



When connection becomes distress: Psychosocial profiles of digital behavior and mental health among Spanish university students

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ABSTRACT

The pervasive integration of smartphones and social media into daily life has transformed digital behavior into a central component of psychosocial functioning among young adults. In Spain, nearly half of university students report problematic smartphone use, and over 30% spend more than 5 h per day on their devices during weekdays. This study aimed to identify distinct psychosocial profiles based on digital behavior and mental health indicators in a sample of 416 Spanish university students (71.9% female; $M_{age} = 21.9$, $SD = 4.93$). A cluster analysis was conducted on standardized scores for digital addiction symptoms, nomophobia, recreational digital engagement, attachment-related anxiety, depression, loneliness, self-esteem, psychological well-being, and sleep health. Cluster 1 ($n = 159$) exhibited high scores for addiction symptoms, nomophobia, attachment-related anxiety, depression, loneliness and poor sleep quality, and lower scores for sleep quantity; Cluster 2 ($n = 128$) showed the lowest scores across digital addiction symptoms, nomophobia, and psychological symptoms and Cluster 3 ($n = 129$) demonstrated lowest scores in poor sleep quality, moderate digital engagement, attachment-related anxiety, depression and loneliness but significantly better self-esteem and sleep quantity. ANOVA and Tukey's post-hoc tests confirmed significant differences across clusters ($p < .001$) for all variables. These findings highlight the multidimensional nature of digital addiction and its cumulative associations with psychological and sleep-related outcomes. The identification of differentiated profiles supports the development of tailored interventions ranging from cognitive-behavioral therapy for high-risk groups to preventive psychoeducation for low-risk users. This study contributes to a nuanced understanding of digital behavior and its psychological correlates in university populations.

1. Introduction

Manfred E. Clynes and Nathan S. Kline published an article in 1960 in which they proposed the term *cyborg* to describe a human being modified with technological components to adapt to their environment. Although today Clynes and Kline's (1960) idea may still seem somewhat futuristic, the reality is that without any genetic modification, we have incorporated the mobile phone as an extension of our own hands. The first thing we do upon waking up is checking our phone, and it is the last thing we do before going to sleep—in the bathroom, in waiting rooms, at conferences, in meetings ... The mobile phone has become an alternative to boredom, but its excessive use and abuse are causing harm to our psychological health, especially to young adults.

Multiple studies (v.gr. Belic et al., 2025; Mason et al., 2022; Zhito-mirsky-Geffet & Blau, 2016) consistently showed that Generation Z exhibited the highest rates of smartphone and social media addiction. Gen Z's daily screen time, compulsive app downloading, and social media use were significantly higher than those of previous generations (Lozano-Blasco et al., 2022), making them more vulnerable to digital addiction and its negative consequences, such as poor sleep quality, lower self-esteem, anxiety, loneliness, and depression, especially in adolescents and young adults (Khan et al., 2023; Nikolić et al., 2023; Wang et al., 2025a).

In Spain, recent studies have revealed a worrying prevalence of problematic mobile phone use among young adults and university students. Nearly half of Spanish university students (49.3 %) reported

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problematic smartphone use, and about 30 % spent more than 5 h per day on their phones during weekdays (Red Española de Universidades Promotoras de Salud, 2023). Similarly, in a national study of adolescents and young adults, 52 % of females and 44 % of males acknowledged experiencing frequent or occasional problems related to mobile phone use (Olivella-Cirici et al., 2023). In another survey of 1216 Spanish university students aged 18–24 years, problematic smartphone use was significantly associated with higher anxiety and depression levels, particularly among female students (Zahinos-Gordillo, 2024).

Although previous studies have examined anxiety, depression, and digital media use among young Spanish adults, most have approached these constructs independently, limiting the ability to understand how these dimensions interact within individuals. Despite growing evidence linking problematic digital engagement to emotional distress, research in Spain has seldom adopted a person-centered perspective capable of identifying integrated psychosocial configurations. Consequently, few studies have sought to capture the coexistence of behavioral, emotional, and health-related factors within unified profiles. A profile-based approach is particularly relevant for heterogeneous phenomena such as problematic social media and smartphone use, where these dimensions may cluster differently across individuals. Addressing this gap provides a strong rationale for employing cluster analysis to uncover distinct psychosocial profiles among university students and to offer a more holistic understanding of digital behavior and its psychological correlates.

1.1. Digital addiction (DA) and nomophobia

The term Digital Addiction (DA) is employed here as an umbrella, non-clinical construct referring to problematic or addictive-like patterns of digital engagement. It does not denote a formal psychiatric diagnosis, as neither DSM-5-TR nor ICD-11 include digital addiction, smartphone addiction, or social media addiction as recognized disorders (except for gaming disorder). Consistent with the I-PACE model and with current behavioral addiction research, we conceptualize problematic digital use as a spectrum of behaviors that may involve compulsive tendencies, loss of control, or functional impairment, but should not be equated with chronic substance-based addictions. Accordingly, all references to digital addiction in this study are descriptive and theoretical rather than diagnostic. In line with this, the construct measured in this study reflects the specific dimensions assessed by the AR-SNIS—namely addiction symptoms and nomophobia—rather than a generalized form of digital addiction across devices or platforms.

In the present study, DA specifically refers to maladaptive patterns of social-network and Internet use—those captured by the AR-SNIS addiction symptoms subscale—together with nomophobia as an indicator of smartphone-related anxiety. These patterns have been associated with increased loneliness, anxiety, depression, and physical or behavioral consequences, such as disrupted routines or poor posture (Erzincanli & Geçikli, 2024). Among university students and young adults, previous studies have shown that individuals who engage more intensely with smartphones and social media tend to report higher levels of loneliness (“phoneliness”), anxiety, and depressive symptoms (Peper & Harvey, 2018).

Nomophobia, short for “No Mobile Phobia,” is defined as the fear or anxiety of being without a mobile phone or internet connection, characterized by feelings of discomfort or distress when individuals are unable to access their smartphones or mobile networks (Constantinidou et al., 2025; Sui & Sui, 2021). The widespread use of smartphones and social media platforms has led to increased rates of nomophobia, particularly among young adults and university students (Tung et al., 2025). Studies have shown that problematic social media and smartphone use are positively related to nomophobia, which in turn mediates the relationship between these behaviors and psychological distress, including anxiety and depression symptoms (Daraj et al., 2023; Santi et al., 2022), as well as sleep disorders (Ahmed et al., 2025).

1.2. Digital addiction (DA), anxiety, depression and loneliness

Multiple studies have found a positive correlation between digital addiction and symptoms of depression and anxiety (Peper & Harvey, 2018; Stanković & Nešić, 2022; Zhang et al., 2025). Moreover, the relationship between digital addiction and mental health issues can be bidirectional: DA has been associated with higher anxiety and depression symptoms, and vice versa (Gu, Zhan & Huang, 2024). This bidirectional nature suggests that individuals with preexisting mental health issues may be more prone to developing DA. DA and excessive exposure to online content can significantly amplify anxiety and depression symptoms through social comparison, need for approval, information overload, isolation, and low self-worth. For example, online risk exposure can lead to negative attribution styles in which individuals interpret information pessimistically and exacerbate anxiety (Wang et al., 2025b). In the same way, constant connectivity can lead to FoMO (Fear of Missing Out), increasing anxiety as individuals feel they are missing out on experiences others are having (Martinac Dorčić et al., 2024). Problematic digital engagement may also reduce offline social interactions, leading to feelings of loneliness, perceived isolation, and depressive symptoms (Stanković & Nešić, 2022). When online connections do not translate into offline social capital, they can result in DA and higher depression levels (Zubair et al., 2023).

It is important to note that, although literature frequently refers to broader forms of digital addiction, the present study operationalizes these constructs strictly through the addiction symptoms and nomophobia dimensions of the AR-SNIS.

1.3. DA, self-esteem and online validation

Research has consistently shown that social media plays a dual role in influencing self-esteem, both reinforcing and undermining it through feedback mechanisms and social comparison. Positive feedback, such as likes and supportive comments, serves as social reinforcement that boosts users' sense of worth and happiness (Marengo et al., 2021). This effect is especially strong among adolescents who experience temporary increases in self-esteem after receiving validation online (Chen, 2025). Similarly, social support derived from meaningful interactions on platforms such as WeChat and Instagram can foster a sense of belonging, reduce loneliness, and enhance perceived self-worth (Han & Yang, 2023). Conversely, social media can undermine self-esteem through upward social comparison. Such comparisons often result in diminished self-image, particularly among individuals who already have fragile self-esteem (Pikó et al., 2024). Additionally, FoMO has also been linked to compulsive digital addiction, social media use, and reduced self-esteem, as individuals feel inadequate or excluded from others' seemingly fulfilling experiences (Servidio et al., 2024). According to previous studies, several factors can moderate these effects. Perceived authenticity in online interactions can buffer against negative feedback (Chen, 2025), whereas relational closeness strengthens the positive effects of social support and mitigates harmful comparisons (Han & Yang, 2023). While online interactions can reinforce self-esteem through validation and connection, they can erode it equally through comparison and rejection. This dual nature reflects a complex psychological dynamic shaped by individual traits, patterns of use, and social environments that are constructed online.

1.4. DA and sleep health

Exposure to digital screens, notification overload, and nighttime device use have been consistently linked to circadian rhythm disruption and impaired sleep quality. Blue light, particularly at high color temperatures, suppresses melatonin secretion more effectively than at lower color temperatures, delaying the onset of sleep and shortening total sleep duration (Randjelović et al., 2023). Artificial light at night, especially from electronic screens, induces circadian misalignment by

delaying the internal biological clock relative to the environmental cues. This misalignment contributes not only to poor sleep quality, but also to broader health consequences, such as metabolic and cognitive dysfunction. The continuous exposure to illuminated devices at night creates a state of physiological arousal that conflicts with the natural decline in alertness necessary for sleep initiation and maintenance (Lateef et al., 2023). The psychological stimulation associated with notification overload further exacerbates these disturbances. Frequent alerts and messages prompt heightened cognitive engagement and anxiety levels, delaying sleep onset, and fragmenting rest (Hale et al., 2025). Repeated interruptions also reduce overall sleep efficiency and increase daytime fatigue, creating a feedback loop in which sleep deprivation intensifies a user's sensitivity to device-related stress (Biswas et al., 2025).

Empirical evidence has consistently demonstrated that poor sleep quality is closely associated with elevated anxiety and depression and diminished overall well-being (Benítez & Gunstad, 2012). Individuals reporting poor sleep tend to exhibit significantly higher anxiety and depression scores across diverse populations including students, healthcare professionals, and older adults (Cahill et al., 2025). These psychological disturbances not only reflect a direct outcome of disrupted sleep but also function as mediating variables linking sleep quality to broader cognitive and emotional impairments.

Mediation models have revealed that anxiety and depression frequently explain the relationship between poor sleep and subjective cognitive decline (Sun et al., 2024; Xu et al., 2021). In the case of university students, greater emotional instability and cognitive inefficiency adversely affect their academic and occupational performance (Zochil & Thorsteinsson, 2018). Poor sleep is further linked to reduced well-being across the physical, mental, and emotional domains. Chronic sleep deprivation intensifies stress responses, impairs attention and memory, and contributes to fatigue and daily dysfunction (Alharbe, 2025; Palmer & Alfano, 2020).

1.5. Aims and hypotheses

Based on the literature review, the present study aimed to identify distinct psychosocial profiles of digital behavior, emotional and health-related dimensions among Spanish university students. Digital addiction symptoms and nomophobia were assessed as indicators of problematic social-network and Internet use and digital-related anxiety. Emotional variables comprised attachment-related anxiety, depression, loneliness, and self-esteem, representing core dimensions of psychological functioning frequently linked to digital dependence. Health-related indicators encompassed psychological well-being, sleep quality, and sleep quantity, given their established associations with excessive digital engagement and emotional distress. Additionally, recreational digital engagement was included as a behavioral marker of digital use.

By adopting a person-centered analytical approach, this study seeks to move beyond traditional variable-based models and uncover clusters of participants that reflect different psychosocial configurations. This approach allows for a more comprehensive understanding of how emotional well-being, self-perception, and digital dependence coexist and influence one another, thereby offering insights that may guide preventive and therapeutic interventions tailored to specific user profiles.

Therefore, we hypothesize that:

- H1.** Distinct psychosocial profiles will emerge, characterized by systematic differences in digital behavior patterns, psychological functioning, and health-related indicators.
- H2.** Profiles will differ primarily according to levels of addiction symptoms and nomophobia, with the highest-addiction profile showing greater attachment-related anxiety and lower self-esteem.
- H3.** Recreational digital engagement will be significantly higher in

profiles characterized by elevated addiction symptoms and nomophobia.

- H4.** Profiles with higher addiction symptoms and nomophobia will show poorer psychological functioning and greater sleep-related difficulties compared to profiles with lower levels.

2. Methods

2.1. Participants and procedure

The sample consisted of 416 university students recruited from Rey Juan Carlos University (Faculty of Communication Sciences, Faculty of Education, Sports and Interdisciplinary Studies, and Faculty of Health Sciences), Autonomus University of Madrid (Faculty of Psychology), Carlos III University, National Distance Education University (UNED, Faculty of Education and Faculty of Psychology), University of Huelva (Faculty of Education and Psychology), and International University of Andalusia. The participants ranged in age from 16 to 54 years ($M = 21.9$, $SD = 4.93$) and were predominantly female (71.9%). The inclusion criteria required participants to be enrolled in undergraduate or post-graduate programs, hold Spanish nationality, and be at least 16 years old. Data collection took place between November 2023 and May 2024 using an online survey administered via Microsoft Forms®. Recruitment was conducted through institutional mail lists and academic networks, and invitations were sent by email to randomly selected students who met the inclusion criteria. The invitation included a link to the questionnaire and emphasized voluntary participation to minimize selection bias. The survey was designed to be completed in approximately 20–25 min and was compatible with desktop and mobile devices.

To ensure data quality, attention check items and logic controls were included, and no personally identifiable information was collected. Ethical approval was obtained from the Ethical Committee for Human Research of the responsible institution (Approval ID: 1309202330323), following the principles of the Declaration of Helsinki (1975, revised in 2000) and international ethical guidelines. All participants provided informed consent electronically before beginning the survey, and their privacy and anonymity were guaranteed throughout the study.

2.2. Measures

The following measures were administered to the participants. All scales have been validated in Spanish and have been widely used in young people.

2.2.1. Addiction risk to social networks and internet scale (AR-SNIS; Peris et al., 2018)

AR-SNIS is a self-report instrument composed of 29 items grouped into four dimensions: addiction symptoms (9 items), social use (8 items), freak traits (6 items), and nomophobia (6 items). In the present study, only the addiction and nomophobia subscales were administered as they are considered indicators of problematic social-network/Internet use and smartphone-related anxiety, commonly included within broader conceptualizations of digital addictive-like behaviors. Items were rated on a 4-point Likert scale (1 = never or almost never, 2 = sometimes, 3 = difficult times, 4 = many times, or always). Scores for the addiction symptoms subscale ranged from 9 to 36, and for the nomophobia subscale from 6 to 24, with higher scores indicating greater risk. The internal consistency reliability in the present sample, calculated using Cronbach's alpha, was .85.

2.2.2. Recreational digital engagement

Participants were asked to estimate their daily time spent on social media platforms, excluding study-related activities. The question was: "Considering all the times I access social networks, the Internet, and WhatsApp without engaging in academic tasks, the time I spend daily on them is".

Responses were recorded on a four-point Likert scale: 1 = about 1 h, 2 = about 2 h, 3 = between three and 4 h, and 4 = more than 4 h. This item was designed to differentiate recreational use from academic purposes, ensuring that the measure captures leisure-oriented and potentially compulsive engagement, which aligns with the conceptual framework of digital addiction (San Martín et al., 2024). It is important to clarify that this item captures general recreational digital engagement (social networks, Internet browsing, and WhatsApp), rather than social media use exclusively.

2.2.3. Adult attachment questionnaire-revised (CAA-r; Melero and Cantero, 2024)

The CAA-r (Melero and Cantero, 2024) consists of 35 items assessing three dimensions: anxiety, socioemotional competence, avoidance and anger. For this study we administered the anxiety subscale (4 items) which measures need for approval, negative self-concept, fear of rejection/abandonment and anticipatory anxiety in relationships. This enables exploration of how relational insecurity interacts with problematic social media use, nomophobia, and well-being. Attachment-related anxiety is particularly relevant because it may amplify digital dependency behaviors and emotional distress, thereby contributing to the multidimensional nature of digital addiction and its psychological correlates. Responses were provided on a six-point Likert scale ranging from 1 = strongly disagree to 6 = strongly agree. The total scores range from 4 to 24, with higher scores indicating greater anxiety. The internal consistency reliability in the present sample, calculated using Cronbach's alpha, was 0.92.

2.2.4. Centre for epidemiologic studies depression scale – short form (CESD-10; Robinson, 2022)

The CESD-10 is a widely used self-report instrument designed to assess depressive symptoms in the general population. It consists of 10 items that ask respondents to indicate how frequently they have experienced specific symptoms during the past week. Each item is rated on a 4-point Likert scale: 0 = no days, 1 = one to three days, 2 = four to six days, and 3 = every day. The total score ranges from 0 to 30, with higher scores reflecting a greater severity of depressive symptoms. The CESD-10 captures the core dimensions of depression, including affective (e.g., sadness), cognitive (e.g., hopelessness), and somatic aspects (e.g., sleep disturbances). Its brevity makes it suitable for large-scale surveys and longitudinal studies, while maintaining strong psychometric properties. Previous research has demonstrated good internal consistency ($\alpha > .80$) and validity across diverse populations, including adolescents and young adults. In this study, the CESD-10 was used to quantify depressive symptoms as a continuous variable, providing a reliable indicator of emotional well-being. The internal consistency reliability of the present sample, calculated using Cronbach's alpha, was .88.

2.2.5. UCLA Loneliness Scale – short form (ULS-8; Yildiz & Duy, 2014)

The ULS-8 is an abbreviated version of the original UCLA Loneliness Scale (Russell et al., 1980) designed to assess subjective feelings of loneliness and social isolation. This instrument evaluates individuals' cognitive awareness of deficiencies in social and close relationships as well as emotional responses such as longing, despair, and perceived emptiness. The short form consists of eight items rated on a 4-point Likert scale: 1 = never, 2 = rarely, 3 = sometimes, and 4 = always. The total scores range from 8 to 32, with higher scores indicating greater perceived loneliness. The ULS-8 has demonstrated strong psychometric properties including reliability and validity across diverse cultural contexts. Its brevity makes it particularly suitable for large-scale surveys and research involving adolescents and young adults while maintaining sensitivity to variations in loneliness levels. Previous studies have confirmed its factorial structure and internal consistency ($\alpha > .80$), supporting its use in both clinical and non-clinical populations. In this study, ULS-8 was employed as a continuous measure of loneliness, providing an indicator of participants' perceived social connectedness.

The internal consistency reliability in the present sample, calculated using Cronbach's alpha, was .85.

2.2.6. Medical outcomes study Sleep Scale (MOS Sleep-R; Yarlas et al., 2021)

This scale is a revised version of the MOS Sleep Scale (Hays & Stewart, 1992) and is a self-report instrument that measures sleep quality and problems over the previous four weeks. For this study, we used sleep disturbance (quality) and sleep quantity dimensions. The six items for sleep quality are rated on a 6-point Likert scale (1 = never, 6 = always), and sleep quantity records the actual number of hours slept per night. Higher scores indicated poorer sleep quality. The Cronbach's alpha for the sleep quality dimension was .86.

2.2.7. Rosenberg self-esteem scale (RSES; Rosenberg, 1965)

The Rosenberg Self-Esteem Scale is one of the most widely used instruments to assess global self-esteem. It consists of ten items designed to measure an individual's overall sense of self-worth and self-acceptance. Five items were positively worded (e.g., "On the whole, I am satisfied with myself"), and five are negatively worded (e.g., "I feel I do not have much to be proud of"), requiring reverse scoring. Responses were provided on a 4-point Likert scale ranging from 1 = strongly agree to 4 = strongly disagree. After reversing the negatively worded items, scores were summed to produce a total score that ranged from 10 to 40, with higher scores indicating greater self-esteem. The RSES has demonstrated excellent psychometric properties across diverse populations and cultural contexts, including strong internal consistency (α typically $> .80$) and test-retest reliability. It has been widely applied in research on psychological well-being, identity development, and mental health outcomes. Its brevity and clarity make it suitable for both clinical and non-clinical settings as well as large-scale surveys. In this study, the internal consistency reliability, calculated using Cronbach's alpha, was .81.

2.2.8. Brief version of Ryff's Psychological Well-Being Scales (Stavraki et al., 2022)

This short form of Ryff's Psychological Well-Being Scale assesses six core dimensions of eudaimonic well-being: self-acceptance, positive relationships with others, autonomy, environmental mastery, purpose in life, and personal growth. The instrument consists of six items, each representing one of these dimensions, and responses are rated on a 6-point Likert scale ranging from 1 = strongly disagree to 6 = strongly agree. The total score ranged from 6 to 36, with higher scores indicating greater psychological well-being across these domains.

This brief version was developed to provide a concise yet valid measure of well-being for large-scale surveys and research contexts in which time constraints exist. Despite its brevity, studies have demonstrated that this version retains strong psychometric properties, including factorial validity and internal consistency, and correlates well with the full version of Ryff's scale. It is widely used in research on mental health, resilience, and positive psychology, particularly among adolescents and young adults. In this study, the internal consistency reliability, calculated using Cronbach's alpha, was .91.

2.3. Statistical analyses

Statistical analyses for this study were conducted in several sequential steps to address the research aims. First, all psychological, behavioral, and health-related variables, including addiction symptoms, nomophobia, attachment-related anxiety, depression, loneliness, self-esteem, sleep quality, sleep quantity, and psychological well-being, were standardized prior to analysis to ensure comparability and prevent disproportionate influence from variables measured on different scales. A cluster analysis using the Hartigan-Wong K-means algorithm with ten random initializations was performed to identify naturally occurring psychosocial profiles among Spanish university students, with

the optimal cluster number selected based on empirical criteria and conceptual interpretability. This process resulted in a stable three-cluster solution reflecting distinct psychosocial functioning, validated by even participant distribution across clusters and clear differences in psychological profiles. To test for differences across the identified clusters, one-way ANOVAs were conducted on all primary study variables, followed by Tukey post hoc tests to facilitate pairwise comparisons, with all analyses performed using Jamovi software. Statistical significance was set at 0.05 level for all tests. Given the large and nearly balanced sample sizes, ANOVA is considered robust to moderate violations of normality and homoscedasticity; therefore, parametric tests were applied following current recommendations. It is important to mention that well-being was not included in the clustering procedure and therefore played no role in the formation of the clusters. After the three-cluster solution had been established, well-being scores were compared across clusters as an external variable. Treating well-being in this way avoids circularity and allows it to serve as an independent criterion, helping to assess whether the empirically derived clusters differ meaningfully on an outcome not used to define them and thereby supporting the external validity of the cluster solution.

3. Results

3.1. Descriptive characteristics

In total, 416 participants were included in this study. The mean age of the participants was 21.9 years ($SD = 4.93$), with a minimum age of 16 years and a maximum of 54 years. The sample comprised 71.9% females, 27.2% males, and 1% non-binary individuals. The descriptive statistics are presented in Table 1.

3.2. Cluster analysis

In this study, a cluster analysis was conducted to identify distinct profiles based on a set of psychological, behavioral, and health-related variables (see Table 2). The following variables were assessed: addiction, nomophobia, attachment-related anxiety, depression, loneliness, self-esteem, poor sleep quality, and sleep quantity. The selection of these variables is justified by their conceptual relevance to understanding psychosocial functioning in the studied population, as they represent key constructs implicated in overall mental health and daily well-being. The three-cluster solution was supported by the elbow method and inspection of within-cluster sum-of-squares, which showed diminishing returns beyond three clusters.

To ensure comparability across measures and prevent variables with larger scales from disproportionately influencing the clustering solution,

all variables were standardized prior to analysis. Standardization is a widely accepted practice in cluster analysis, and is considered critical for obtaining valid clusters when variables are measured on different scales or distributions (Nogueira, 2021; Schaffer & Green, 1996). This pre-processing step strengthens the reliability of the results and addresses possible confounding due to heterogeneous measurement units.

The clustering algorithm chosen was the Hartigan-Wong method, which was implemented via the K-means clustering procedure using 10 random initializations. The Hartigan-Wong algorithm is recognized for its efficiency, robustness, and accuracy in partitioning data into clusters (Hartigan & Wong, 1979; Lesmeister & Chinnamgari, 2019), particularly for medium to large sample sizes, such as that in this study. Employing 10 random starting points mitigates the risk of converging on a local minimum and improves the likelihood of obtaining a globally optimal solution.

After reviewing the optimal cluster solutions using empirical criteria and interpretability, a three-cluster solution is selected. The choice of three clusters is justified by both the distribution observed in cluster sizes and conceptual interpretability while also balancing the variance explained between clusters and ensuring meaningful group distinctions. This approach ensures that the resulting clusters represent stable, distinct subtypes in the studied sample without overfitting or fragmenting the data into unnecessarily small groups.

The final cluster analysis produced three distinct groups with the following membership sizes: Cluster 1 included 159 participants, Cluster 2 included 128 participants, and Cluster 3 included 129 participants. This nearly even distribution across clusters supports the stability and reliability of the selected three-cluster solution. The standardized cluster centroids for the main variables were as follows: Cluster 1 was characterized by higher scores for addiction, nomophobia, attachment-related anxiety, depression, loneliness and poor sleep quality, and lower scores for sleep quantity; Cluster 2 demonstrated the lowest scores for addiction, nomophobia, attachment-related anxiety, depression, loneliness and self-esteem and intermediate scores for sleep quantity and poor sleep quality; and Cluster 3 showed moderate or mixed values in addiction, nomophobia, attachment-related anxiety, depression and loneliness; highest scores in self-esteem and sleep quantity and lowest scores in poor sleep quality. The means of the clusters across each variable are shown in Fig. 1.

The cluster plot is shown in Fig. 2. The PCA plot of the cluster analysis is shown in Fig. 3. Principal Component Analysis (PCA) and cluster plots provided deeper insights into how the variables and clusters differentiated across the studied population. In the PCA biplot, key variables such as addiction, nomophobia, and attachment-related anxiety are clustered together and aligned with Cluster 1, pointing to a psychosocial profile driven by problematic tech use and emotional distress, along with poor sleep quality. Cluster 2 is visually separated from Cluster 1 and is associated with low scores across most variables, indicating a group generally less affected by psychological and behavioral issues. Cluster 3 stands apart because of its association with higher sleep quality and quantity, suggesting a subgroup that maintains healthier sleep, but displays moderate levels of other variables. The cluster plot further illustrates these separations: Cluster 1 is positioned towards higher values on Dim1, Cluster 2 occupies the negative side of Dim1, and Cluster 3 straddles intermediate space in the feature field, confirming the multidimensional nature of psychological subtypes and illustrating how sleep-related factors help distinguish healthier profiles in this cohort.

3.3. ANOVA comparisons of clusters

One-way ANOVA tests using Fisher's method and post-hoc Tukey's tests revealed robust differences across clusters for all variables included in the analysis: recreational digital engagement, nomophobia, addiction, attachment-related anxiety, depression, loneliness, self-esteem, sleep quality, sleep quantity, age, and well-being. Although formal

Table 1
Descriptive statistics.

Variable	N	Mean	SD	Min	Max	Percentage (%)
Gender: Female	416	-	-	-	-	71.9
Gender: Male	416	-	-	-	-	27.2
Gender: Non-binary	416	-	-	-	-	1.0
Age (years)	416	21.9	4.93	16	54	-
Nomophobia	416	11.4	3.40	6	24	-
Attachment-related anxiety	416	10.4	5.25	4	24	-
Depression	416	11.2	5.56	0	30	-
Loneliness	416	16.9	4.35	8	32	-
Poor Sleep quality	416	10.1	4.44	4	23	-
Sleep quantity (hours)	416	5.79	2.70	2	12	-
Self-esteem	416	29.0	5.30	12	40	-
Well-being	416	27.7	7.11	6	36	-
Recreational digital engagement	416	16.0	3.79	8	32	-
Addiction symptoms	416	20.1	4.54	10	35	-

Table 2
Cluster analysis.

Cluster	N	Addiction Symptoms	Nomophobia	Attachment-related Anxiety	Depression	Loneliness	Self-esteem	Poor Sleep Quality	Sleep Quantity
1	159	0.499	0.414	0.679	0.794	0.737	−0.725	0.642	−0.307
2	128	−0.651	−0.748	−0.781	−0.584	−0.702	0.075	−0.435	−0.497
3	129	0.031	0.232	−0.062	−0.398	−0.212	0.819	−0.360	0.872

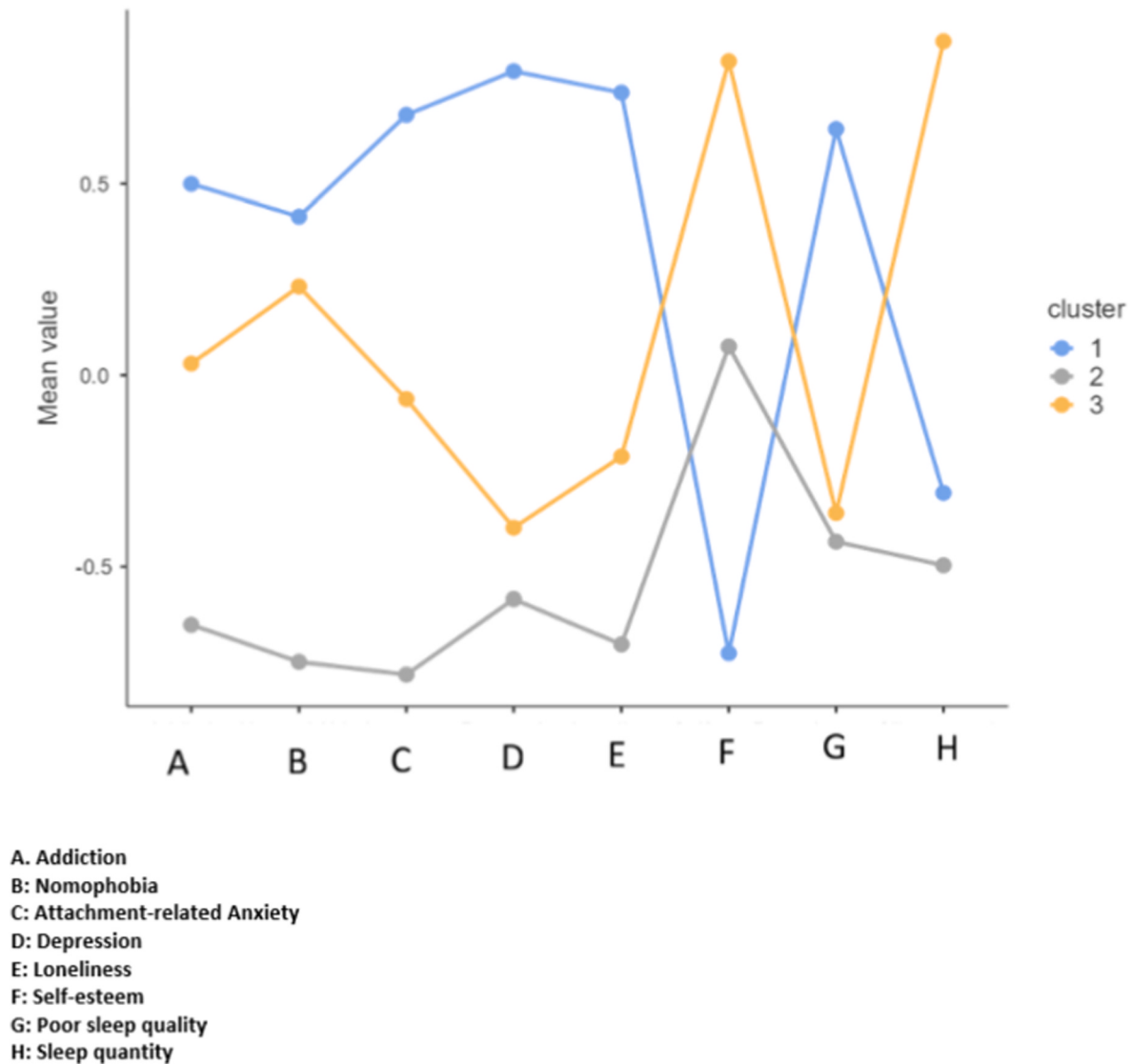


Fig. 1. Standardized cluster centroids for the three-cluster solution across the variables of the study.

assumption tests were not central to the analytic aims, ANOVA is robust to moderate deviations from normality and homoscedasticity with large, balanced samples; therefore, parametric tests were deemed acceptable (v.gr. Blanca et al., 2017; Zhou et al., 2023); for this reason, parametric tests were deemed appropriate and were applied to analyze group differences.

Recreational digital engagement ($F(2,413) = 21.33, p < .001$), nomophobia ($F(2,413) = 70.65, p < .001$), and addiction ($F(2,413) = 60.51, p < .001$) were the highest in Cluster 1 (mean: 16.86, 12.77, and 22.32, respectively), moderate in Cluster 3, and lowest in Cluster 2 (mean: 14.29, 8.83, and 17.10, respectively). Tukey post hoc tests confirmed that Cluster 1 had significantly higher social network consumption than Cluster 2 (mean difference = 2.57, $p < .001$), as well as substantially higher nomophobia (mean difference vs Cluster 2 = 3.95,

$p < .001$) and addiction (mean difference vs Cluster 2 = 5.22, $p < .001$).

Higher levels of nomophobia and addiction in Cluster 1 were strongly associated with greater social network consumption, which is in line with the literature that links digital dependency with the intensification of social media and related anxiety behaviors. Furthermore, the elevated addiction levels in Cluster 1 were mapped to significantly greater psychological distress. Attachment-related anxiety (mean = 14.01, $SD = 5.07$), depression (mean = 15.56, $SD = 4.82$), and loneliness (mean = 20.09, $SD = 3.50$) were highest in Cluster 1. Tukey post hoc comparisons showed that Cluster 1 had significantly higher anxiety than Cluster 2 (mean difference = 7.66, $p < .001$) and Cluster 3 (mean difference = 3.89, $p = .001$), as well as greater depression (1 vs 2 = 7.65, $p < .001$; 1 vs 3 = 6.62, $p < .001$) and loneliness (1 vs 2 = 6.27, $p < .001$; 1 vs 3 = 4.13, $p < .001$).

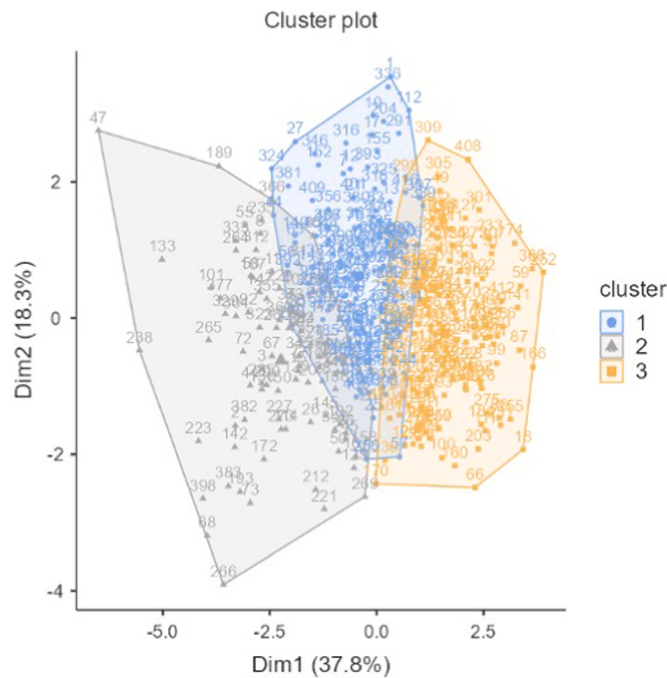


Fig. 2. Distribution of participants across the three-cluster solution on the first two dimensions of the cluster analysis, showing the spatial separation and overlap among clusters.

Sleep problems and reduced well-being were also most pronounced in Cluster 1, which had the lowest well-being scores (mean = 26.24, SD = 6.06) and sleep quantity (mean = 4.96, SD = 2.13). In contrast, cluster 3 showed markedly better outcomes, with the highest well-being (mean

= 31.24, SD = 5.29) and sleep quantity (mean = 8.14, SD = 2.36). Tukey tests confirmed significant differences in well-being between Cluster 1 and Cluster 3 (mean difference = -5.00, $p < .001$), and in sleep quantity between Cluster 1 and Cluster 3 (mean difference = -3.18, $p < .001$), indicating that elevated addiction correlates with worse psychological and sleep health.

Cluster 2, characterized by the lowest addiction scores, also had the lowest recreational digital engagement and nomophobia, alongside moderately better well-being and sleep scores. For self-esteem and sleep quality, variables where healthier values reflect better functioning, Clusters 2 and 3 outperformed Cluster 1 by significant margins. For self-esteem, Cluster 1's mean (25.19) was well below Cluster 3's (33.37), with Tukey post hoc differences (1 vs 3: mean difference = -8.18, $p < .001$) illustrating the contrast between high-addiction and low-addiction profiles; similarly for sleep quality (1 vs 3: mean difference = 4.45, $p < .001$).

These patterns demonstrate that the cluster distinguished by digital dependency and addictive behaviors reported the highest levels of recreational digital engagement, most pronounced psychological distress, and the broadest spectrum of sleep and well-being problems. Conversely, clusters with lower addiction and technology use, especially Cluster 3, presented healthier profiles across these domains.

Integrated ANOVA and Tukey's comparisons across clusters are presented in Table 3.

4. Discussion

This study aimed to identify distinct psychosocial profiles among university students based on digital behavior, psychological functioning and health-related variables. Because the construct of digital addiction is used conceptually in this manuscript, the empirical indicators correspond specifically to addiction symptoms and nomophobia as measured by the AR-SNIS. Specifically, it examined patterns derived from

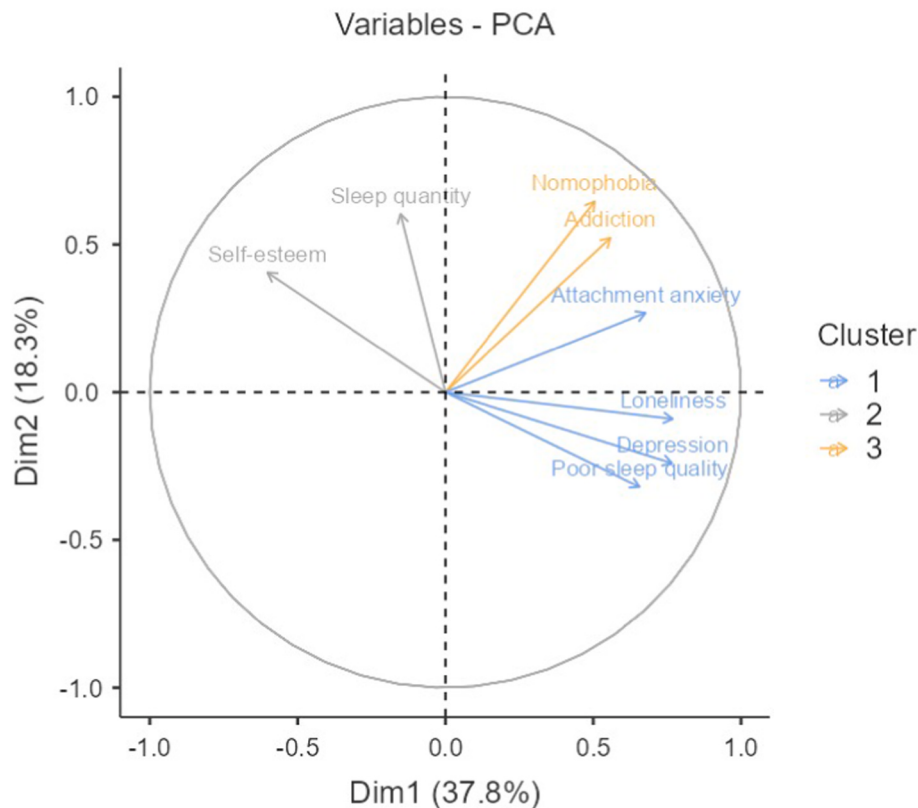


Fig. 3. PCA biplot of the main study variables across the first two principal components, illustrating the relationships among variables and their alignment with the three identified clusters.

Table 3
ANOVA and Tukey comparisons.

Variable	ANOVA F (df1, df2)	ANOVA p	Cluster 1 Mean (SD)	Cluster 2 Mean (SD)	Cluster 3 Mean (SD)	Tukey Mean Diff (p-value) 1 vs 2	1 vs 3	2 vs 3
Age	9.88 (2, 413)	.001	20.73 (3.20)	23.27 (6.19)	22.10 (4.97)	−2.54 (.001)	−1.37 (.045)	1.16 (.131)
Nomophobia	70.65 (2, 413)	.001	12.77 (3.40)	8.83 (2.25)	12.16 (2.93)	3.95 (.001)	0.62 (.179)	−3.33 (.001)
Attachment-related anxiety	119.29 (2413)	.001	14.01 (5.07)	6.35 (3.00)	10.12 (3.99)	7.66 (.001)	3.89 (.001)	−3.77 (.001)
Depression	135.31 (2413)	.001	15.56 (4.82)	7.91 (4.67)	8.94 (3.18)	7.65 (.001)	6.62 (.001)	−1.03 (.137)
Loneliness	123.59 (2413)	.001	20.09 (3.50)	13.82 (3.56)	15.95 (3.28)	6.27 (.001)	4.13 (.001)	−2.13 (.001)
Poor sleep quality	71.31 (2413)	.001	12.96 (4.60)	8.17 (3.27)	8.50 (3.29)	4.78 (.001)	4.45 (.001)	−0.33 (.768)
Sleep quantity	110.40 (2413)	.001	4.96 (2.13)	4.45 (2.07)	8.14 (2.36)	0.51 (.121)	−3.18 (.001)	−3.69 (.001)
Self-esteem	144.67 (2413)	.001	25.19 (4.18)	29.43 (3.91)	33.37 (4.10)	−4.24 (.001)	−8.18 (.001)	−3.94 (.001)
Recreational digital engagement	21.33 (2413)	.001	16.86 (3.97)	14.29 (3.01)	16.72 (3.71)	2.57 (.001)	0.13 (.947)	−2.43 (.001)
Addiction symptoms	60.51 (2413)	.001	22.32 (4.21)	17.10 (3.80)	20.19 (3.93)	5.22 (.001)	2.13 (.001)	−3.09 (.001)
Well-being	25.30 (2413)	.001	26.24 (6.06)	26.09 (8.56)	31.24 (5.29)	0.15 (.980)	−5.00 (.001)	−5.15 (.001)

variables, such as digital addiction symptoms, nomophobia, recreational digital engagement, attachment-related anxiety, depression, loneliness, self-esteem, well-being, and sleep health. The findings from the cluster and ANOVA analyses supported the proposed hypotheses, providing a nuanced understanding of the interplay between the evaluated variables.

4.1. Identifying differentiated clusters based on the assessed variables

Cluster analysis confirmed the existence of three clearly differentiated profiles among the participants, supporting Hypothesis 1. These clusters were primarily distinguished by their levels of digital addiction but also showed systematic differences in the different psychosocial variables. This finding reinforces the notion that digital addiction is not a homogeneous phenomenon, but manifests through distinct patterns of emotional and behavioral functioning. Rather than a uniform risk profile, our results underscore the multidimensional nature of digital behavior, revealing subgroups that differ not only in the intensity of technology use but also in associated psychosocial outcomes. This person-centered approach aligns with prior research that emphasizes the heterogeneity of technology-related experiences among young adults (Lozano-Blasco et al., 2022; Servidio et al., 2024). Meta-analytic evidence further corroborates that problematic technology use is not a monolithic construct but emerges through diverse behavioral and emotional configurations (Marengo et al., 2021; Cheng et al., 2021). For instance, systematic reviews on Internet and smartphone addiction have documented clusters ranging from high-risk groups with severe psychological distress to low-risk groups that maintain adaptive engagement (Sha et al., 2019). Our findings replicate this pattern: Cluster 1 exhibited elevated digital addiction and nomophobia along with high attachment-related anxiety, depression, and loneliness, whereas Cluster 3 combined moderate technology use with better sleep quality and psychological functioning. This differentiation reinforces the argument that interventions should be tailored to specific profiles rather than adopting a “one-size-fits-all” approach (Billieux et al., 2015).

The emergence of these profiles also resonates with theoretical frameworks, such as the Interaction of Person-Affect-Cognition-Execution (I-PACE) model (Brand et al., 2019), which posits that addictive behaviors result from complex interactions between individual predispositions, affective states, and cognitive responses. Our findings extend this model by illustrating how these interactions cluster within distinct subgroups, suggesting that vulnerability factors such as low self-esteem and poor sleep aggregate with behavioral indicators of digital dependence. Moreover, recent meta-analyses have confirmed that anxiety and depression are among the most robust correlates of problematic use (Gu et al., 2024; Huang, 2022), a pattern clearly reflected in the high-distress cluster identified in this study.

Consistent with Hypothesis 2, the clusters differed primarily according to the level of digital addiction (high, medium, and low) and

exhibited distinct emotional patterns. Specifically, the cluster with the highest addiction scores showed elevated attachment-related anxiety and markedly lower self-esteem than clusters with moderate or low addiction levels. These results align with previous research demonstrating that problematic technology use is strongly associated with emotional dysregulation and psychosocial vulnerability among university students (Lozano-Blasco et al., 2022; Nikolić et al., 2023). Meta-analytical evidence has supported this link. Servidio et al. (2024) found that higher levels of smartphone and social media addiction significantly predict increased anxiety and diminished self-esteem, largely mediated by fear of negative evaluation and compulsive reassurance seeking. Similarly, Marengo et al. (2021) reported that excessive engagement with social networking platforms fosters upward social comparison, undermining self-worth and amplifying anxiety symptoms. Attachment-related anxiety may amplify digital dependency behaviors and emotional distress, thereby contributing to the multidimensional nature of digital addiction and its psychological correlates. These processes appear particularly salient in young adults whose identity development and social validation needs are heightened during emerging adulthood.

The emotional configuration observed in the high addiction cluster reflects a psychosocial profile consistent with broader frameworks of digital dependency (Erzincanlı & Geçikli, 2024). Individuals in this cluster may experience a cycle of compulsive digital engagement driven by the avoidance of offline social discomfort and reliance on online validation, which paradoxically exacerbates feelings of inadequacy and isolation. Longitudinal evidence supports this interpretation, showing that problematic smartphone use predicts increases in anxiety and depressive symptoms over time (Gu et al., 2024), whereas persistent exposure to idealized social content erodes self-esteem (Pikó et al., 2024).

From a methodological perspective, the identification of three stable clusters aligns with prior studies employing latent profiles or cluster analysis to examine psychosocial correlates of technology use (Andreassen et al., 2020; Wang et al., 2023). These studies consistently report that profiles differ not only in addiction severity, but also in emotional and behavioral dimensions, supporting the ecological validity of our findings. Furthermore, the integration of sleep quality and psychological functioning into the clustering solution adds a novel contribution as these variables are often overlooked despite their strong association with digital habits and mental health (Hale et al., 2025; Randjelović, 2023).

Beyond empirical differentiation, the present findings contribute theoretically by demonstrating that digital-engagement variables do not operate independently but coalesce into meaningful psychosocial configurations. This supports the argument that problematic digital engagement is better conceptualized as part of broader affective-behavioral systems rather than as an isolated behavioral construct. By integrating emotional distress, well-being, and sleep health into a

single profiling framework, the study advances person-centered theoretical models of technology use among young adults.

4.2. Daily social media use and digital addiction

The results from this study confirmed Hypothesis 3, demonstrating that daily recreational digital engagement was significantly higher among participants grouped in profiles characterized by elevated levels of nomophobia and addiction symptoms. Cluster 1, which exhibited the highest scores for both indicators, reported substantially greater social media use compared to clusters with lower levels of these traits. This pattern underscores the strong behavioral link between digital dependency and intensified engagement with social networking platforms. These results align with prior evidence that problematic smartphone use, and social media addiction are robust predictors of excessive online engagement (Sserunkuuma et al., 2023). Meta-analytic data indicate that individuals with higher digital addiction scores spend significantly more time on social media, often exceeding 4 h daily, and display compulsive checking behaviors driven by the fear of disconnection and reward-seeking mechanisms (Hosgör & Güngördü, 2025; Olson et al., 2022). Similarly, systematic reviews on nomophobia highlight its role as a mediator between problematic social media use and psychological distress, suggesting that anxiety related to connectivity loss amplifies the frequency and intensity of digital interactions (Rodríguez-García et al., 2020). The association observed in our study is consistent with theoretical models of behavioral addiction, which posit that compulsive digital engagement is maintained by reinforcement loops involving social validation and the avoidance of negative affect (Ho et al., 2024; Hou et al., 2019). Experimental evidence further supports this interpretation: interventions aimed at reducing screen time through commitment devices have shown persistent decreases in social media use, confirming the habit-forming nature of these platforms and the role of self-control deficits in sustaining addictive patterns (Allcott et al., 2022). Moreover, recent meta-analyses indicate that problematic social media use is not only linked to increased online time but also to adverse psychological outcomes, including anxiety, depression, and loneliness (Ansari et al., 2024; Jing et al., 2025). These findings reinforce the clinical relevance of our results, as the cluster with the highest digital addiction symptoms also presented with elevated emotional distress and poorer well-being, suggesting a cumulative risk profile.

4.3. Digital addiction, effects on mental health and sleep disturbances

The results of the present study confirm the fourth hypothesis, indicating that clusters with higher digital addiction exhibited poorer psychological well-being and greater sleep-related problems than clusters with lower addiction levels. Specifically, Cluster 1, characterized by elevated addiction and nomophobia, reported the lowest scores for psychological functioning, along with the most pronounced sleep disturbances and reduced sleep quantity. By contrast, Cluster 3, with lower addiction indicators, showed significantly better outcomes across these domains. These patterns underscore the cumulative burden of digital dependence on emotional health and sleep regulation.

Our results are consistent with the growing body of evidence linking digital addiction to adverse mental health outcomes. Meta-analytic findings demonstrated moderate associations between Internet or smartphone addiction and depression, anxiety, and stress, highlighting the psychological vulnerability of individuals with high digital engagement (Sun et al., 2025). Similarly, systematic reviews confirm that problematic smartphone use negatively impacts psychological well-being, with younger populations and females being particularly susceptible (Amin et al., 2024; Kumar et al., 2025). These associations are explained by mechanisms such as social comparison, fear of missing out (FoMO), and impaired self-regulation, which exacerbate emotional distress and reduce perceived life satisfaction (Servidio et al., 2024).

Sleep-related problems observed in high-addiction clusters align

with previous studies showing that problematic social media use and internet addiction significantly predict poor sleep quality and shorter sleep duration (Alimoradi et al., 2019; Chen et al., 2024). For instance, pooled estimates indicate that individuals with internet addiction have more than twice the odds of experiencing sleep problems compared to non-addicted users and exhibit reduced sleep duration (Alimoradi et al., 2019). Recent reviews have revealed that electronic media use disrupts circadian rhythms through blue-light exposure and bedtime procrastination, contributing to insomnia and daytime fatigue (Han et al., 2024). Experimental studies corroborate these findings, showing that interventions targeting digital addiction significantly improve sleep quality and reduce insomnia symptoms among university students (Sonkaya & Yazgan, 2025).

Taken together, these results highlight the dual impact of digital addiction on mental health and sleep, suggesting a synergistic effect that compromises overall well-being. The convergence of emotional distress and sleep disruption in high addiction profiles underscores the need for integrated interventions that address both cognitive and behavioral dimensions.

4.4. Limitations

Despite its contributions, this study had several limitations. First, the sample was restricted to Spanish university students, which limits the generalizability of the results to other cultural contexts, age groups, and non-academic populations. Moreover, the sample was predominantly female, which may further limit the applicability of the findings to more gender-balanced or male-dominated populations. Future research should replicate these analyses in more diverse samples to examine whether psychosocial profiles of digital behavior differ across cultural, demographic, and gender settings. Second, we used a cross-sectional design; therefore, we could not determine the causative relationships. Longitudinal studies are needed to clarify temporal dynamics and determine whether digital dependency precedes declines in mental health and sleep quality or whether these relationships are bidirectional. Third, reliance on self-report measures may introduce response biases such as social desirability or inaccurate recall of daily technology use. Incorporating objective behavioral data, such as device-logged screen time or app usage metrics, would strengthen the validity of future research. Fourth, the study did not differentiate between specific domains of mobile phone use (e.g., communication, social media browsing, web navigation, or entertainment), relying instead on a global indicator of recreational digital engagement. Future research would benefit from examining these domains separately to determine whether distinct patterns of use are differentially associated with psychological outcomes.

Despite these limitations, this study had notable strengths. It adopts a person-centered approach to identify integrated psychosocial profiles, moving beyond traditional variable-centered analyses. This approach provides a nuanced understanding of how digital addiction coexists with mental and health-related dimensions. Additionally, the use of validated instruments and a relatively large sample enhance the reliability of the findings and contributes to the growing literature on digital behavior and mental health among university populations. Additionally, although the term “digital addiction” was used as a conceptual umbrella, the operational measures correspond only to addiction symptoms and nomophobia. This limits the scope of inferences about broader forms of digital engagement.

4.5. Implications for treatment and intervention

The findings of this study underscore the need for comprehensive person-centered interventions to mitigate the negative consequences of digital addiction among university students. The identification of these three distinct clusters provides a foundation for tailored interventions that address the specific psychosocial profiles observed in this study.

Cluster 1, characterized by high digital addiction, elevated nomophobia, emotional distress, and pronounced sleep problems, requires intensive and multidimensional strategies. Interventions for this group should prioritize cognitive-behavioral therapy (CBT) to target maladaptive cognitions, such as fear of missing out (FoMO), and enhance self-regulation skills (Hou et al., 2019; Servidio et al., 2024). Integrating CBT with mindfulness-based approaches may further reduce compulsive urges and connectivity-related anxiety (Ho et al., 2024). Given the strong association between addiction and sleep disturbances, sleep hygiene training and behavioral strategies to limit nighttime device use are essential, complemented by objective monitoring tools, such as app-based trackers or wearables, to support adherence (Alimoradi et al., 2019; Chen et al., 2024). Programs aimed at emotional resilience, including acceptance and commitment therapy (ACT), may also benefit individuals in this cluster by addressing anxiety and depressive symptoms (Zou et al., 2025). Cluster 2, which exhibited low addiction and better psychological functioning, represents a preventive intervention target. For this group, psychoeducational programs promoting digital literacy and healthy technological habits can help maintain balanced usage and prevent the escalation of problematic patterns. These initiatives should emphasize evidence-based guidelines for screen time management and digital hygiene, fostering awareness of mental health and sleep implications of excessive use (Servidio et al., 2024). Cluster 3, with moderate addiction indicators and relatively better sleep and well-being, may benefit from selective interventions focused on reinforcing adaptive coping strategies and promoting offline social competence. Given the observed link between digital addiction and attachment-related anxiety, interventions should also incorporate CBT techniques to address fear of negative evaluation and encourage balanced digital habits. Gender and cultural factors should be considered, as prior research indicates that females often report higher anxiety and depressive symptoms in the context of problematic smartphone use (Kaur & Mehndroo, 2024). Finally, universities should implement policies and support systems such as digital detox initiatives, counseling services, and peer-support programs to foster healthier digital habits within academic environments. Future research should evaluate the effectiveness of these interventions using longitudinal and experimental designs to ensure scalability and cultural adaptability.

5. Conclusions

This study provides robust evidence that digital behavior among Spanish university students is intricately linked to distinct psychosocial profiles characterized by varying levels of behavioral and emotional functioning and health-related indicators. We identified three differentiated clusters that reflected the multidimensional nature of digital addiction and its psychological correlates. The findings confirmed that high levels of digital addiction and nomophobia are associated with elevated attachment-related anxiety, depression, loneliness and poor sleep quality and quantity. In the context of this study, these findings refer specifically to the AR-SNIS dimensions (addiction symptoms and nomophobia), which represent problematic but non-clinical patterns of social-network and Internet use.

Conversely, profiles with lower addiction symptoms demonstrated healthier emotional and behavioral functioning, suggesting that balanced digital engagement may act as a protective factor. These results advance the current understanding by moving beyond variable-centered models and highlighting the coexistence of behavioral and emotional dimensions within individuals. The integration of sleep health and psychological functioning into the clustering solution offers a novel contribution to literature by emphasizing the cumulative burden of digital dependency on mental health. Moreover, the study supports theoretical frameworks, such as the I-PACE model, illustrating how individual predispositions and affective states interact with digital behaviors to shape psychosocial outcomes. In sum, this study underscores the importance of adopting a nuanced, person-centered perspective

when addressing digital addiction and its psychosocial consequences. Future studies should explore the longitudinal trajectories of these profiles and evaluate the effectiveness of targeted interventions in diverse cultural and educational contexts.

CRediT authorship contribution statement

Lilian Velasco-Furlong: Writing – review & editing, Writing – original draft, Validation, Supervision, Methodology, Formal analysis, Data curation, Conceptualization. **Gabriel Andrade:** Writing – original draft, Visualization, Validation, Software, Formal analysis, Data curation. **Luis M. Romero-Rodríguez:** Writing – review & editing, Writing – original draft, Investigation, Conceptualization.

Ethical approval and informed consent statements

This research was approved by the Research Ethics Committee of the Universidad Rey Juan Carlos with the registration number 1309202330323.

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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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Data availability

The data that support the findings of this study are available from Lilian Velasco-Furlong (lilian.velasco@urjc.es), upon reasonable request.

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