Online-Journals.org

iJIM International Journal of Interactive Mobile Technologies

iJIM | eISSN: 1865-7923 | Vol. 18 No. 6 (2024) | OPEN ACCESS

https://doi.org/10.3991/ijim.v18i06.45253

PAPER

Fear of Disconnection: Analysis of Nomophobia among Undergraduate Students according to their Educational Program and Gender

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ABSTRACT

In our ever more technologically interconnected and globalized society, nomophobia, or the apprehension of lacking a mobile device, has emerged as a significant concern. This research centered on undergraduate students, a demography particularly immersed in technology, with the aim of assessing the prevalence of nomophobia and its correlation with gender and the academic program pursued by the students. The participants were 320 undergraduate students from four distinct academic programs—Administration (A), foreign trade (FT), public accounting (PA), and information technology (IT). Each program was represented by eighty students, with an equal gender distribution of forty men and forty women. A Spanish version of the NMP-Q questionnaire was utilized to assess nomophobia. A two-way factorial balanced design was used to determine the effect of educational program and gender on the nomophobia levels of university students. A two-way ANOVA test was conducted. The statistical approach helped identify significant impacts related to the academic program ($p = .003$), gender ($p = .001$), and the interaction of both factors ($p = .064$). Based on these findings, the following recommendations are proposed: Academic program-specific support initiatives, gender-sensitive interventions, awareness campaigns and workshops to educate students about nomophobia, continuous well-being monitoring and feedback, training and resilience building. These programs should be available to all students, with an emphasis on high-risk populations.

KEYWORDS

nomophobia, higher education, university students, academic programs, gender

1 INTRODUCTION

In modern society, mobile devices have become essential tools in our daily lives. Research reports high rates of smartphone ownership and use. For example, 92.8%

Roque Hernández, R.V., Guerra Moya, S.A., Hernández, R.S., Mendoza, A.L. (2024). Fear of Disconnection: Analysis of Nomophobia among Undergraduate Students according to their Educational Program and Gender. *International Journal of Interactive Mobile Technologies (iJIM)*, 18(6), pp. 143–158. https://doi.org/10.3991/ijim.v18i06.45253

Article submitted 2023-09-24. Revision uploaded 2023-12-27. Final acceptance 2024-01-06.

of Spaniards access the Internet daily via a smartphone, a figure that rises to 99% in the case of young people [1]. According to Alotaibi [2], studies have reported particularly high rates of smartphone ownership among students; for instance, between 91% and 99% in the United States and Saudi Arabia. Furthermore, in Denmark, 90% of the population owns a smartphone, and most children have their own smartphone by the age of 9 [3].

This escalating technological dependency has also sparked worries about the mental health and psychological well-being of the users [4]. In the study conducted by Alotaibi [2], it was found that excessive use of smartphones is associated with low academic productivity, poor physical health, diminished mental well-being and reduced socialization. Bukhori et al. [5] also found that the higher the smartphone addiction, the lower the intensity of reading academic textbooks, which affects learning achievement. In Frydenlund's work [3] with 1251 Danish University College Students, 23% were at high risk of smartphone addiction. Those students with elevated risk of smartphone addiction who perceived their behavior was problematic were more prone to report low mental health and well-being. In a study conducted by Abdul Hadi [6] with 409 medical and dental students, 47.9% of the participants were found to be at high risk of being addicted to cell phones.

An emerging phenomenon in this context is nomophobia. This term signifies the dread or worry that individuals experience when they are detached from their smartphones. Present literature indicates that nomophobia, or the fear of being without a smartphone, is prevalent among students and can have negative effects on them. For instance, according to Ahmed et al. [7], severe nomophobia has been determined to be associated with poor levels of school performance. On the other hand, Sureka et al. [8] detected that nomophobia is significantly connected to stress and depression. Aguilera-Manrique et al. [9] discovered that nursing students who showed high levels of nomophobia also often utilized their smartphones during their clinical practice, leading to increased levels of distraction. Rodriguez-Garcia & Moreno-Guerrero [10] determined that nomophobia negatively affects personality, self-esteem, anxiety, stress, academic performance, and produces other physical and mental health problems. Moreover, research conducted by Ozdemir et al. [11] revealed that the prevalence of nomophobia among college students was remarkably high. Also, they found that as the level of nomophobia increased among students, their feelings of isolation also tended to increase, while their self-esteem tended to decrease. Additionally, a positive relationship between nomophobia and psycho-loneliness among students was found by Aldalalah [12].

As it can be noted from these references, nomophobia may be particularly significant among undergraduate students, a demographic group that has grown up immersed in digital environments and is distinguished by their continuous engagement with mobile devices for academic as well as personal reasons. In addition, university life involves an increased workload, communication, and information management, which could exacerbate emotional attachment to smartphones and thus lead to high levels of nomophobia.

The objectives of this work are to describe nomophobia in undergraduate students and to evaluate the impact of gender and educational program on their nomophobia levels. Employing a two-way factorial balanced design and a quantitative approach, this study delves into a deeper understanding of the presence of nomophobia in relation to these factors.

The fact that the study focuses on a specific demographic group—university students—offers a closer understanding of nomophobia within this population known for its high level of technological immersion. This specificity allows us to understand how nomophobia manifests and varies in the context of Mexican higher

education, which has been an area little explored in the existing literature. Secondly, the research design used is an advantage of this work since it allowed us to analyze the incidence of academic programs, gender, and the interaction of both on nomophobia. Most existing studies tend to examine nomophobia in a more general sense, overlooking possible interactions between academic discipline and gender. In addition, the paper provides suggestions for specific interventions that may promote students' technological well-being. The combination of all these features makes this work contribute to fill the existing knowledge gap and provide valuable information to both scholars and institutions.

The following section presents the literature review. Consequently, the approach and procedures employed to conduct this investigation are outlined. Then the results and their discussion are presented. In the end, the conclusions are presented.

2 LITERATURE REVIEW

2.1 The NMP-Q instrument

The NMP-Q instrument [13] is composed of twenty questions—see Appendix 1—distributed into four factors; each of them is elucidated in Table 1. A seven-point Likert scale is employed to answer each question. Thus, the aggregate score attained by summing up each NMP-Q response can fluctuate between 20 and 140 points. According to the authors of that instrument, if an aggregate of 20 points is achieved, the absence of nomophobia is presumed. A score between 21 and 59 points signifies a mild or low level; a score of 60 to 99 is construed as a moderate level, while 100 or more points represent a severe level of nomophobia.

Table 1. The four factors of nomophobia according to the NMP-Q questionnaire

Factor	Definition	Example
1. Not being able to communicate.	Feeling of losing instant communication with people and not being able to use services that enable instant communication	Not being able to receive or make calls or text messages.
2. Losing connectedness.	Feeling of losing the permanent connectivity provided by smartphones and of being disconnected from one's digital identity	Not being able to post on social networks.
3. Not being able to access information.	Uneasiness about the loss of widespread access to information through smartphones	Not being able to search for information through the telephone when desired.
4. Giving up convenience.	Feeling of abandoning the comfort provided by smartphones	Fear of being stranded somewhere and not being able to call for help.

Source: Own elaboration with information from [13].

The NMP-Q questionnaire was originally formulated in the English language [13]. However, it has been translated into numerous languages such as Persian [14], Chinese [15], [16], Greek [17], Arabic [18], German [19], and Spanish [20], to mention a few. In each of these linguistic contexts, its reliability and validity have been established, as acceptable psychometric properties have been obtained, thereby designating it as a robust tool. Consequently, the NMP-Q questionnaire is the preeminent instrument globally employed to assess nomophobia across diverse populations of interest [21]. Some of these studies, pertinent to the present article, are delineated below.

2.2 Nomophobia in university students according to NMP-Q

Average scores and levels of nomophobia reported with the NMP-Q questionnaire. Table 2 lists some of the average values obtained with the NMP-Q questionnaire that have been reported in the literature. Scores belonging to the moderate level predominate, according to the NMP-Q interpretation criteria. Moreover, this is confirmed by the frequencies presented in Table 3, which summarizes the data reported by other researchers. The moderate level of nomophobia predominates, with over 50% of the participants in the various studies, followed by mild and severe levels.

Table 2. Average scores on the NMP-Q questionnaire reported in the literature

Authors	Sample Characteristics	NMP-Q Mean Score	Confidence Interval (95%)
Ahmed et al. [7]	157 undergraduate physiotherapy students in India	77.6	72.96 to 82.15
Pirinçci et al. [22]	2,111 students in Turkey	73.21	72.08 to 74.34
Essel [23]	670 university students from Ghana	83.3	81.48 to 85.12

Source: Own elaboration.

Table 3. Nomophobia levels reported in the literature

Authors	Sample Characteristics	Mild	Moderate	Severe
Tuco et al. [24]	11,300 participants	24%	56%	17%
Gunay Molu et al. [25]	424 nursing students from 3 universities.	31%	52.6%	16.3%
Vagka et al. [26]	1,408 young adults (18-25 years) from six universities in Athens.	24.1%	57%	18.9%
Jilisha et al. [27]	774 university students from India	20.8%	54.5%	23.5%

Source: Own elaboration.

Differences in nomophobia levels. Several studies have investigated the impact of gender on participants' levels of nomophobia. The findings have been varied. Table 4 presents a summary of some of the results reported in the literature, showing a tendency for women to obtain higher scores on the NMP-Q questionnaire.

Table 4. Gender differences in nomophobia levels

Authors	Sample	Females	Males	Statistically Significant
Schwaiger & Tahir [28]	138 undergraduate students from a private university in Lahore, Pakistan	Mean = 88.88 Std. Dev. = 21.5	Mean = 80.41 Std. Dev. = 22.28	Yes
Coenen & Görlich [19]	807 German individuals, predominantly students.	Mean = 62.86 Std. Dev. = 19.15	Mean = 54.17 Std. Dev. = 18.96	Yes
Vagka et al. [26]	1408 young adults aged 18–25 years.	21.2% of women with severe nomophobia.	13% of men with severe nomophobia.	Yes
Pirinçci et al. [22]	2,111 students from Turkey	Mean = 74.11 Std. Dev. = 26.96	Mean = 71.19 Std. Dev. = 25.80	No
Essel [23]	670 university students from Ghana.	Mean = 83.7	Mean = 78.8	No

Source: Own elaboration.

Research conducted by Coenen & Görlich [19] also discovered that females had significantly higher levels of nomophobia than males in the first factor: "Not being able to communicate", as well as in the fourth factor, labeled "Giving up convenience". Similarly, the findings of Moreno-Guerrero et al. [10] in a study conducted with 1,743 students aged 12 to 20 years from the Autonomous City of Ceuta, Spain, indicate that females displayed higher levels of nomophobia than males, specifically in the dimensions of "Not being able to communicate" (Factor 1) and "Giving up convenience" (Factor 4).

Rodríguez-Sabiote et al. [29] identified nomophobic profiles in university students in the field of education. Their findings unveiled three nomophobia profiles. The lowest level of nomophobia is depicted by current master's degree students over 24 years of age; gender was not relevant in this case. A moderate degree of nomophobia is depicted by females in the second year of their bachelor's degree in pedagogy or elementary education and aged 21–24 years. The profile of higher levels of nomophobia is also characterized by female students in the second year of their bachelor's degree in pedagogy or elementary education, but with ages ranging from 17 to 20 years.

On the other hand, other studies have discovered greater nomophobia among males compared to females. For instance, in the work of Jilisha et al. [27], male gender was considerably associated with nomophobia. Also, Daei et al. [30] conducted research with 320 students of diverse educational levels at Isfahan University of Medical Sciences, Iran. Their findings indicated significant statistical differences in terms of the participants' gender and educational level. In that work, men had higher levels of nomophobia. However, no differences were discovered among the various educational programs examined. Moreover, in the analyses conducted by Essel [23], no disparities were found between the scores observed across the diverse educational programs scrutinized—health sciences, sciences, arts and urban environment, engineering, agriculture and natural resources, humanities and social sciences.

3 METHODOLOGY

3.1 Type of study

This is a quantitative, cross-sectional study with explanatory scope.

3.2 Research design

A two-way factorial balanced design was used to determine the effect of educational program and gender on the nomophobia levels of university students. Both genders, male and female, were considered and four undergraduate university academic programs—Administration (A), Foreign Trade (FT), Public Accounting (PA) and Information Technology (IT)—were analyzed.

Two-way factorial design was chosen since two factors—gender, educational program—were of interest to the research team conducting the study on nomophobia. This design allows an interaction effect to be analyzed. Therefore, not only can each factor be examined separately, but also the combined effect of both factors can be studied [31]. Of interest to us was whether gender and academic program have a significant effect on the level of nomophobia as well as the combined effect of the two factors.

3.3 Participants

A total of 320 undergraduate students participated in the study, corresponding to 80 students from each of the four academic programs—40 men and 40 women. The mean age of the females was 20.9 years with a standard deviation of 3.36. The mean age of the males was 21.3 years with a standard deviation of 2.66. The mean academic period (semester) that participants were in at the time of the study was 5 with a standard deviation of 2.5. All students were enrolled and active in the spring term of 2023 at a Mexican public state university.

3.4 Instrument

A Spanish version of the NMP-Q questionnaire was used [32] (See Appendix 1). The electronic questionnaire was designed in Microsoft Forms and the link was shared virtually with participants through Microsoft Teams and face-to-face through QR codes.

3.5 Data analysis

The statistical software Jamovi version 2.3.28 was used for data analysis [33].

First, a confirmatory factor analysis was performed to determine whether the original structure of the instrument could be maintained with the data collected. The following model fit results were obtained: CFI = 0.946, TLI = 0.937, SRMR = 0.039, RMSEA = 0.08 (90% confidence interval: 0.0771–0.0929). In this analysis, it could be seen that all the standardized loadings were between 0.751 and 0.946 and were significant ($p < .001$). Internal consistency was also ascertained and the following composite reliability values ω were obtained for each of the four factors of the NMP-Q questionnaire: Factor 1 = 0.964, Factor 2 = 0.94, Factor 3 = 0.90, Factor 4 = 0.907. With these results, it was determined that the structure of the original instrument could be preserved intact for the present study.

Subsequently, we proceeded to determine whether the statistical assumptions for ANOVA analysis were met. First, the normality of each of the eight subgroups of the design was determined through the Shapiro-Wilk test ($p > .05$) and visual inspection. Homogeneity of variances was determined through Levene's test ($F = 0.248$, $p = 0.973$). These results established the basis for applying the ANOVA test.

Then, a two-way factorial ANOVA test was performed to evaluate the effects of the educational program and gender on the total score of the questionnaire. The p-values obtained from the general table of results were reviewed, and we proceeded to analyze the effect size through the indicators η^2, partial eta squared η^2p and omega squared ω^2, as well as to analyze significant effects through Tukey post-tests and t-tests. Cohen's d indicator was used in the subsequent tests to establish the effect size.

3.6 Standard values adopted in this study

CFI and TLI values greater than 0.90 are considered acceptable [15] and even better when they are greater than 0.95 [34]. The SRMR value is appropriate when it is less than 0.08 [15]. On the other hand, according to Kim et al. [35], an RMSEA value

less than 0.05 indicates a good fit; if it is between 0.05 and 0.08, the fit is acceptable, while if it is between 0.08 and 0.10, the fit is marginal. RMSEA values greater than 0.10 indicate a poor fit.

On the other hand, the composite reliability values ω should be greater than 0.70 [36]. Likewise, to quantify the effect size, the values of Eta squared η^2, partial Eta squared η^2p and ω^2, which indicate effect sizes proportional to their magnitude, are used. According to Field [37], Eta Squared and partial Eta Squared are values that can be interpreted as the variance explained (r^2), with zero being no effect and one being a very strong effect. However, Eta Squared presents a bias as it is not adjusted to estimate the effect size in the population but in the sample. For this reason, ω^2 is used, which in general is a more precise measure that can be interpreted as: 0.01: small effect size, 0.06: medium effect size and 0.14: large effect size.

Cohen's d values of 0.2 indicate a small effect size, while d = 0.5 value represents a medium effect and d = 0.8 value shows a large effect size [38].

Strengths and limitations of research methods. One of the strengths of this work is the use of a two-way factorial design, since it allows the statistical techniques such as ANOVA to be applied, which quantify the effects of the educational program, gender and the interaction of both on the levels of nomophobia. This favors a global understanding of the factors involved. The balanced design is also a strength that enhances the statistical results obtained, minimizes confounding variables, and improves the generalizability of the results in the context of the university studied. Likewise, the study of a single university provides a homogeneous context that reduces external factors that could influence the results.

On the other hand, care must be taken when attempting to generalize the results to a larger population, since the participants belong to a single university. For this reason, it should be considered that the findings could be influenced by the specific and cultural characteristics of the academic programs chosen and of the university context. Another limitation of the study is that the instrument was self-administered. For this reason, there is a risk of biased responses due to social desirability, even when participants were informed about the anonymity of their identity and the privacy of their responses.

4 RESULTS

4.1 Characterization of the presence of nomophobia

Table 5 presents the mean scores collected with the NMP-Q instrument and their respective standard deviations observed in each of the eight groups of participants analyzed. The totals by gender, by academic program and of all the sample data are also presented.

Table 5. Levels of nomophobia according to the NMP-Q questionnaire. Mean values are shown. The standard deviation is in parentheses

	Administration	Foreign Trade	Public Accounting	Information Technology	Total (Gender)
Female	60.4 (27.8)	71.2 (26.9)	77.1 (26.5)	78.8 (25.4)	71.9 (27.4)
Male	61.1 (24.2)	59.6 (24.3)	56.7 (23.6)	72.7 (25.8)	62.5 (25.0)
Total (Academic programs)	60.8 (25.9)	65.4 (26.1)	66.9 (27.0)	75.8 (25.6)	All data 67.2 (26.6)

Source: Own elaboration with results from Jamovi.

Considering the overall score of the NMP-Q questionnaire and the levels of intensity proposed by its creators, only eight students (2.5%) were found with no nomophobia, 117 (36.6%) with a low or mild level of nomophobia, 163 (50.9%) with moderate levels of nomophobia and 32 (10%) with a severe level of nomophobia.

4.2 Evaluation of the effects of educational program and gender on nomophobia

The results of the two-way ANOVA analysis to determine the effects of educational program and gender on nomophobia levels are shown in Table 6. Both factors were significant ($p < .05$), with small effect sizes. The interaction, on the other hand, was not significant at 95% confidence. However, it would be significant at the 90% confidence level. For this reason, we proceed with the analysis of the differences detected both in the two factors and in the interaction of both.

Table 6. Results of the factorial ANOVA analysis

	Sum of Squares	Degrees of Freedom	Root Mean Square	F	p	η^2	η^2p	ω^2
General model	21288	7	3041	4.64	<.001			
Gender	6984	1	6984	10.65	0.001	0.031	0.033	0.028
Educational program	9494	3	3165	4.83	0.003	0.042	0.044	0.033
Gender* Educational program	4809	3	1603	2.44	0.064	0.021	0.023	0.013
Residuals	204591	312	656					

Source: Own elaboration with results from Jamovi.

4.3 Further analysis of differences between educational programs

The differences detected between the educational programs are described in Table 7. These differences are related to the Information Technology program, whose scores were significantly higher than those of Administration and Foreign Trade. The resulting effect sizes are small to medium.

Table 7. Post analysis of differences between educational programs

Comparison		Difference in Averages	Standard Error	Degrees of Freedom	t	p Tukey	Cohen's d
Educational Program	Educational Program						
Administration	Information technology	−15.04	4.05	312	−3.714	0.001	−0.5872
Foreign trade	Information technology	−10.39	4.05	312	−2.566	0.05	−0.4056

Source: Own elaboration with results from Jamovi.

Further analysis of gender differences. Regarding the difference between male and female genders, significant statistical differences were found (mean

difference = 9.34, standard error = 2.86, t(312) = 3.26, p Tukey = 0.001, d = 0.365), as female scores were higher than male scores. The effect size obtained is small to medium.

Subsequent analysis of the interaction between educational program and gender. The significant interactions are shown in Table 8. The analyses evidenced that most of the differences are related to the high scores registered by females and, especially, those belonging to the IT and PA educational programs. The contrasts indicate that IT and PA women had the highest scores, while A, PA and FT men registered the lowest scores. Effect sizes that tend to be medium to large are observed in the differences analyzed.

Table 8. Post-hoc analysis of significant interactions

Genre	Ed. Prog.	Genre	Ed. Prog.	Difference in Averages	Standard Error	Degrees of Freedom	t	p Tukey	d Cohen
Female	Ad	Female	IT	–18.475	5.73	312	–3.22	0.030	–0.721
Female	PA	Male	FT	17.500	5.73	312	3.05	0.049	–0.683
Female	PA	Male	PA	20.450	5.73	312	3.57	0.010	0.798
Female	IT	Male	A	17.725	5.73	312	3.096	0.044	–0.692
Female	IT	Male	FT	19.225	5.73	312	3.357	0.020	–0.750
Female	IT	Male	PA	22.175	5.73	312	3.873	0.003	–0.866

Source: Own elaboration with results from Jamovi.

5 DISCUSSION

5.1 Interpretation of the results and comparison with the literature

The results of this study shed light on several noteworthy facets of nomophobia in undergraduate students. As per the obtained characterization, the category with the highest number of students falls under “moderate nomophobia”, followed by “mild or low nomophobia” and “severe nomophobia”. In this respect, the results are akin to those of Tuco et al. [24], Gunay Molu et al. [25], Vagka et al. [26] and Jilisha et al. [27]. It is also worth mentioning that the overall mean score on the NMP-Q indicates a moderate level of nomophobia, as reported by Ahmed [7] and Pirinçci et al. [22].

Another significant finding is the variation in levels of nomophobia across different educational programs. Students enrolled in the information technology (IT) program manifest higher degrees of nomophobia compared to their counterparts in the Administration (A) and foreign trade (FT) educational programs. This discrepancy suggests that the educational curriculum’s nature and technological exposure within the information technology (IT) program may serve as factors that promote increased levels of nomophobia. These results do not align with those of Daei et al. [30] and Essel et al. [23] who found no differences between the educational programs they analyzed. In the present research, the data underscore the importance of considering the unique characteristics of each educational program when addressing nomophobia among undergraduate students.

An additional finding concerns the variation in nomophobia levels in relation to gender. Female students report higher levels of nomophobia than male students in the overall score. The results coincide with the findings of Arpaci [39], Schwaiger & Tahir [28], Coenen & Görlich [19], Moreno-Guerrero et al. [10], Rodríguez-Sabiote et al. [29],

but differ from the results reported by Daei et al. [30] and Jilisha [27]. The gender differences observed in this study suggest the need for targeted interventions to support psychological responses to technology among the student population.

Similarly, in the context of this study, an interaction effect emerged between educational programs and gender. Female students in the information technology (IT) and public accounting (PA) programs exhibit the highest levels of nomophobia, while male students in the administration (A), public accounting (PA) and foreign trade (FT) programs manifest the lowest levels. This interaction implies that certain programs may amplify gender disparities in nomophobia.

In the incidence of high levels of nomophobia, some tendencies can be appreciated, such as being female and studying careers with a high technological emphasis. The congruence of our results with the existing literature suggests the robustness of our findings within the broader nomophobia discourse. However, the novel aspect of our study lies in the exploration of specific academic programs as contributing factors to nomophobia levels, a dimension often overlooked in previous research. The cultural aspects of the context in which this work was conducted and the particularities of the academic programs studied could influence the discrepancies of our findings with previous work.

5.2 Further reflections on the possible reasons underlying the findings of this paper

Students enrolled in the IT educational program scored the highest in nomophobia. This may be due to the fact that they are the most technologically immersed of all the students at the university where this research was conducted. IT students are characterized by being assiduous users of technology for all their activities. This would imply a greater use and dependence on their cell phones. However, more research is needed to determine this.

Females, on the other hand, had the highest nomophobia scores. This may be because they use their telephone to communicate more with their family and friends. This may be due to social reasons or for prevention, since there is a climate of citizen insecurity where they live, which could lead them to become victims of crime.

Regarding the interaction effect, the increased levels of nomophobia among female students in IT and AP programs may be attributed to the combined effect of gender and the greater reliance on technology in these fields, potentially exposing students to higher levels of dependence factors related to mobile devices. Conversely, the lower levels among male students in the Administration, Public Accounting and Foreign Trade programs may reflect varying degrees of technology integration within these disciplines, potentially fostering a more balanced and less anxiety-, or dependency-inducing relationship with mobile devices.

5.3 Implications

These results can guide universities in devising intervention strategies and support services to effectively address the complex interaction between the specific demands of each educational program and gender-related psychological responses to technology.

The implications of this study underscore the necessity for universities to adopt proactive measures to foster healthy technology utilization among the student body.

By acknowledging the influence of educational programs and gender on nomophobia, institutions can develop targeted interventions, workshops, and awareness campaigns that cater to the diverse needs of various student subgroups. In addition, future research could delve deeper into the psychological mechanisms underlying nomophobia and explore the potential influence of sociocultural factors on these tendencies.

For example, in the case of female students in technology-intensive programs, tailored workshops and awareness campaigns could be organized to address and manage nomophobia. Similarly, for male students in disciplines with lower levels of nomophobia, the development of balanced technology strategies for maintaining a healthy relationship with mobile devices could be encouraged. Specific support initiatives in academic programs should consider the unique challenges posed by the integration of technology across disciplines by providing specific resources to alleviate nomophobia-related stress.

In addition, the identification of these patterns establishes precedents for the continuous monitoring of individual well-being and regular feedback mechanisms that provide valuable information for educational institutions to adapt their student support structures. These results highlight the need for a holistic approach to student support services, recognizing the interaction of academic programs and gender in pursuing their technological well-being.

5.4 Strengths, limitations and future perspectives

The strengths of this study lie in its methodological rigor, in particular the use of a two-way balanced factorial design, which allowed a statistical ANOVA test of the influence of educational programs, gender and the interaction of both on the levels of nomophobia among undergraduate students. These strengths contribute to increase the internal validity of the study.

Nonetheless, the study also has limitations. The cross-sectional nature of this research design limits the establishment of causal relationships between educational programs, gender, and nomophobia. Accordingly, further research is also necessary to establish links between other variables and the presence of nomophobia. Longitudinal studies could furnish a more comprehensive understanding of the evolutionary trajectories of technological fear and anxiety. In addition, the present study focused only on quantitative measures, which limit the depth of knowledge of students' experiences related to nomophobia. The incorporation of qualitative and mixed methods perspectives in future research would provide a deeper understanding of the subjective aspects of nomophobia, capturing students' experiences and perceptions. Thus, we highlight the need to work with a multifaceted approach that combines quantitative rigor with qualitative depth in future work to enrich the understanding of nomophobia.

6 CONCLUSIONS

In an era characterized by pervasive technological connectivity, the phenomenon of nomophobia has emerged as a social concern, particularly among undergraduate students whose lives are characterized by multiple digital activities. This study addressed nomophobia within the university milieu, examined its prevalence, and explored the influence of educational programs and gender differences.

The results ascertained that students in each educational program exhibit different levels of nomophobia. Students in the IT program recorded the highest levels, while gender differences manifested higher levels of nomophobia among female students. The interaction between the two factors highlighted the complex interplay between the specific demands of each program and gender-related responses to technology.

As institutions of higher education endeavor to promote the holistic well-being of the student populace, this research proposes targeted interventions. Universities can tailor their strategies to address the diverse profiles of nomophobia observed among various scholar subgroups. Through adopting proactive measures, universities can cultivate a harmonious rapport with technology and facilitate the emotional well-being of students.

This study contributes to the understanding of nomophobia and furnishes insights that can steer academic institutions as well as educators and researchers. Other forthcoming studies encompassing longitudinal studies and qualitative explorations may deepen the understanding of nomophobia and its complex psychological underpinnings. As long as students continue to navigate complex digital scenarios on a daily basis, research that seeks their emotional well-being and initiatives that foster healthy interactions with technology will remain pertinent and justified.

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8 APPENDIX

Appendix 1: Spanish translation of the NMP-Q questionnaire originally published in English.

Factor	Question Id	Question
1. Incapacidad de comunicarse	P10	Me siento nervioso/a al no poder comunicarme instantáneamente con mi familia y/o amigos.
	P11	Me preocupa que mi familia y/o mis amigos no puedan ponerse en contacto conmigo.
	P12	Me pongo nervioso/a cuando no puedo recibir mensajes ni llamadas.
	P13	Me siento nervioso/a al no poder ponerme en contacto con mi familia y/o amigos.
	P14	Me pongo nervioso/a al pensar que alguien ha intentado contactar conmigo y no ha podido.
	P15	Me siento nervioso/a al no tener mi conexión constante con mi familia y amigos.
2. Pérdida de conectividad	P16	Me pongo nervioso/a cuando estoy desconectado de las redes sociales.
	P17	Me siento incómodo/a al no poder estar al día en las redes sociales.
	P18	Me siento incómodo porque no puedo ver las notificaciones y actualizaciones de mis contactos y redes sociales.
	P19	Me inquieta no poder comprobar mi correo electrónico.
	P20	Si no tengo mi smartphone: Me siento incómodo porque no sé qué hacer.
3. Incapacidad de acceder a la información	P1	Me siento incómodo/a si no dispongo de acceso constante a información a través de mi smartphone.
	P2	Me molesta si quiero buscar información en mi smartphone y no puedo hacerlo.
	P3	Me pongo nervioso/a cuando no puedo acceder a las noticias (ej. actualidad, el tiempo, etc.) a través de mi smartphone.
	P4	Me molesta no poder utilizar mi smartphone y/o sus aplicaciones cuando yo quiera.
4. Renuncia a la conveniencia	P5	No me gusta la idea de que se agote la batería de mi smartphone.
	P6	Me preocupa quedarme sin saldo o excederme en la tarifa mensual de datos.
	P7	Si no dispongo de señal de datos o si no puedo conectarme a través de wifi, compruebo constantemente la señal o trato de encontrar una red wifi a la que poder conectarme.
	P8	Si no puedo utilizar mi smartphone, me da miedo quedarme tirado en cualquier parte.
	P9	Cuando no miro mi smartphone durante un tiempo siento la necesidad de hacerlo.

Source: Adapted from [32].

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