Volumen 19
Número 2
ISSN-impreso 1390-7581
ISSN-digital 2661-6742
Revista Eugenio Espejo

Mobile device dependence and internalizing problems in Ecuadorian university students

Dependencia al dispositivo móvil y problemas internalizados en estudiantes universitarios ecuatorianos

https://doi.org/10.37135/ee.04.23.04

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Received: january 06, 2025 **Accepted**: march 14, 2025

ABSTRACT

This research analyzed the relationship between mobile device dependence and internalizing problems in Ecuadorian university students, identifying differences based on gender, time spent using cell phones, and demographic characteristics. A quantitative, analytical, descriptive, explanatory, and cross-sectional study was conducted. The study sample consisted of 3,203 university students based on a non-probability sample. 37.7% were men, and 64.3% were women, with a mean age of 21.50 years. The TDM cell phone dependence test and the GADS anxiety and depression scale were administered. The study found that cell phone dependence among university students is moderate, manifesting through symptoms such as withdrawal, tolerance, and impulse control difficulties. A strong correlation was observed between problematic cell phone use and an increase in anxiety and depression. Furthermore, mobile dependence had a significant impact on internalizing disorders, and differences were identified based on gender and time of cell phone use. Implementing programs that prevent, and curb problematic mobile phone use is recommended.

Keywords: Psychological Dependence, Mobile Devices, Depression, Anxiety

RESUMEN

El objetivo de esta investigación fue analizar la relación entre la dependencia al dispositivo móvil y los problemas internalizados en estudiantes universitarios ecuatorianos, identificando las diferencias

ISSN-impreso 1390-7581
ISSN-digital 2661-6742

de género, el tiempo dedicado al uso del celular y características demográficas. Se realizó un estudio cuantitativo, analítico, descriptivo, explicativo y trasversal. La muestra de estudio fue de 3203 estudiantes universitarios a partir de un muestreo no probabilístico. El 37,7 % fueron hombres y el 64,3 % mujeres con una media de 21,50 años. Se aplicó el test de dependencia al celular TDM y la escala de ansiedad y depresión GADS. El estudio encontró que la dependencia al celular entre estudiantes universitarios es moderada, manifestándose a través de síntomas como abstinencia, tolerancia y dificultades en el control de impulsos. Se observó una fuerte correlación entre el uso problemático del móvil y un aumento en la ansiedad y la depresión. Además, la dependencia al dispositivo móvil tuvo un impacto significativo en los trastornos internalizados, y se identificaron diferencias en función del género y el tiempo de uso del celular. Se recomienda implementar programas que prevengan y detentación del uso problemático del móvil.

Palabras Clave: dependencia psicológica, dispositivos móviles, depresión, ansiedad

INTRODUCTION

The wide availability and variety of mobile phone services have significantly increased the use of these devices, making them essential for adolescents and young people.[1] This phenomenon is because mobile telephony has evolved, giving access to a wide range of content and services that facilitate communication and availability of information;[2] however, excessive use of mobile phones can lead to problems such as dependence or addiction.[3] Different researchers[4–6] indicate that this dependence is conceptualized as a behavioral addiction, similar to non-chemical addictions such as gambling addiction.

Based on what was mentioned before, excessive cell phone use is a behavioral addiction, as it negatively impacts the emotional and social well-being of those affected.[7] Young people who have this addiction often postpone or abandon important activities, experience anxiety when separated from their phones, and ignore warnings about excessive use.[8,9]

Similarly, the level of mobile device use considered problematic or indicative of possible addiction is often related to daily usage time. Some studies[10–12] have identified cell phone use for more than four hours a day as an indicator of problematic use or addiction. On the other hand, those who use their cell phone for less than this amount of time tend to have a lower risk of developing problems related to device use, as its use is less likely to interfere with their responsibilities and relationships significantly.

Several studies[1,9,13,14] highlight that the symptoms of problematic mobile phone use are similar to those of substance use, such as tobacco or alcohol, suggesting a significant prevalence of this addiction. For example, Carbonell et al.[13] indicated that excessive mobile phone use can cause symptoms such as sleep problems and deterioration in family relationships. Furthermore, de la Villa Moral and Suárez [15] showed a high prevalence of problematic mobile phone use in Spanish adolescents.

ISSN-impreso 1390-7581
ISSN-digital 2661-6742

Villagómez et al.[16] found that more than 50% of university students hamoderate mobile device dependence in Ecuador. However, studies on this topic are scarce in the Ecuadorian population.

Regarding gender differences in cell phone addiction, there is no definitive consensus on whether men or women are more likely to develop this dependence. Espinoza and Chávez[17] suggest that men use cell phones primarily for social media. On the other hand, Zahinos and Olivella-Cirici[18,19]found that women are more prone to problematic cell phone use. For Choliz, Villanueva, and Choliz,[20] women use their cell phones more to cope with unpleasant moods. One factor that emerges as an indicator of problematic use is frequent cell phone use. However, Kilmenko et al.[21] did not identify significant gender differences in this behavioral addiction.

Furthermore, regarding the mental health consequences of mobile device addiction, it has been observed that excessive use of these devices can be linked to symptoms of anxiety and depression.[13] These problems, known as internalizing problems, refer to people's tendency to direct their emotions and conflicts inward, which can manifest as anxiety and depression.[22,23] Some research[24,25] has shown that women are more likely to experience these problems than men.

Zabala-Romero[26] found that women tended to have a more pronounced addiction to mobile device use compared to men and also experienced a more significant number of anxiety problems related to this excessive use. However, Bueno-Brito et al.[27] found no gender differences. Still, they showed that a group of Mexican students with mobile phone addiction were 2.57 times more likely to suffer from depression, 2.50 times more likely to experience anxiety, and 3.34 times more likely to suffer from stress compared to those without this addiction.

The findings indicate that mobile phone addiction is linked to mental disorders in university students. It is essential to understand how demographic factors such as age, gender, and cultural context influence mobile device use and its impact on mental health. Therefore, researching these variables is essential to develop more effective and culturally adapted interventions. In this context, the main objective of this study was to analyze the relationship between mobile device addiction and internalizing problems in Ecuadorian university students, considering gender differences, time spent using cell phones, and demographic characteristics.

MATERIALS AND METHODS

The study adopted a quantitative, non-experimental, descriptive, analytical, explanatory, and cross-sectional approach. Non-probability snowball sampling was considered, including 3,203 students between 18 and 36 enrolled in the 2023 academic year at three public universities in Ecuador. Participants were contacted and informed about the details of the study, providing their informed consent. The psychological instruments were digitized, ensuring that there was no sample manipulation. Data collection was carried out using two specific instruments:

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ISSN-digital 2661-6742

The Ecuadorian version of the Cell Phone Dependence Test (CDT) assesses three dimensions: withdrawal and tolerance (α=0.88), abuse and difficulty controlling impulses (α=0.83), and problems resulting from excessive use (α=0.74). The test's overall reliability is high, with a coefficient of 0.92. [28] The TDM framework consists of 22 items answered on a five-point Likert scale, ranging from 0 (never) to 4 (always). Dependence levels are classified as low (5th to 25th percentiles), moderate (30th to 70th percentiles), and high (75th to 90th percentiles).

The Goldberg Anxiety and Depression Scale (GADS) is a psychological assessment tool designed to differentiate and measure the intensity of anxiety and depression in individuals.[29] This scale is adapted for the Ecuadorian population.[30] and consists of two subscales, each with nine questions: one for anxiety (questions 1-9) and another for depression (questions 10-18). The first four questions of each subscale act as a filter to determine whether it is necessary to answer the remaining questions. The questionnaire is hetero-administered and allows not only to guide the diagnosis of anxiety or depression but also to discriminate between both disorders and measure their respective intensities. The cut-off points for identifying anxiety and depression problems are set at four or more affirmative answers, with higher scores indicating greater severity of the problem. The GADS has proven to be a reliable instrument, with a Cronbach's alpha of 0.89, and shows high convergence with scales measuring depression (r = 0.92) and anxiety (r = 0.85).

A database was created using SPSS statistical software, version 25. Frequencies were used to analyze categorical variables, while quantitative variables were evaluated using measures of central tendency and dispersion.

Student's t-test was used to determine the differences between the means of the sample characteristics related to mobile device dependence and internalizing problems. Pearson's correlation was also used to examine the relationship between mobile device dependence and anxiety and depression. Simple linear regression was also performed to identify how mobile device dependence influences anxiety or depression. The study was approved by the relevant authorities of the institutions involved and was intended exclusively for scientific and academic purposes. It was conducted following the Declaration of Helsinki and received approval from the University of Extremadura's Doctorate in Psychology (R014). Authorization for data collection was also obtained, as detailed in Official Document 0061DCEHT-UNACH 2023 and Official Document No. 0031-DFI-UNACH-2023.

RESULTS

The study sample comprised 64.3% women and 35.7% men, with an average age of 21.5 years (δ = 2.82). Regarding cell phone use, 48.9% of participants reported using it for more than three hours daily. The sample included students from three public universities, predominantly those from middle socioeconomic classes (84.8%), followed by 15.2% from lower socioeconomic levels and only 2% from upper socioeconomic levels. Geographically, 70% of participants came from urban areas, while 30% were

ISSN-impreso 1390-7581
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from rural areas, indicating more excellent urban representation. Most ethnically identified as mestizo (88.7%), in line with national demographics.

Table 1. Factors and levels of mobile device dependence

Factors	Low Dependency		Medium Dependency	
	f	%	f	%
Abstinence and tolerance	1354	42.3	1848	57.7
Abuse and difficulty controlling impulses	2124	33.7	2124	66.3
Problems arising from excessive use	1480	46.2	1722	53.8
Full-scale	1229	38.3	1973	61.6

The total score on the Mobile Phone Dependence Test (MPDT) revealed a predominance of moderate dependence (61.6%) among the participants in the study sample, with no high levels detected. More than 50% of those tested exhibited symptoms of cell phone dependence, such as withdrawal and tolerance, abuse and difficulty controlling impulses, as well as problems arising from excessive use (see Table 1).

Table 2. Sample characteristics and cell phone dependence

Sample characteristics		**Cell phone addiction**		***t***	***p***
		M	*SD*		
Gender	Women	41.30	7.83	5.06	0.584
	Man	42.10	7.91		
Cell phone use	≤ 3 hours	46.70	11.10	15.2	<0.001
	≥ 3 hours	49.50	12.20	0	
Socioeconomic level	Low	39.20	9.10	3.20	0.158
	Half	38.90	8.70		
Geographical area	Rural	37.20	11.00	4.10	0.14
	Urban	38.10	10.90		
Age	≤ 20 years old	31.30	9.20	4.50	0.192
	≥ 20 years old	31.70	9.30		

Student 's t-test ; p = significance; SD: standard deviation

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ISSN-digital 2661-6742

Table 2 analyzes cell phone dependence and the characteristics of the sample, showing that cell phone use is the only factor with a significant difference. Participants who use their cell phone three or more hours a day show greater dependence (M = 49.5, SD = 12.2) compared to those who use it less than 3 hours (M = 46.7, SD = 11.1), with $p < 0.001$. In contrast, no significant differences were observed in cell phone dependence based on gender, socioeconomic level, geographic area, or age, suggesting that these factors do not determine cell phone dependence in this sample.

Table 3. Sample characteristics and internalizing problems

Sample characteristics		**Anxiety**				**Depression**			
		M	*SD*	*t*	*p*	*M*	*SD*	*p*	*p*
Gender	Woman	8.30	6.30	15.3	<0.001	5.4	3.7	12.3	<0.001
	Man	6.70	5.70			3.2	3.5		
Use of the cell phone	≤ 3 hours	6.70	6.20	13.40	<0.001	4.20	4.10	11.5	<0.001
	≥ 3 hours	8.10	6.80			4.90	4.30		
Socioeconomic level	Low	6.10	4.90	3.20	0.14	4.90	3.10	3.2	0.584
	Half	6.40	4.60			5.10	3.70		
Geographical area	Rural	7.20	6.20	0.52	0.24	4.30	3.30	4.1	0.14
	Urban	7.30	6.70			4.10	3.30		
Age	≤ 20 years old	7.40	6.50	1.24	0.19	3.10	3.10	2.1	0.192
	≥ 20 years old	7.60	6.30			3.30	3.10		

Student 's t-test; p = significance; SD: standard deviation

Table 3 shows that gender and cell phone use are significant factors in anxiety and depression levels. Women and people who use their cell phones for three or more hours a day have higher levels of anxiety and depression. On the other hand, no significant differences in anxiety and depression levels are observed concerning socioeconomic status, geographic area, or age, indicating that these factors do not have a noticeable impact on this specific sample.

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Table 4. Correlation between cell phone dependence and internalizing problems

	Anxiety	***Depression***
Abstinence and tolerance	32.4**	21.1**
Abuse and impulse control difficulties	22.2**	24.1**
Problems arising from excessive use	31.7**	19.1**
Full-Scale	33.4**	21.5**

** Correlation values with statistical significance

Table 4 shows a correlation between the variables, indicating that withdrawal and tolerance factors, as well as problems stemming from excessive cell phone use, are associated with internalizing problems such as anxiety and depression, with a p-value below 0.05. However, abuse and impulse control difficulties were not associated with these internalizing problems.

Table 5. Linear regression between mobile device dependence and internalized problems

Model	R^2	*F*	*β*	*B*	*t*
1. TDM - Anxiety	,15	98.3	,78	,28	12.94
2. TDM- Depression	,12	66.9	,15	,23	9.94

Note. R2 = coefficient of determination; F = ANOVA; β = Unstandardized beta coefficient; B = Standardized beta coefficient; t = t-test

Linear regression models (Table 5) indicate that anxiety and depression are related to mobile dependence. Anxiety explains 15% of the variability in dependence, with a strong positive relationship (β = 0.78) and statistical significance (t = 12.94). Depression explains 12% of the variability, with a weaker positive relationship (β = 0.15) and significance (t = 9.94). Both models are statistically significant, but anxiety has a stronger impact on mobile dependence.

DISCUSSION

This research highlights moderate mobile device dependence among university students, reflecting a worrying trend, as other research has shown.[28,31,32]

Although this study did not identify a high level of dependence, mobile phone use is already considered problematic due to the presence of symptoms such as tolerance and withdrawal. These symptoms indicate that students not only prolong their device use but also experience discomfort when they

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cannot access it.[31] This dependence on mobile phones presents the need to increase the dose to obtain the same effect (tolerance) and discomfort or anxiety when use is interrupted (abstinence).[33–35] Furthermore, difficulty controlling impulses while using the device suggests that students may face more significant challenges regulating their behavior, which can exacerbate existing problems and create new conflicts in their daily lives.[36]

These results are consistent with other studies[10–12], which indicate that people who use their mobile devices for more than three hours a day tend to develop a higher level of dependence. This suggests a direct relationship between the time spent using a cell phone and the level of dependence that develops.

However, no gender differences were found concerning mobile device addiction. This information agrees with the study by Kilmenko et al.[21], which indicates that both male and female students face similar challenges regarding the excessive use of technology. This could be related to cultural and social factors that equitably influence access and use of mobile devices between genders. In Ecuador, as in other countries, smartphones have become essential tools for communication, access to information, and entertainment, which could explain why both genders have similar levels of addiction.

Furthermore, it was determined that both gender and cell phone usage time are essential factors influencing anxiety and depression levels. In particular, women had higher levels of internalizing disorders. These results are consistent with other studies.[24,37] who have stated that women have experienced more significant problems in their mental health, presenting symptoms of anxiety and depression.

Women's vulnerability to anxiety and depression is due to an interaction of genetic, psychological, and social factors. Genetically, they may have a greater hereditary predisposition to these disorders. (38)Psychologically, socialization to be more emotionally expressive can increase introspection and pressure to meet social expectations, increasing stress. Socially, they face gender inequalities, violence, and a disproportionate burden of responsibilities, which contribute to chronic stress and mental health problems exacerbated by pressure from social media to maintain an idealized image.[39]

Cell phone use time and internalizing problems also align with other research (40,41)that suggests prolonged screen time can interfere with sleep, negatively impacting mood and mental health. Additionally, heavy social media use can lead to unfavorable social comparisons and decreased self-esteem, which contribute to anxiety and depression.[21,24]

Similarly, an association was identified between mobile device dependence and internalizing problems. This suggests that as mobile device dependence increases, so do internalizing problems such as anxiety and depression. [11,19,26,42]

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Finally, the results of the simple linear regression analysis indicated that mobile device dependence has a more significant impact on anxiety levels, while its effect on depression is moderate. This is consistent with the study by Bueno-Brito et al.[27], who determined that students with smartphone addiction are more likely to experience symptoms of anxiety and depression.

Research suggests that mobile phone dependence significantly impacts participants' anxiety levels, possibly due to withdrawal and tolerance symptoms that result when the individual cannot access the device.[25,27] Anxiety can be both a cause and a consequence of excessive mobile phone use, creating a cycle where the device is used to relieve anxiety but also contributes to its increase[43]. Additionally, factors such as constant connectivity, social pressure from social media, and sleep disruption, which are familiar with excessive mobile device use, may be linked to higher levels of anxiety.[28]

Although this research showed that the impact of depression is less than on anxiety, it is still relevant. This could be because excessive cell phone use can lead to social isolation[44] and problems in various areas of an individual's life, such as social, family, work, and education[43]. In other words, cell phone dependence can create a negative cycle in which the device is used to escape feelings of depression, but excessive use can intensify these feelings.

The limitations of this study include its exclusively qualitative approach, which suggests the need for mixed-method research to gain a more detailed understanding of the dynamics of excessive cell phone use. Furthermore, social desirability represents another limitation, as students' responses may be influenced by the desire to provide socially acceptable answers. Finally, the cross-sectional nature of this study makes it advisable to conduct longitudinal research to allow for more comprehensive follow-up and better understand the long-term effects of excessive smartphone use.

This study contributes significantly by highlighting how the academic challenges faced by college students can lead to mental health problems, such as depression and anxiety. These problems, in turn, are linked to excessive cell phone use, which can further exacerbate their emotional well-being. By identifying this connection, the study underscores the importance of addressing academic problems and using technology to improve students' mental health. Furthermore, it provides a basis for developing interventions that promote a more balanced use of mobile devices, which is crucial for preventing addiction and its negative effects.

CONCLUSION

Mobile device dependence was classified as moderate, showing symptoms of tolerance, withdrawal, impulse control difficulties, and problems associated with excessive cell phone use. Significant differences were found based on gender and hours of cell phone use, with an increase in internalizing problems. A significant correlation was also identified between internalizing problems and cell phone

ISSN-impreso 1390-7581
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dependence, indicating that the greater the dependence, the more intense the internalizing difficulties. Anxiety showed a more significant effect on cell phone dependence, while depression had a more minor but equally significant effect. These findings underscore the importance of addressing both cell phone dependence and associated mental health problems to mitigate their negative effects.

Funding: the research was self-funded

Conflicts of interest: There are no conflicts of interest

Contribution Statement: Mayra Elizabeth Castillo Gonzales conducted the entire research process, collected updated scientific information, and wrote the article.

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