



Original Research Article

EMERGING BURDEN OF NOMOPHOBIA AMONG MEDICAL STUDENTS: ASSOCIATIONS WITH DIGITAL ENGAGEMENT PATTERNS AND SMARTPHONE USE BEHAVIOURS IN A MULTI-INSTITUTIONAL CROSS-SECTIONAL STUDY FROM AN EASTERN INDIAN STATE

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ABSTRACT

Background: Nomophobia, defined as fear or anxiety of being without a mobile phone, is an emerging behavioural health concern among young adults. Evidence on its association with digital engagement patterns and smartphone-use behaviours remains limited, particularly from eastern India. This study assessed the burden of nomophobia and its behavioural correlates among medical students. This study aimed to assess the burden of nomophobia and examine its associations with digital engagement patterns and smartphone use behaviours among young adults in a multi-institutional setting in an eastern state of India.

Materials and Methods: A multicentre cross-sectional study was conducted from August to December 2025 among 541 final-year medical students from three government medical colleges in West Bengal, India. Participants were selected using proportional allocation. Nomophobia was assessed using the 20-item Nomophobia Questionnaire (NMP-Q). Data on sociodemographic and smartphone-use behaviours were collected using a structured questionnaire. Associations were examined using bivariate tests and multivariable linear regression.

Results: The mean nomophobia score was 84.2 (SD 20.4), indicating moderate-to-high nomophobia. The highest domain score was inability to communicate. In bivariate analysis, higher nomophobia was significantly associated with female gender, hostel residence, sleep <8 hours/day, prolonged smartphone use, frequent device checking, immediate use on waking, and purposeless scrolling (all $p < 0.05$). In multivariable analysis, independent predictors of higher nomophobia included female gender ($\beta = 0.130$), hostel residence ($\beta = 0.183$), later age at first smartphone use ($\beta = 0.217$), longer daily smartphone use ($\beta = 0.189$), purposeless smartphone use ($\beta = 0.153$), tablet use ($\beta = 0.112$), and poor sleep duration ($\beta = -0.104$). The model explained 31.2% of the variance.

Conclusion: Nomophobia is highly prevalent among young medical students and is strongly associated with intensive and purposeless smartphone

engagement, inadequate sleep, and residential status. These findings highlight the need for targeted digital wellbeing interventions in academic settings.

Keywords: Nomophobia, inadequate sleep, linear regression, purposeless smartphone engagement.

INTRODUCTION

The widespread adoption of smartphones has transformed communication, education, and access to information, particularly among young adults who represent one of the most digitally connected populations worldwide. While smartphones offer substantial benefits, concerns have emerged regarding excessive dependence on these devices and their impact on mental and behavioural health.^[1] Nomophobia, or "no mobile phone phobia", refers to the fear, anxiety, or discomfort experienced when individuals are unable to access or use their smartphones.^[2] Increasing evidence suggests that nomophobia is an emerging behavioural health concern associated with excessive smartphone use, psychological distress, sleep disturbances, and impaired academic performance.^[3-5] As smartphones increasingly mediate social interaction and daily functioning, the inability to remain connected may generate significant anxiety, particularly among young adults. University students are considered especially vulnerable to nomophobia because smartphones play a central role in maintaining social relationships, accessing educational resources, and engaging with digital platforms. Studies conducted across different countries have reported a high prevalence of moderate-to-severe nomophobia among students and young adults, highlighting its growing public health relevance.^[6] In India, rapid expansion of smartphone ownership and internet accessibility has been accompanied by increasing reports of problematic smartphone use and nomophobic behaviours among students.^[7] Emerging evidence indicates that specific smartphone-use behaviours, including prolonged daily use, frequent device checking, excessive internet engagement, and passive scrolling, may contribute to the development of nomophobia.^[8-9] However, data examining these behavioural correlates remain limited, particularly from eastern India and multi-institutional educational settings. Understanding the relationship between digital engagement patterns and nomophobia is essential for developing effective strategies to promote digital wellbeing among young adults.

Therefore, this study aimed to assess the burden of nomophobia and examine its associations with digital engagement patterns and smartphone use behaviours among young adults in a multi-institutional setting in an eastern state of India.

MATERIALS AND METHODS

Type of Study: A multicentre cross-sectional analytical study

Place of Study: Murshidabad Medical College and Hospital, Berhampore; Bankura Sammilani Medical College, Bankura; and Prafulla Chandra Sen Government Medical College and Hospital, Hooghly

Study Duration: From August 2025 to December 2025 (5 months).

Sample Size: The sample size was calculated using the single population proportion formula, assuming a 95% confidence level, 5% absolute precision, and an expected prevalence of nomophobia of 80% based on previous regional evidence.⁹ A design effect of 2 was applied to account for multicentre clustering, followed by a 10% non-response adjustment, resulting in a minimum required sample size of 541 participants. Proportional allocation was used based on institutional intake, yielding target samples of 159, 255, and 127 students from the respective colleges.

Inclusion Criteria:

- Final-year MBBS undergraduate students enrolled in the selected medical colleges.
- Students who owned and regularly used a personal smartphone.
- Students who provided informed consent to participate.

Exclusion Criteria:

- Students with self-reported or clinician-diagnosed psychiatric disorders, including anxiety disorders, depressive disorders, or obsessive-compulsive disorder.
- Students receiving psychotropic medications.
- Students who declined or did not provide informed consent.

Study Variables:

A) Independent Variables:

Age in years
Religion
Gender
Studying from
Duration of sleep in 24 hours
Number of Gadget
Primarily used Gadgets
Age of getting first Smartphone
Duration of using Smartphone in a day
Frequency of checking the Smartphone per day
Frequency of phone recharge
Internet package or top up recharge separately
Checking Smartphone after waking up in the morning
Mode of use of Smartphone mostly

B) Dependent Variable:

Nomophobia

Statistical Analysis

Data were collected through an anonymous, structured, self-administered Google Forms

questionnaire covering sociodemographic characteristics, nomophobia assessed using the 20-item NMP-Q, and smartphone-use behaviours. Data were collected over three months. Categorical variables were presented as frequencies and percentages, while continuous variables were

expressed as mean (SD) or median (IQR). Appropriate parametric and non-parametric tests were applied, followed by multivariable linear regression to identify independent predictors of nomophobia. A two-sided $p < 0.05$ was considered statistically significant.

RESULTS

Table 1: Sociodemographic, lifestyle and smartphone-use characteristics of study participants (N=541)

Variable	Category	n (%)
Age	<20 years	61 (11.3)
	≥20 years	480 (88.7)
Gender	Male	356 (65.8)
	Female	185 (34.2)
Religion	Hindu	351 (64.9)
	Other religions	190 (35.1)
Residence	At home	93 (17.2)
	Hostel	448 (82.8)
Sleep duration	<8 hours/day	292 (54.0)
	≥8 hours/day	249 (46.0)
Number of digital gadgets	Single gadget	238 (44.0)
	Multiple gadgets	303 (56.0)
Primary gadget used	Smartphone	234 (43.3)
	Tablet	158 (29.2)
	Laptop	149 (27.5)
Age at first smartphone acquisition	<15 years	104 (19.2)
	≥15 years	437 (80.8)
Daily smartphone use	<6 hours	—
	6–12 hours	249 (46.0)
	≥12 hours	148 (27.4)
Smartphone checking frequency	<20 times/day	—
	20–60 times/day	243 (44.9)
	≥60 times/day	120 (22.2)
Checking immediately after waking	Yes	481 (88.9)
	No	60 (11.1)
Phone recharge frequency	Frequently	210 (38.8)
	Less frequently	331 (61.2)
Separate internet data top-up	Yes	204 (37.7)
	No	337 (62.3)
Primary purpose of smartphone use	Study	132 (24.4)
	Communication	104 (19.2)
	Entertainment	32 (5.9)
	Passive purposeless scrolling	273 (50.5)

Table 2: Distribution of total nomophobia score and its four dimensions among participants (N=541)

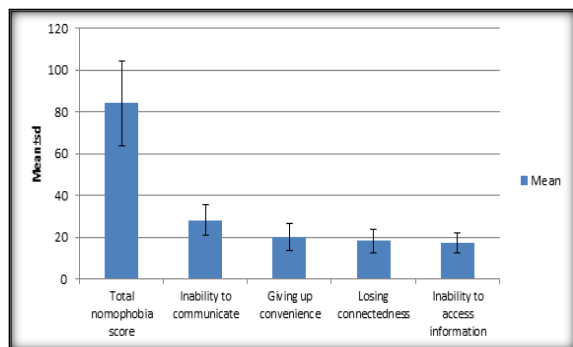
Nomophobia domain	Mean ± SD	Range
Total nomophobia score	84.2 ± 20.4	32–140
Inability to communicate	28.3 ± 7.5	6–42
Giving up convenience	20.3 ± 6.5	5–35
Losing connectedness	18.3 ± 5.7	5–35
Inability to access information	17.3 ± 5.0	6–28

Table 3: Association of sociodemographic and lifestyle characteristics with nomophobia score

Variable	Category	Mean nomophobia score	p-value
Gender	Male	82.76	0.023
	Female	86.95	
Residence	At home	72.2	<0.001
	Hostel	86.69	
Sleep duration	<8 hours/day	86.13	0.017
	≥8 hours/day	81.93	
Age group	<20 years	82.96	>0.05
	≥20 years	83.45	
Religion	Hindu	83.15	>0.05
	Other	86.14	
Number of gadgets	Single	83.61	>0.05
	Multiple	84.65	

Table 4: Association between smartphone-use behaviours and nomophobia score

Variable	Finding	p-value
Age at first smartphone acquisition	≥15 years associated with higher score	<0.001
Daily smartphone use	Score increased from 73.96 (<6 h) to 91.12 (≥12 h)	<0.001
Smartphone checking frequency	Higher checking frequency associated with higher score	0.01
Phone recharge frequency	Frequent recharge associated with higher score	<0.001
Separate internet data top-up	Yes: 92.33 vs No: 79.27	<0.001
Checking immediately after waking	Yes: 85.86 vs No: 70.87	<0.001
Primary gadget used	Tablet users had highest score	0.002
Primary purpose of smartphone use	Highest with passive purposeless scrolling; lowest with academic use	0.001

**Figure 1: Distribution of Mean Nomophobia Scores and Its Four Dimensions Among Study Participants**

A total of 541 participants were included in the study. The study population was predominantly composed of participants aged ≥20 years (88.7%), with males accounting for nearly two-thirds of the sample (65.8%). Hindu participants represented the majority religious group (64.9%), while 35.1% belonged to other religions. Most respondents were residing in hostels (82.8%), reflecting the largely residential nature of the study population.

Lifestyle characteristics indicated that more than half of the participants reported sleeping for less than 8 hours per day (54.0%). Ownership of digital devices was widespread, with 56.0% reporting the use of multiple gadgets. Smartphones emerged as the most predominantly used device (43.3%), followed by tablets (29.2%) and laptops (27.5%). The majority of participants acquired their first smartphone at or after 15 years of age (80.8%). Patterns of smartphone engagement suggested extensive daily use. Almost half of the participants reported using smartphones for 6–12 hours per day (46.0%), while more than one-quarter reported usage exceeding 12 hours daily (27.4%). Frequent interaction with smartphones was also common, with 44.9% checking their devices 20–60 times per day and 22.2% reporting more than 60 checks daily. Behavioural indicators further highlighted a high degree of smartphone dependence. Nearly nine in ten participants (88.9%) reported checking their smartphones immediately upon waking. Although 61.2% reported less frequent phone recharges, and 62.3% did not purchase separate internet data packages, substantial proportions reported frequent recharging (38.8%) and separate internet top-ups (37.7%).

Regarding the primary purpose of smartphone use, purposeless passive scrolling was the predominant activity (50.5%), substantially exceeding study-

related use (24.4%) and communication (19.2%), while entertainment accounted for only a small proportion of reported smartphone engagement (5.9%).

Among 541 participants, the mean nomophobia score was 84.2 (SD 20.4; range 32–140), indicating a moderate-to-high level of nomophobia in the study population. Of the four nomophobia dimensions, inability to communicate had the highest mean score (28.3 ± 7.5 ; range 6–42), suggesting that concerns about being unable to make calls or send messages constituted the most prominent aspect of nomophobia. This was followed by giving up convenience (20.3 ± 6.5 ; range 5–35), losing connectedness (18.3 ± 5.7 ; range 5–35), and inability to access information (17.3 ± 5.0 ; range 6–28). [Figure 1]

The distributions of the total nomophobia score and its subdomains were approximately symmetric, with skewness and kurtosis values close to zero, indicating no substantial departure from normality. Overall, fears related to communication loss appeared to contribute most strongly to nomophobia, whereas concerns regarding access to information showed comparatively lower scores.

Bivariate analyses identified several sociodemographic, behavioural, and smartphone-use characteristics that were significantly associated with nomophobia scores. Female participants demonstrated significantly higher nomophobia scores than males (mean score 86.95 vs 82.76; $p=0.023$). Participants residing in hostels also reported substantially higher nomophobia scores than those studying from home (86.69 vs 72.20; $p<0.001$).

Sleep duration was significantly associated with nomophobia, with participants sleeping less than 8 hours per day exhibiting higher scores than those reporting at least 8 hours of sleep (86.13 vs 81.93; $p=0.017$). In contrast, age group, religion, and the number of gadgets owned were not significantly associated with nomophobia scores ($p>0.05$ for all). Several indicators of smartphone-use behaviour demonstrated strong associations with nomophobia. Participants who obtained their first smartphone at ≥15 years of age had significantly higher nomophobia scores than those who acquired a smartphone before 15 years of age ($p<0.001$). Nomophobia scores increased progressively with daily smartphone use, ranging from 73.96 among those using smartphones for less than 6 hours per day to 91.12 among those reporting use for at least

12 hours daily (overall $p < 0.001$). Post-hoc analyses indicated significant differences between all duration categories.

Similarly, more frequent smartphone checking was associated with higher nomophobia scores ($p = 0.01$), with the highest scores observed among participants checking their devices at least 60 times per day. Frequent phone recharging was also associated with significantly higher nomophobia scores compared with less frequent recharging ($p < 0.001$). Participants who purchased separate internet data packages exhibited markedly higher nomophobia scores than those who did not (92.33 vs 79.27; $p < 0.001$). Furthermore, individuals who checked their smartphones immediately after waking reported significantly higher nomophobia scores than those who did not (85.86 vs 70.87; $p < 0.001$).

The primary device used was significantly associated with nomophobia ($p = 0.002$), with tablet users reporting the highest scores, followed by laptop and smartphone users. The purpose of smartphone use was also significantly related to nomophobia ($p = 0.001$). Participants predominantly engaged in purposeless passive scrolling exhibited the highest nomophobia scores, followed by those primarily using smartphones for entertainment and communication, whereas the lowest scores were observed among those using smartphones mainly for academic purposes.

Overall, behavioural indicators reflecting greater smartphone engagement—including prolonged daily use, frequent device checking, frequent recharging, separate internet data purchases, immediate smartphone use upon waking, and purposeless scrolling—were consistently associated with higher nomophobia scores.

In multivariable linear regression analysis, the model explained approximately 31.2% of the variance in nomophobia scores (adjusted $R^2 = 0.298$) and demonstrated good overall fit ($F = 21.80$, $p < 0.001$). No evidence of problematic multicollinearity was observed (all VIFs < 2), and the Durbin-Watson statistic (1.68) indicated acceptable independence of residuals.

After adjustment for potential confounders, higher nomophobia scores were independently associated with female gender ($\beta = 0.130$, $p < 0.001$), hostel residence ($\beta = 0.183$, $p < 0.001$), use of tablets as the primary device ($\beta = 0.112$, $p = 0.002$), older age at first smartphone acquisition ($\beta = 0.217$, $p < 0.001$), longer daily smartphone use ($\beta = 0.189$, $p < 0.001$), and purposeless smartphone use patterns ($\beta = 0.153$, $p < 0.001$). In contrast, sleeping ≥ 8 hours per day was independently associated with lower nomophobia scores ($\beta = -0.104$, $p = 0.008$).

Additional independent correlates of nomophobia included phone recharging behaviour ($\beta = -0.119$, $p = 0.002$), separate internet data recharges ($\beta = -0.164$, $p < 0.001$), and smartphone checking immediately after waking ($\beta = -0.079$, $p = 0.045$). Among all predictors, age at first smartphone acquisition ($\beta = 0.217$), duration of smartphone use

($\beta = 0.189$), and hostel residence ($\beta = 0.183$) exhibited the strongest associations with nomophobia. Frequency of smartphone checking throughout the day was not independently associated with nomophobia after adjustment for other covariates ($p = 0.476$).

Nomophobia score = $45.31 + 5.59(\text{Gender}) + 9.87(\text{Stay}) - 4.23(\text{Sleep}) + 2.72(\text{Primarily used gadget}) + 11.23(\text{Age at first smartphone}) + 5.25(\text{Duration of smartphone use}) + 0.89(\text{Frequency of smartphone checking}) - 4.99(\text{Phone recharge frequency}) - 6.91(\text{Separate internet top-up}) - 5.12(\text{Checking smartphone after waking}) + 2.44(\text{Mode of smartphone use})$.

DISCUSSION

This study demonstrates a substantial burden of nomophobia among young adults, with a mean nomophobia score of 84.2 (SD 20.4), indicating moderate-to-high levels of fear and anxiety related to smartphone unavailability. The findings reinforce growing evidence that smartphone dependency has emerged as a major behavioural and psychological concern among adolescents and young adults globally. The predominance of moderate-to-severe nomophobia observed in the present study is consistent with reports from India, the Middle East, Europe, and other regions, where prevalence estimates have ranged from 60% to over 90% among university students and young adults depending on the measurement tools and cut-off values used.^[10–13]

A notable finding was that the highest scoring nomophobia domain was inability to communicate, followed by giving up convenience and losing connectedness. This pattern is consistent with the theoretical framework proposed during the development of the Nomophobia Questionnaire (NMP-Q), where communication-related concerns constitute the core psychological component of nomophobia.^[14] Contemporary smartphones serve not merely as communication tools but as primary gateways for maintaining social identity, interpersonal relationships, and emotional reassurance. Consequently, the prospect of losing the ability to contact others appears to provoke greater anxiety than losing access to information alone. Similar domain-specific findings have been reported among university populations in Turkey, Saudi Arabia, and India, where communication-related fears consistently emerged as the strongest contributor to nomophobic behaviour.^[14,15–17]

The observed gender differences, with females demonstrating significantly higher nomophobia scores than males, align with findings from several international studies.^[3,18–19] Women often report greater reliance on smartphones for social interaction, emotional support, and relationship maintenance, which may increase vulnerability to separation anxiety when access to mobile devices is

restricted. Furthermore, previous research has shown that females are more likely to engage in social networking activities and communication-oriented smartphone use, behaviours closely linked with nomophobia and problematic smartphone use.^[20] However, not all studies have demonstrated gender differences, suggesting that cultural, social, and contextual factors may moderate this relationship.^[17–21]

Hostel residence emerged as one of the strongest independent predictors of nomophobia. Students living away from home may rely more heavily on smartphones to maintain social support networks and family connections, increasing emotional dependence on digital communication platforms. Previous investigations among university students have similarly reported greater problematic smartphone use among those living in residential settings, where peer influence, reduced parental monitoring, and increased autonomy may encourage prolonged digital engagement.^[5,22] The association observed in this study suggests that residential educational environments may represent important settings for interventions targeting healthy digital behaviours.^[5,22]

Sleep duration demonstrated a significant inverse relationship with nomophobia. Participants sleeping less than eight hours per day had higher nomophobia scores, and adequate sleep remained independently protective in multivariable analysis. This finding is consistent with accumulating evidence linking excessive smartphone use and nomophobia with poor sleep quality, delayed sleep onset, sleep fragmentation, and reduced total sleep duration.^[23–25] Several biological and behavioural mechanisms may explain this relationship. Night-time smartphone use exposes individuals to blue-wavelength light that suppresses melatonin secretion, while emotional engagement with digital content may increase cognitive arousal and delay sleep initiation.^[26] Additionally, highly nomophobic individuals may experience anxiety-driven compulsive checking behaviours that disrupt sleep continuity.^[23–26]

Indicators of smartphone engagement showed particularly strong associations with nomophobia. Daily smartphone use exhibited a clear dose-response relationship, with scores increasing progressively across usage categories. Participants reporting more than 12 hours of daily smartphone use had the highest nomophobia scores, and duration of smartphone use remained among the strongest independent predictors in the adjusted model. Similar associations have been repeatedly documented across diverse populations, supporting the concept that prolonged smartphone exposure contributes to the development and maintenance of behavioural dependence.^[1,27–28] Excessive use may reinforce habitual checking patterns and psychological attachment through mechanisms involving intermittent reward reinforcement, social validation, and fear of missing out (FoMO).^[26–29]

Frequent smartphone checking, immediate phone use upon waking, frequent battery recharging, and separate internet data purchases were all associated with higher nomophobia scores in unadjusted analyses. These behaviours likely represent observable manifestations of smartphone dependency and compulsive digital engagement. Previous studies have identified frequent checking behaviour as a hallmark of problematic smartphone use, often driven by anticipatory anxiety and reward-seeking mechanisms. Although checking frequency lost statistical significance in the adjusted model, this attenuation may reflect shared variance with other measures of smartphone engagement, particularly daily duration of use and purposeless scrolling behaviour.^[30,31]

An interesting finding was the association between older age at first smartphone acquisition and higher nomophobia scores. This observation contrasts with some previous studies suggesting that earlier exposure to smartphones may increase the risk of digital dependence. One possible explanation is that participants who obtained smartphones later may have experienced a more abrupt integration into digitally connected lifestyles during adolescence or young adulthood, resulting in greater perceived dependence once access was established. Alternatively, this association may reflect cohort-specific behavioural patterns or contextual factors unique to the study population. Further longitudinal investigations are required to clarify the temporal relationship between age of smartphone acquisition and subsequent nomophobia.^[32]

Purpose of smartphone use emerged as a particularly important behavioural determinant. Participants reporting purposeless passive scrolling exhibited the highest nomophobia scores, whereas those using smartphones primarily for academic activities demonstrated the lowest levels. Passive consumption of digital content has been increasingly linked to psychological distress, reduced wellbeing, social comparison, and addictive patterns of use. Unlike goal-directed academic engagement, purposeless scrolling may promote habitual and repetitive smartphone interaction without providing meaningful cognitive or social benefits. The persistence of this association after adjustment suggests that the quality and intention of smartphone use may be as important as the quantity of use in understanding nomophobia.^[33,34]

The finding that tablet users reported higher nomophobia scores than smartphone users warrants consideration. Although relatively little literature has explored device-specific differences in nomophobia, tablet ownership may represent greater overall digital immersion and multi-platform connectivity. Individuals using multiple interconnected devices may develop stronger expectations of continuous online access, increasing anxiety when disconnected. Future research should examine how ecosystem-level digital engagement

contributes to nomophobia beyond smartphone use alone.

The multivariable model explained approximately 31% of the variance in nomophobia scores, indicating that behavioural and sociodemographic factors account for a substantial but incomplete proportion of the phenomenon. This finding highlights the multifactorial nature of nomophobia, which likely reflects the interaction of individual psychological traits, social influences, environmental contexts, and technology-related behaviours. Previous studies have identified additional determinants including anxiety, depression, loneliness, low self-esteem, FoMO, impulsivity, and social media addiction, variables not assessed in the present investigation but potentially relevant for future research.^[35–36]

CONCLUSION

We concluded that the findings suggest that nomophobia is highly prevalent and closely linked to patterns of intensive and purposeless smartphone engagement. Female gender, hostel residence, later smartphone acquisition, prolonged daily smartphone use, inadequate sleep, and passive scrolling behaviours emerged as key correlates. These findings contribute to the growing body of evidence indicating that nomophobia represents an important emerging behavioural health concern among young adults and warrants greater attention from educators, clinicians, and public health practitioners. From a public health perspective, the findings underscore the need for preventive strategies within educational institutions. Interventions promoting digital literacy, healthy smartphone habits, sleep hygiene, and mindful technology use may help reduce nomophobia among students. Screening for problematic smartphone use and nomophobia could be integrated into student wellbeing programmes, particularly among hostel residents and heavy smartphone users. Given the growing integration of digital technologies into education and daily life, interventions should focus not on eliminating smartphone use but on fostering balanced and purposeful engagement with technology.

Limitation

Several limitations should be acknowledged. The cross-sectional design precludes causal inference and limits the ability to determine temporal relationships between smartphone behaviours and nomophobia. Self-reported measures may be subject to recall and social desirability biases. The study population was predominantly composed of hostel-residing young adults, which may limit generalisability to other age groups and community populations. Furthermore, psychological variables such as anxiety, depression, FoMO, and social media addiction were not assessed and may have contributed to residual confounding. Nevertheless, the study benefits from a relatively large sample size

and comprehensive assessment of smartphone-use behaviours, providing valuable insights into determinants of nomophobia in a population increasingly exposed to digital technologies.

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