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Nomophobia and its association with musculoskeletal pain and disability in university students: A cross-sectional study

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ABSTRACT

Background: Nomophobia, defined as the fear of being without access to a mobile phone, is prevalent among young adults and may have physical and psychological consequences. However, its relationship with musculoskeletal pain and disability remains insufficiently explored.
Objective: This study aimed to determine the prevalence of nomophobia among university students and investigate its association with musculoskeletal pain and pain-related disability.
Methods: This cross-sectional study included 714 university students. Nomophobia was assessed using the Nomophobia Questionnaire. Musculoskeletal pain in the neck, upper back, and low back regions was evaluated using the Nordic Musculoskeletal Questionnaire. Disability was assessed using the Neck Disability Index and Oswestry Disability Index. Analyses included group comparisons, correlation analyses, and multivariate logistic regression.
Results: Nomophobia was highly prevalent, with 58.1% of participants showing moderate and 14.6% severe levels. Neck, upper back, and low back pain were reported by 62.6%, 59.4%, and 53.4% of participants, respectively. Higher nomophobia scores were associated with greater neck and upper back pain intensity and neck- and low back-related disability; however, no significant association was observed with low back pain intensity. After adjustment for sex, BMI, and daily smartphone use, higher nomophobia scores remained associated with higher odds of neck, upper back, and low back pain. Associations were modest.
Conclusion: Nomophobia was highly prevalent and remained associated with musculoskeletal pain and disability after adjustment, although the associations were modest. These findings highlight the importance of considering behavioral factors in the assessment of musculoskeletal complaints. Longitudinal studies are needed to clarify causal relationships.

1. Introduction

The rapid proliferation of smartphones over the past decade has profoundly transformed communication, education, and social interaction (León-Mejía et al., 2021). However, excessive smartphone use has also introduced new behavioral health concerns (León-Mejía et al., 2021). One of the most notable phenomena is nomophobia (No Mobile Phone Phobia), defined as the fear or anxiety of being unable to access or use one's mobile phone or its services (Notara et al., 2021).

Nomophobia should be distinguished from excessive smartphone use and smartphone addiction. Although these constructs may overlap, nomophobia specifically refers to fear or anxiety related to being unable to access a mobile phone, rather than the extent or problematic pattern of smartphone use itself (León-Mejía et al., 2021; Notara et al., 2021). Although nomophobia is not currently classified as a formal psychiatric disorder, it is increasingly recognized as a modern behavioral condition associated with various psychological and physical health outcomes (Sharma et al., 2019). Young adults, particularly university students, represent one of the most vulnerable populations due to their intensive reliance on smartphones for communication, academic activities, and social networking (Copaja-Corzo et al., 2022; Janatolmakan et al., 2024).

Previous studies have largely focused on the psychological aspects of nomophobia, reporting associations with anxiety, depression, stress,

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sleep disturbances, and impaired academic performance (Sharma et al., 2019; Vagka et al., 2023; Hussein et al., 2024). Systematic reviews indicate that nomophobia is highly prevalent among university students worldwide, with reported rates varying widely depending on the population and measurement methods used (León-Mejía et al., 2021; Notara et al., 2021; Al-Mamun et al., 2023).

In addition to these psychological effects, growing evidence suggests that excessive or problematic smartphone use is associated with musculoskeletal complaints, particularly in the neck, shoulders, and upper back regions (Mustafaoglu et al., 2021; Sirajudeen et al., 2022; Mokhtarinia et al., 2024; Nadar et al., 2025). Prolonged smartphone use may involve sustained neck flexion and other ergonomically unfavorable postures, potentially increasing mechanical loading on spinal structures (Hansraj, 2014; Sureshbabu et al., 2025).

However, existing musculoskeletal research has largely focused on smartphone use duration, excessive use, or smartphone addiction rather than nomophobia as a distinct construct. Consequently, the relationship between nomophobia severity and spinal musculoskeletal outcomes remains insufficiently understood, particularly for upper and low back pain and pain-related disability. Few studies have examined whether nomophobia is associated not only with the presence or intensity of pain but also with its functional consequences (Nadar et al., 2025). Evaluating disability alongside pain may therefore provide additional information regarding the functional impact of musculoskeletal symptoms.

Given that both nomophobia and musculoskeletal pain are highly prevalent among university students, investigating their potential relationship is clinically relevant (León-Mejía et al., 2021; Notara et al., 2021; Mustafaoglu et al., 2021). Therefore, the primary objective of the present study was to determine the prevalence of nomophobia among university students. The secondary objective was to examine the association of nomophobia with neck, upper back, and low back pain and pain-related disability. Given the cross-sectional design, the study was intended to examine associations only and cannot establish causal relationships between nomophobia and musculoskeletal outcomes.

2. Materials and methods

2.1. Study design and setting

This cross-sectional study was conducted between 15 September 2025 and 15 November 2025 among university students at Beykent University. The primary objective was to determine the prevalence of nomophobia among university students, while the secondary objective was to examine its association with neck, upper back, and low back pain and pain-related disability.

2.2. Participants

A total of 1349 undergraduate students were invited to participate in the study, including 279 students from the Faculty of Medicine and 1070 students from the Faculty of Health Sciences. Participants were recruited using convenience sampling through institutional announcements and online student communication platforms. Of the invited students, 714 completed and submitted the survey, corresponding to a response rate of 52.9%. All 714 responses were included in the final analysis. As all questionnaire items were mandatory, no incomplete responses or missing questionnaire data were present.

The inclusion criteria were being an active university student during the study period, being aged 18 years or older, and providing voluntary informed consent. The exclusion criteria were assessed through screening questions included at the beginning of the online survey. Participants were asked whether they had a previously diagnosed musculoskeletal disorder, neurological disease, or a history of trauma or surgery affecting the spine.

2.3. Data collection tools

Nomophobia was assessed using the Nomophobia Questionnaire (NMP-Q), developed by Yildirim and Correia. The instrument includes 20 items scored on a 7-point Likert scale, with higher scores indicating greater levels of nomophobia. It evaluates key aspects such as communication, connectivity, access to information, and convenience. NMP-Q total scores range from 20 to 140 and were categorized as no nomophobia (20 points), mild nomophobia (21–59 points), moderate nomophobia (60–99 points), and severe nomophobia (100–140 points). The Turkish version of the scale has demonstrated high reliability, with a Cronbach's alpha exceeding 0.90 (Yildirim and Correia, 2015; Yildirim et al., 2016).

Musculoskeletal symptoms were evaluated using the Nordic Musculoskeletal Questionnaire (NMQ), a standardized tool widely used in epidemiological research. The questionnaire assesses the presence of pain or discomfort across multiple body regions. In this study, analyses focused on the neck, upper back, and lower back. Participants were asked to report symptoms experienced within the past 12 months and the previous 7 days, as well as any related functional limitations or healthcare utilization (Dawson et al., 2009; Alaca et al., 2019).

Pain intensity was assessed using a 0–10 Visual Analog Scale (VAS) among participants who reported pain in the relevant anatomical region during the previous 7 days, with 0 indicating no pain and 10 indicating the worst imaginable pain. Participants were first asked about pain during the previous 12 months, followed by pain during the previous 7 days; those reporting pain during the previous 7 days were subsequently asked to rate its intensity using the VAS.

Functional disability related to spinal pain was evaluated using region-specific validated disability indices. Participants reporting neck pain during the previous 12 months completed the Neck Disability Index (NDI), which consists of 10 items scored from 0 to 5, resulting in a maximum raw score of 50 points, with higher scores indicating greater disability (Vernon and Mior, 1991). Participants reporting low back pain during the previous 12 months completed the Oswestry Disability Index (ODI, version 2.0), which also consists of 10 sections scored from 0 to 5, resulting in a maximum raw score of 50 points (Fairbank and Pynsent, 2000). Both the NDI and ODI have validated Turkish versions with demonstrated good reliability (Telci et al., 2009; Yakut et al., 2004). In the present study, raw NDI and ODI scores were converted to percentage scores (0–100%), with higher scores indicating greater disability. For analyses involving continuous disability scores, NDI and ODI percentage scores were analyzed as continuous variables.

In addition to these instruments, a structured questionnaire was used to obtain participants' sociodemographic and lifestyle information. The collected variables included age, sex, body mass index (BMI), faculty and academic year, dominant hand, smoking status, presence of chronic diseases, and regular physical activity. Furthermore, smartphone-related behavioral variables were recorded, including daily duration of smartphone use, purpose of use (education, social media, gaming, or communication), duration of continuous smartphone use without breaks, preferred posture during smartphone use (sitting, lying down, or standing), and ergonomic habits such as screen height, hand support, and break frequency.

2.4. Procedure

Data were collected using an online self-administered survey created through Google Forms. The survey link was distributed via institutional mailing lists and student communication groups. Participation was voluntary and anonymous. Before completing the questionnaire, participants were required to provide electronic informed consent. The approximate completion time of the survey was 8–10 min.

2.5. Ethical considerations

The study protocol was reviewed and approved by the Istanbul Beykent University Non-Interventional Clinical Research Ethics Committee (approval number 204486, approval date: 15 September 2025). The study adhered to the principles of the Declaration of Helsinki. Participation was voluntary, and electronic informed consent was obtained from all participants. All collected data were handled confidentially, and no personally identifiable information was recorded. The anonymity of the participants was strictly maintained throughout the study.

2.6. Sample size calculation

Sample size estimation was performed using G*Power software (version 3.1.9.7) for a two-tailed independent-samples *t*-test comparing participants with and without musculoskeletal pain. Assuming a small effect size (Cohen's $d = 0.20$), an alpha level of 0.05, a statistical power of 80% ($1-\beta = 0.80$), and an allocation ratio of 1:1, the required sample size was estimated as 394 participants per group (788 participants in total). This calculation was intended to provide a general a priori target sample size for detecting small between-group differences and was not designed as a regression-specific power analysis. Of the 1349 students invited to participate, 714 completed the survey and were included in the final analysis.

2.7. Statistical analysis

All analyses were carried out using SPSS software (version 25.0; IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarize the data and were reported as mean ± standard deviation, median (minimum–maximum), and percentages, as appropriate. The normality of continuous variables was assessed using the Kolmogorov–Smirnov test. Multicollinearity among variables included in the logistic regression models was assessed using tolerance and variance inflation factor (VIF) values, with no evidence of problematic multicollinearity (all tolerance values > 0.80 and all VIF values < 1.20).

Group comparisons were performed according to data distribution. Independent samples *t*-test or Mann–Whitney *U* test was used for comparisons between two groups, while one-way ANOVA or Kruskal–Wallis test was applied for comparisons involving more than two groups. When overall differences were significant, post hoc analyses with Bonferroni adjustment were conducted.

Categorical variables were analyzed using the Chi-square test or Fisher's exact test when appropriate. Relationships between continuous variables were examined using Spearman's rank correlation analysis because several variables included in the correlation analyses deviated from normality. Binary logistic regression analyses were performed to examine factors associated with the presence of musculoskeletal pain. Separate models were constructed for neck, upper back, and low back pain during the previous 12 months. In each model, the presence of pain was coded as 1 and the absence of pain as 0. NMP-Q total score, sex, BMI, and daily smartphone use duration were entered simultaneously as covariates. NMP-Q total score was included as the primary exposure variable, while sex, BMI, and daily smartphone use duration were included as clinically relevant covariates with potential associations with musculoskeletal pain and smartphone-related behaviors. The same set of covariates was entered into all three models to provide consistent adjustment across anatomical regions. Male sex was used as the reference category. Model fit was evaluated using the Hosmer–Lemeshow goodness-of-fit test. Nagelkerke R^2 and overall classification accuracy were also reported as measures of model performance. Results were presented as odds ratios (ORs) with 95% confidence intervals (CIs). A p value < 0.05 was considered statistically significant.

3. Results

A total of 714 participants were included in the study. The study population consisted of 501 (70.2%) female participants and 213 (29.8%) male participants. The mean age of the participants was 21.38 ± 3.14 years. The mean body mass index (BMI) was 22.83 ± 3.96 kg/m^2, and the average daily smartphone use was 5.35 ± 2.39 h. The mean nomophobia score was 74.25 ± 23.88. Regarding pain intensity, the mean Visual Analog Scale (VAS) scores were 4.28 ± 2.12 for the neck, 4.48 ± 2.34 for the upper back, and 4.65 ± 2.44 for the low back. The mean NDI and ODI percentage scores were 23.00 ± 11.77 and 13.41 ± 12.97, respectively. Nomophobia levels were classified as mild in 27.3% of participants, moderate in 58.1%, and severe in 14.6% (Table 1).

3.1. Prevalence of musculoskeletal pain

Neck pain was reported by 62.6% of participants within the past 12 months and by 41.0% within the last 7 days. Upper back pain was reported by 59.4% in the past 12 months and 40.1% in the last 7 days. Low back pain was reported by 53.4% in the past 12 months and 33.8% in the last 7 days. Pain-related limitations in daily activities were reported by 61.1% of participants with neck pain, 44.6% of those with upper back pain, and 52.5% of those with low back pain (Table 2).

3.2. Association between nomophobia and musculoskeletal pain

A significant association was observed between nomophobia level and musculoskeletal pain across all regions. For neck pain, higher nomophobia levels were significantly associated with increased prevalence of pain in the past 12 months ($p < 0.001$), pain in the last 7 days ($p < 0.001$), and pain-related limitations in daily activities ($p < 0.001$).

Table 1
Demographic, clinical, and smartphone use characteristics of the study population.

Variable	n (%)/Mean ± SD	Median (Min–Max)
Sex		
Female	501 (70.2)	
Male	213 (29.8)	
Nomophobia level		
No nomophobia	0 (0)	
Mild	195 (27.3)	
Moderate	415 (58.1)	
Severe	104 (14.6)	
Neck disability (NDI)		
Minimal	212 (47.4)	
Moderate	200 (44.7)	
Severe	35 (7.8)	
Low back disability (ODI)		
Minimal	293 (76.9)	
Moderate	68 (17.8)	
Severe	20 (5.2)	
Continuous variables		
BMI (kg/m^2)	22.83 ± 3.96	22.31 (15.43–43.84)
Daily smartphone use (hours)	5.35 ± 2.39	5.00 (0.50–13.00)
Nomophobia score	74.25 ± 23.88	74.00 (20–140)
Neck pain (VAS) (n = 293)	4.28 ± 2.12	4.00 (0–10)
Upper back pain (VAS) (n = 286)	4.48 ± 2.34	4.00 (0–10)
Low back pain (VAS) (n = 241)	4.65 ± 2.44	5.00 (0–10)
NDI score (%) (n = 447)	23.00 ± 11.77	22.50 (0–60)
ODI score (%) (n = 381)	13.41 ± 12.97	8.89 (0–57.78)

Values are presented as mean ± SD, median (minimum–maximum), or n (%), as appropriate. VAS scores were calculated only for participants reporting pain in the corresponding anatomical region during the previous 7 days. NDI and ODI are reported as percentage scores and were completed by participants reporting neck and low back pain, respectively. NMP-Q severity categories were defined as absence (≤20), mild (21–59), moderate (60–99), and severe (≥100). VAS, Visual Analog Scale; NDI, Neck Disability Index; ODI, Oswestry Disability Index; NMP-Q, Nomophobia Questionnaire.

Table 2
Prevalence of neck, upper back, and low back pain in the study population.

Region	Pain in past 12 months n (%) (n = 714)	Pain in last 7 days n (%) (n = 714)	Impact on daily activities n/N (%)
Neck	447 (62.6)	293 (41.0)	273/447 (61.1)
Upper back	424 (59.4)	286 (40.1)	189/424 (44.6)
Low back	381 (53.4)	241 (33.8)	200/381 (52.5)

Similarly, significant associations were found between nomophobia level and upper back pain in the past 12 months ($p = 0.006$), in the last 7 days ($p < 0.001$), and its impact on daily activities ($p = 0.001$). For low back pain, nomophobia level was significantly associated with pain in the past 12 months ($p = 0.001$) and in the last 7 days ($p = 0.020$), whereas the association with pain-related limitations in daily activities did not reach statistical significance ($p = 0.077$). In addition, nomophobia levels were significantly higher in female participants compared to males ($p = 0.013$) (Table 3).

3.3. Comparison of continuous variables across nomophobia levels

There were no significant differences in age or BMI across nomophobia groups ($p > 0.05$). However, significant differences were observed in daily smartphone use, pain intensity, and disability scores. Participants with severe nomophobia reported significantly longer daily smartphone use compared to both mild and moderate groups ($p < 0.001$). Neck pain (VAS) and upper back pain (VAS) were significantly higher in the moderate and severe nomophobia groups compared to the mild group ($p < 0.001$ and $p = 0.001$, respectively). No significant differences were observed in low back pain intensity across groups ($p = 0.316$). NDI and ODI scores were significantly higher in participants with moderate and severe nomophobia compared to those with mild nomophobia ($p < 0.001$ for both) (Table 4).

3.4. Regression analyses

In unadjusted analyses, female participants had a higher 12-month prevalence of neck pain (68.7% vs. 48.4%), upper back pain (64.9% vs. 46.5%), and low back pain (58.3% vs. 41.8%) than male participants (all $p < 0.001$).

3.4.1. Neck pain

Binary logistic regression analysis showed that the model was statistically significant ($\chi^2(4) = 66.495$, $p < 0.001$) and demonstrated good fit (Hosmer–Lemeshow test, $p = 0.850$). Higher NMP-Q scores were associated with higher odds of neck pain (OR = 1.014, 95% CI: 1.006–1.021, $p < 0.001$). Female sex was associated with higher odds of neck pain (OR = 2.421, 95% CI: 1.669–3.509, $p < 0.001$), as was longer daily smartphone use (OR = 1.181, 95% CI: 1.095–1.273, $p < 0.001$). BMI was not significantly associated with neck pain (OR = 1.017, 95% CI: 0.974–1.062, $p = 0.448$). The model had a Nagelkerke R^2 of 0.123 and an overall classification accuracy of 65.3% (Table 5).

3.4.2. Upper back pain

For upper back pain, the regression model was statistically significant ($\chi^2(4) = 31.305$, $p < 0.001$) and demonstrated acceptable goodness of fit (Hosmer–Lemeshow test, $p = 0.225$). Higher NMP-Q scores were associated with higher odds of upper back pain (OR = 1.008, 95% CI: 1.001–1.015, $p = 0.018$). Female sex (OR = 2.058, 95% CI: 1.437–2.948, $p < 0.001$) and longer daily smartphone use (OR = 1.082, 95% CI: 1.010–1.159, $p = 0.026$) were also associated with higher odds of upper back pain, whereas BMI was not significantly associated (OR = 1.018, 95% CI: 0.977–1.061, $p = 0.386$). The model had a Nagelkerke R^2 of 0.059 and an overall classification accuracy of 61.9% (Table 5).

Table 3
Association between nomophobia levels and musculoskeletal pain and disability.

Variable	Mild n (%)	Moderate n (%)	Severe n (%)	p value	Cramér's V
Sex (female)	121 (62.1)	302 (72.8)	78 (75.0)	0.013	0.110
Neck pain (12 months)	100 (51.3)	268 (64.6)	79 (76.0)	<0.001	0.164
Neck pain (last 7 days)	55 (28.2)	184 (44.3)	54 (51.9)	<0.001	0.168
Neck pain affecting daily activities	41 (41.0)	172 (64.2)	60 (75.9)	<0.001	0.238
Upper back pain (12 months)	97 (49.7)	261 (62.9)	66 (63.5)	0.006	0.120
Upper back pain (last 7 days)	53 (27.2)	186 (44.8)	47 (45.2)	<0.001	0.161
Upper back pain affecting daily activities	28 (28.9)	125 (47.9)	36 (54.5)	0.001	0.178
Low back pain (12 months)	82 (42.1)	237 (57.1)	62 (59.6)	0.001	0.140
Low back pain (last 7 days)	51 (26.2)	156 (37.6)	34 (32.7)	0.020	0.105
Low back pain affecting daily activities	34 (41.5)	131 (55.3)	35 (56.5)	0.077	0.116
Neck disability (NDI) (%) (n = 447)				0.002	0.138
Minimal	64 (64.0)	119 (44.4)	29 (36.7)		
Moderate	33 (33.0)	124 (46.3)	43 (54.4)		
Severe	3 (3.0)	25 (9.3)	7 (8.9)		
Low back disability (ODI) (%) (n = 381)				0.053	0.111
Minimal	71 (86.6)	178 (75.1)	44 (71.0)		
Moderate	11 (13.4)	45 (19.0)	12 (19.4)		
Severe	0 (0.0)	14 (5.9)	6 (9.7)		

Values are presented as n (%). Comparisons across nomophobia severity groups were performed using the Chi-square test or Fisher's exact test, as appropriate. Cramér's V is reported as a measure of effect size for categorical comparisons. NMP-Q severity categories were defined as mild (21–59), moderate (60–99), and severe (100–140). NDI and ODI disability categories were defined as minimal (0–20%), moderate (21–40%), and severe (>40%). NDI categories were calculated among participants reporting neck pain during the previous 12 months (n = 447; mild nomophobia: n = 100, moderate: n = 268, severe: n = 79), and ODI categories among participants reporting low back pain during the previous 12 months (n = 381; mild nomophobia: n = 82, moderate: n = 237, severe: n = 62).

(Table 5).

3.4.3. Low back pain

The regression model for low back pain was statistically significant ($\chi^2(4) = 40.746$, $p < 0.001$); however, the Hosmer–Lemeshow test indicated suboptimal model fit ($p = 0.004$). Higher NMP-Q scores were associated with higher odds of low back pain (OR = 1.007, 95% CI: 1.001–1.014, $p = 0.032$). Female sex (OR = 2.206, 95% CI: 1.532–3.176, $p < 0.001$), higher BMI (OR = 1.044, 95% CI: 1.001–1.088, $p = 0.042$), and longer daily smartphone use (OR = 1.128, 95% CI: 1.053–1.209, $p = 0.001$) were also associated with higher odds of low back pain. The model had a Nagelkerke R^2 of 0.075 and an overall classification accuracy of 60.6%. Given the suboptimal goodness of fit, the findings of the low back pain model should be considered exploratory and interpreted with caution (Table 5).

Table 4
Comparison of pain intensity, disability scores, and smartphone use across nomophobia levels.

Variable	Mild	Moderate	Severe	p value	Post-hoc
Age	21.72 ± 3.39	21.19 ± 3.05	21.51 ± 2.95	0.131	—
BMI	23.14 ± 4.15	22.59 ± 3.92	23.21 ± 3.71	0.167	—
Daily smartphone use	4.85 ± 2.36	5.33 ± 2.22	6.38 ± 2.77	<0.001	Severe > Moderate, Mild
Neck pain (VAS)	3.44 ± 2.00	4.45 ± 2.06	4.77 ± 2.20	<0.001	Moderate, Severe > Mild
Upper back pain (VAS)	3.82 ± 2.07	4.54 ± 2.35	5.20 ± 2.51	0.001	Moderate, Severe > Mild
Low back pain (VAS)	4.29 ± 2.26	4.74 ± 2.47	4.79 ± 2.54	0.316	—
NDI score (%)	18.03 ± 10.24	23.89 ± 12.00	26.30 ± 10.98	<0.001	Moderate, Severe > Mild
ODI score (%)	8.37 ± 9.81	14.55 ± 13.09	15.70 ± 14.62	<0.001	Moderate, Severe > Mild

Between-group comparisons were performed using Kruskal–Wallis test. When the overall test was significant, pairwise comparisons were performed with Bonferroni adjustment. VAS analyses included participants reporting pain during the previous 7 days in the corresponding region (neck: n = 293; upper back: n = 286; low back: n = 241). NDI and ODI analyses included participants reporting neck pain (n = 447) and low back pain (n = 381), respectively, during the previous 12 months.

Table 5
Binary logistic regression analyses for the presence of musculoskeletal pain during the previous 12 months.

Variable	Neck pain OR (95% CI), p value	Upper back pain OR (95% CI), p value	Low back pain OR (95% CI), p value
NMP-Q total score	1.014 (1.006–1.021), <0.001	1.008 (1.001–1.015), 0.018	1.007 (1.001–1.014), 0.032
Female sex	2.421 (1.669–3.509), <0.001	2.058 (1.437–2.948), <0.001	2.206 (1.532–3.176), <0.001
BMI	1.017 (0.974–1.062), 0.448	1.018 (0.977–1.061), 0.386	1.044 (1.001–1.088), 0.042
Daily smartphone use	1.181 (1.095–1.273), <0.001	1.082 (1.010–1.159), 0.026	1.128 (1.053–1.209), 0.001
Nagelkerke R^2	0.123	0.059	0.075
Hosmer–Lemeshow p	0.850	0.225	0.004
Classification accuracy	65.3%	61.9%	60.6%

Dependent variables were coded as 0 = no pain and 1 = pain during the previous 12 months. Male sex was the reference category. All covariates were entered simultaneously into each model. OR, odds ratio; CI, confidence interval; BMI, body mass index; NMP-Q, Nomophobia Questionnaire.

3.5. Correlation analyses

Correlation analysis demonstrated that nomophobia scores were positively correlated with daily smartphone use ($\rho = 0.195$, $p < 0.001$), neck pain intensity ($\rho = 0.225$, $p < 0.001$), upper back pain intensity ($\rho = 0.169$, $p < 0.001$), Neck Disability Index scores ($\rho = 0.244$, $p < 0.001$), and Oswestry Disability Index scores ($\rho = 0.177$, $p = 0.001$). No significant correlation was found between nomophobia and low back pain intensity ($\rho = 0.085$, $p = 0.098$). Overall, the correlations were weak in magnitude.

4. Discussion

The present study demonstrated that nomophobia is highly prevalent among university students, with the majority of participants exhibiting moderate levels. Additionally, musculoskeletal pain, particularly in the neck, upper back, and low back regions, was commonly reported.

Importantly, higher nomophobia scores were associated with greater neck and upper back pain intensity, although these correlations were weak. In contrast, no significant association was observed between nomophobia and low back pain intensity. Higher nomophobia scores were also associated with greater neck- and low back-related disability. After adjustment for sex, BMI, and daily smartphone use duration, higher nomophobia scores remained associated with higher odds of neck, upper back, and low back pain. These findings suggest an association between nomophobia and musculoskeletal health; however, the modest magnitude of the observed associations should be considered when interpreting their clinical relevance.

The high prevalence of nomophobia observed in this study is consistent with previous literature. A recent meta-analysis including over 36,000 participants reported that approximately 51% of individuals exhibit moderate and 21% severe nomophobia (Al-Mamun et al., 2025). Similarly, a cross-sectional study conducted among medical students reported that 58.6% of participants had moderate levels of nomophobia, closely aligning with the findings of the present study (Hussein et al., 2024). In addition, a systematic review by Notara et al. reported a remarkably wide prevalence range of nomophobia (15.2%–99.7%), emphasizing its growing importance as a public health concern (Notara et al., 2021). Likewise, another systematic review demonstrated substantial variability in prevalence rates across studies, with moderate nomophobia being the most common category (León-Mejía et al., 2021). Furthermore, recent cross-sectional studies among university students have also reported high prevalence rates, with approximately 80% of students experiencing some level of nomophobia, supporting the notion that this phenomenon is highly prevalent in young populations (Janatolmakan et al., 2024).

Notably, several studies have indicated that nomophobia tends to be more prevalent among females compared to males (León-Mejía et al., 2021). This is further supported by cross-sectional findings showing higher nomophobia levels among women in university populations (Vagka et al., 2023). In line with these findings, our results also demonstrated that female participants exhibited higher levels of nomophobia, suggesting that gender-related behavioral and psychosocial factors may contribute to increased vulnerability to nomophobia and its associated outcomes. These consistent findings across different populations indicate that nomophobia is a widespread phenomenon, particularly among young adults and university students.

Female sex was associated with higher odds of neck, upper back, and low back pain in the adjusted analyses. This finding is consistent with previous studies reporting a higher prevalence of musculoskeletal pain among women. Nevertheless, sex-related differences in musculoskeletal pain are likely multifactorial and may reflect biological, behavioral, psychosocial, and other unmeasured factors.

One of the most important findings of the present study is the significant association between nomophobia and musculoskeletal pain, particularly in the spinal regions. This finding is consistent with previous literature indicating that problematic smartphone use is closely related to increased neck and low back pain. Previous studies have shown that smartphone addiction is significantly associated with musculoskeletal pain, especially in the neck and upper back regions, which are the most commonly affected areas among smartphone users (Mustafaoglu et al., 2021). Similarly, high prevalence rates of neck and shoulder pain have been reported in individuals with excessive smartphone use, largely attributed to sustained flexed neck posture during device use (Sirajudeen et al., 2022). In addition, recent studies have demonstrated that smartphone addiction is significantly associated with low back

pain, suggesting that prolonged use may affect not only the cervical but also the lumbar region (Ali Abdullah AlAidarous et al., 2024). Furthermore, a positive relationship has been reported between smartphone addiction and neck disability, indicating that pain is often accompanied by functional limitations (Rafiyan et al., 2025).

The findings of the present study are in line with this evidence. Higher nomophobia levels were associated with greater neck and upper back pain intensity and with greater neck- and low back-related disability. However, the absence of a significant association with low back pain intensity indicates that these relationships may differ across anatomical regions.

Several mechanisms may explain the observed relationship between nomophobia and musculoskeletal pain, particularly in the spinal regions. Individuals with higher levels of nomophobia tend to use smartphones for prolonged periods, often adopting static and ergonomically unfavorable postures. Forward head posture ("text neck") is one of the most common patterns and has been shown to increase mechanical load on the cervical spine, leading to pain and structural stress (Sureshbabu et al., 2025).

Sustained smartphone use has also been associated with alterations in cervical neuromuscular control, including impaired activation and reduced endurance of the deep cervical flexor muscles, which play a critical role in maintaining spinal stability (D'Souza and Valechha, 2024). In addition, reduced muscle endurance and changes in postural alignment have been observed in individuals with higher levels of smartphone addiction (Torkamani et al., 2023). Prolonged and repetitive smartphone use may further contribute to alterations in spinal kinematics and load distribution across the cervical, thoracic, and lumbar regions. Increased flexion angles and changes in spinal alignment have been shown to disrupt normal biomechanical balance, contributing to musculoskeletal discomfort and pain (Metin et al., 2023). Emerging evidence also suggests that excessive smartphone use may affect cervical proprioception and joint position sense, potentially impairing motor control and increasing susceptibility to pain and dysfunction (Pashine et al., 2023). Taken together, these findings indicate that the relationship between nomophobia and musculoskeletal pain is multifactorial, involving a combination of biomechanical, neuromuscular, and behavioral mechanisms.

The findings of this study may have preliminary clinical implications. Our findings suggest that nomophobia may be considered as one of several behavioral factors associated with spinal musculoskeletal pain among university students. Previous studies have similarly reported associations between smartphone addiction and both neck pain and disability, supporting the potential clinical relevance of smartphone-related behaviors (Rafiyan et al., 2025). Clinical assessment may therefore include consideration of smartphone-related behaviors, together with ergonomic education and appropriate behavioral counseling when relevant. Recent evidence suggests that smartphone addiction is associated with multi-site musculoskeletal pain and increased disability, supporting the need for a more comprehensive, biopsychosocial approach (Is et al., 2025). However, the observed associations were modest, with weak correlations, suggesting that nomophobia represents only one of several factors associated with musculoskeletal pain and disability and supporting a multifactorial interpretation of these outcomes.

This study has several strengths. The relatively large sample size enhances the statistical power and reliability of the findings. In addition, the simultaneous evaluation of musculoskeletal pain and disability provides a more comprehensive understanding of the clinical impact of nomophobia. The use of validated assessment tools, including the NMP-Q, NDI, and ODI, further strengthens the methodological rigor of the study. Moreover, the inclusion of multiple anatomical regions allows for a broader evaluation of musculoskeletal involvement. Finally, the use of adjusted regression analyses allowed the associations between nomophobia and musculoskeletal pain to be examined while accounting for selected covariates. An additional strength is the specific focus on nomophobia as a distinct behavioral construct, rather than examining smartphone use duration or smartphone addiction alone, thereby addressing a relatively understudied aspect of smartphone-related musculoskeletal health.

Several limitations should be considered when interpreting the findings of this study. The cross-sectional design limits the ability to establish causal relationships, and it remains unclear whether nomophobia leads to musculoskeletal pain or whether existing pain contributes to increased smartphone dependence. The achieved sample size ($n = 714$) was lower than the a priori target of 788 participants, which may have reduced the statistical power to detect small effects. Participants were recruited from a single institution using convenience sampling, which may have introduced selection bias and limits the generalizability of the findings to the wider university student population. In addition, the response rate of 52.9% may have introduced non-response bias. The predominantly female composition of the sample should also be considered when interpreting sex-related findings. Nomophobia, musculoskeletal pain, disability, and smartphone-related behaviors were assessed using a single online self-report survey, which may have increased the possibility of common-method bias as well as recall and reporting bias. Furthermore, potentially relevant confounding factors, including physical activity levels, psychological stress and mental health, sleep quality, academic workload, and ergonomic conditions, were not fully controlled. In addition, the regression model for low back pain demonstrated suboptimal goodness-of-fit, suggesting that the model may not fully capture the underlying relationships. Therefore, findings from this model should be considered exploratory and interpreted with particular caution. Finally, the observed correlations were weak, indicating that the clinical magnitude of the associations is limited and supporting a multifactorial interpretation of musculoskeletal pain and disability.

5. Conclusion

In conclusion, nomophobia was highly prevalent in this university student sample and was significantly associated with musculoskeletal pain and disability, particularly in the cervical region. However, the observed associations were modest in magnitude, and causality cannot be established due to the cross-sectional design. These findings underscore the need for longitudinal studies to clarify the directionality of these relationships and to further investigate the role of behavioral and physical factors in musculoskeletal health.

6. Clinical relevance

Nomophobia was associated with musculoskeletal pain in this university student sample, although the observed associations were modest. Smartphone-related behavioral factors may therefore be considered as part of a broader clinical assessment of musculoskeletal complaints. Whether ergonomic or behavioral interventions targeting these factors can reduce musculoskeletal complaints requires evaluation in prospective and intervention studies. These findings support a multifactorial, biopsychosocial perspective rather than a causal interpretation.

CRediT authorship contribution statement

Tuğba Şahbaz: Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Conceptualization. **Yasemin Şahbaz:** Writing – review & editing, Writing – original draft, Methodology, Investigation. **Hatice Kübra Aşık:** Investigation, Data curation. **Murat Uludağ:** Validation, Supervision. **Nergiz Batur:** Investigation, Data curation.

Ethics declaration

This study was performed in compliance with relevant laws,

regulatory frameworks and guidelines where the research took place. This study was conducted in accordance with Declaration of Helsinki. This study was approved by the Istanbul Beykent University Non-Interventional Clinical Research Ethics Committee. (Approval No. 2025/7-204486)

Patient consent

The study protocol was approved by a local institutional ethics committee (approval number: 204486, approval date: 15 September 2025). The study was conducted in accordance with the Declaration of Helsinki. All participants provided electronic informed consent prior to participation. Participation was voluntary and anonymous, and no personally identifiable information was collected.

Language editing statement

The manuscript was carefully reviewed and edited for English language, grammar, clarity, and readability with the assistance of AI-based language tools (ChatGPT by OpenAI). These tools were used solely for language editing and refinement and not for generating or interpreting the study data. All revisions were critically reviewed and approved by the authors, who take full responsibility for the final content of the manuscript.

Declaration of generative AI and AI-assisted technologies in the manuscript preparation process

During the preparation of this manuscript, ChatGPT (OpenAI) was used solely to improve language clarity and readability. The authors critically reviewed and edited the content and take full responsibility for the final manuscript. No generative AI tools were used for data analysis, interpretation, or the creation of figures or images.

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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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