. (2022). Wellbeing, Emotional Response and Stress Among Lay Responders Dispatched to Suspected Out-of-Hospital Cardiac Arrests. *Resuscitation*, *170*, 352-360. https://doi.org/10.1016/j.resuscitation.2021.11.005

Cali, M. A. A., Fernández-López, L., Navarro-Zaragoza, J., Caravaca, F., & Romero, M. F. (2024). Smartphone Addiction Among Adolescents in Southern Italy and Correlation With Other Risky Behaviors. *Actas Esp Psiquiatr*, *52*(5), 632-640. https://doi.org/10.62641/aep.v52i5.1664

Callender, J., Bridge, P., Al-Samarraie, F., & Blair, D. V. (2022). The Use of Emoji to Establish Student Wellbeing: Does the Image Reflect the Reality? *Journal of Radiotherapy in Practice*, *22*. https://doi.org/10.1017/s1460396921000704

Cheung, F. (2022). Work-Related Smartphone Use at Night and Job Satisfaction: Testing a Moderated Mediation Model of Emotional Exhaustion and Organizational Dehumanization. *International journal of environmental research and public health*, *19*(17), 10674. https://doi.org/10.3390/ijerph191710674

Chun, J. W., Choi, J., Hu, M., & Kim, D. J. (2024). Connected but Protected: Guiding Healthy Brain Development in the Digital Age. *Frontiers for Young Minds*, *12*. https://doi.org/10.3389/frym.2024.1445381

Cruz, G. V., Aboujaoude, E., Khan, R., Rochat, L., Brahim, F. B., Courtois, R., & Khazaal, Y. (2023). Smartphone Apps for Mental Health and Wellbeing: A Usage Survey and Machine Learning Analysis of Psychological and Behavioral Predictors. *Digital Health*, *9*. https://doi.org/10.1177/20552076231152164

F., M., & P., M. (2024). Gender, Number of Attempts and Social Media Usage as Correlates of Wellbeing Among Civil Service Aspirants. *International Journal for Multidisciplinary Research*, *6*(4). https://doi.org/10.36948/ijfmr.2024.v06i04.25259

Golds, L., Gillespie-Smith, K., & MacBeth, A. (2024). Associations Between Maternal Smartphone Use and Mother-infant Responsiveness: A Cluster Analysis of Potential Risk and Protective Factors. *Infant Mental Health Journal*, *45*(3), 341-353. https://doi.org/10.1002/imhj.22112

Hidayat, H. (2025). Smartphone Addiction and Its Psychological Consequences Among University Students in Pakistan. *Ijss*, *3*(1), 549-558. https://doi.org/10.59075/ijss.v3i1.729

Khpalwak, A. T., & Hamidi, M. S. (2024). Relationship Between Social Media Use and Sleep Disturbance Among Adults in Afghanistan. *American Journal of Medical Science and Innovation*, *3*(1), 27-34. https://doi.org/10.54536/ajmsi.v3i1.2418

Lavanya, K. (2023). Smartphone Usage as a Predictor of Psychological Wellbeing Among College Students. *International Journal of Research and Scientific Innovation*, *X*(VIII), 153-168. https://doi.org/10.51244/ijrsi.2023.10812

Liu, T., Geng, Y., Han, Z., Qin, W., Zhou, L., Ding, Y., Zhang, Z., & Sun, G. (2023). Self-reported sleep disturbance is significantly associated with depression, anxiety, self-efficacy, and stigma in Chinese patients with rheumatoid

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arthritis. *Psychology, Health & Medicine*, *28*(4), 908-916. https://doi.org/10.1080/13548506.2022.2039398

Manzoor, H., & Safdar, A. (2022). The Impact of Smartphones on Social Relations and Emotional Behaviors of Youth. *Global Digital & Print Media Review*, *V*(II), 92-104. https://doi.org/10.31703/gdpmr.2022(v-ii).09

Miner, S., McVoy, M., & Damato, E. G. (2023). Evaluation of the Relationship of Sleep Disturbances to Severity and Common Behaviors in Autism Spectrum Disorder. https://doi.org/10.21203/rs.3.rs-2674526/v1

Onur, E. E., Muslu, G. K., & Manav, G. (2022). Examining the Relationship Between Subjective Wellbeing and Emotional Eating in Adolescents in Turkey. *Journal of Child and Adolescent Psychiatric Nursing*, *35*(3), 257-266. https://doi.org/10.1111/jcap.12373

Rabbani, Q. S., Hidayat, P., Maharani, E. A., & Satrianawati, S. (2025). The Influence of Smartphone Use on the Cognitive Abilities and Emotional Intelligence of Students at Pogung 2 State Elementary School. *J. Comput. Sci. Math. Learn.*, *2*(1), 1-5. https://doi.org/10.70232/jcsml.v2i1.11

Rodman, A. M., Burns, J. A., Cotter, G., Ohashi, Y. G. B., Rich, R. K., & McLaughlin, K. A. (2024). Within-Person Fluctuations in Objective Smartphone Use and Emotional Processes During Adolescence: An Intensive Longitudinal Study. *Affective science*, *5*(4), 332-345. https://doi.org/10.1007/s42761-024-00247-z

Saikia, U., Dodd, M. M., Chalmers, J., Dasvarma, G., & Schech, S. (2021). COVID-19, Individual Wellbeing and Multi-Dimensional Poverty in the State of South Australia. *PLoS One*, *16*(6), e0252898. https://doi.org/10.1371/journal.pone.0252898

Sari, S. J., Saputri, A. D., Anggraini, M., Retina, S., & Sari, A. P. (2024). Pengaruh Intensitas Penggunaan Smartphone Terhadap Regulasi Emosi Pada Mahasiswa. *Educate*, *2*(1), 35-41. https://doi.org/10.61994/educate.v2i1.347

Sweeney, A., & Hynes, S. M. (2024). An Exploration of the Emotional Impact of Working in an Adult Hospice Service for Irish Healthcare Professionals. *International Journal of Palliative Nursing*, *30*(5), 236-246. https://doi.org/10.12968/ijpn.2024.30.5.236

Tanko, D. B., Austin, M. I., Abbas, F. S., Ahmadu, A. S., & Gambo, N. (2024). Leadership Styles and Employee Wellbeing in Federal Capital Territory Internal Revenue Service. *European Journal of Business and Innovation Research*, *12*(5), 45-60. https://doi.org/10.37745/ejbir.2013/vol12n54560

Terzimehić, N., Aragon-Hahner, S., & Hußmann, H. (2023). The Tale of a Complicated Relationship. *Proceedings of the Acm on Interactive Mobile Wearable and Ubiquitous Technologies*, *7*(1), 1-34. https://doi.org/10.1145/3580792

Zhang, M., Zhang, W., & Shi, Y. (2023). Can Adolescents' Subjective Wellbeing Facilitate Their Pro-Environmental Consumption Behaviors? Empirical Study Based on 15-Year-Old Students. *Frontiers in Public Health*, *11*. https://doi.org/10.3389/fpubh.2023.1184605

Zhoc, K. C. H., Cai, Y., Yeung, S. S., & Shan, J. (2022). Subjective Wellbeing and Emotion Regulation Strategies: How Are They Associated With Student Engagement in Online Learning During Covid-19? *British Journal of Educational Psychology*, *92*(4), 1537-1549. https://doi.org/10.1111/bjep.12513

Zhu, C. (2025). The Impact of Smartphone Addiction on Mental Health and Its Relationship With Life Satisfaction in the Post-Covid-19 Era. *Frontiers in Psychiatry*, *16*. https://doi.org/10.3389/fpsyt.2025.1542040

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