REVISTA INVECOM
ISSN en línea: 2739-0063

Association between internet usage time and anxiety in graduate education

Asociación entre el tiempo de uso de internet y la ansiedad en la educación de posgrado

Received: 25/05/2026 - **Accepted:** 07/08/2026

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Abstract

The growing use of the Internet in graduate education has heightened interest in its potential links to mental health. However, time spent online does not in and of itself equate to problematic use; therefore, its significance must be assessed in relation to study conditions and emotional well-being. In this context, the present study aimed to examine the association between daily Internet use and anxiety levels among master's students at the National University of the Altiplano in Puno, Peru. To this end, a quantitative, observational, analytical, and cross-sectional methodology was applied to 393 master's students selected through non-probability convenience sampling. Internet use was classified as less than 3, between 3 and 4, and more than 4 hours per day, while anxiety was measured using the DASS-21 subscale; data were analyzed using Pearson's chi-square test and Cramér's V. The results showed that 37.9% of the participants reported more than four hours of daily screen time, and 67.4% exhibited some level of anxiety. A significant association was found, $\chi^2(8) = 42.80$, $p < 0.001$, $V = 0.233$, with a non-monotonic pattern in which mild and

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moderate anxiety predominated in the 3- to 4-hour group, while severe anxiety prevailed among those who exceeded four hours. It is concluded that daily Internet use is associated with the distribution of anxiety levels, although this does not prove causality or the presence of problematic use.

Keywords: anxiety, graduate students, Internet use.

Resumen

La expansión del uso de Internet en la formación de posgrado ha intensificado el interés por sus posibles vínculos con la salud mental. Sin embargo, el tiempo de conexión no equivale por sí mismo a un uso problemático, por lo que su significado debe evaluarse en relación con las condiciones de estudio y el bienestar emocional. En este contexto, el presente estudio tuvo como objetivo examinar la asociación entre el tiempo diario de uso de Internet y los niveles de ansiedad en estudiantes de maestría de la Universidad Nacional del Altiplano en Puno, Perú. Para ello, se aplicó una metodología cuantitativa, observacional, analítica y transversal en 393 maestrandos seleccionados mediante un muestreo no probabilístico por disponibilidad. El tiempo de uso se clasificó en menos de 3, entre 3 y 4, y más de 4 horas diarias, mientras que la ansiedad se midió con la subescala DASS-21, analizando los datos mediante la prueba chi-cuadrado de Pearson y V de Cramér. Los resultados mostraron que el 37,9 % de los participantes reportó más de cuatro horas diarias de conexión y el 67,4 % presentó algún nivel de ansiedad. Se encontró una asociación significativa, $\chi^2(8) = 42{,}80$, $p < 0{,}001$, $V = 0{,}233$, con un patrón no monotónico donde la ansiedad leve y moderada predominó en el grupo de 3 a 4 horas, mientras que la severa prevaleció en quienes superaban las cuatro horas. Se concluye que el tiempo diario de uso de Internet se asocia con la distribución de los niveles de ansiedad, aunque esto no demuestra causalidad ni la presencia de un uso problemático.

Palabras clave: ansiedad, estudiantes de posgrado, uso de Internet.

Introduction

Digital connectivity has become an irreversible fixture of university students' study habits, communication, work, and leisure. At the graduate level, the Internet underpins literature searches, participation in virtual classrooms, the coordination of professional activities, and communication with instructors and peers (Real & Guevara Tirado, 2025). This academic utility, however, coexists with patterns of sustained connection that can crowd out rest, fragment attention, or foster repeated exposure to content and social demands. Any analysis of the relationship between Internet use and mental health must therefore steer clear of two extremes: attributing negative effects to all digital activity, on one hand, and disregarding the fact that certain usage patterns are linked to psychological distress, on the other (Domínguez, 2024).

Anxiety is an emotional response marked by anticipatory worry, physiological arousal, and a heightened perception of threat. When symptoms are frequent or intense, they can impair academic performance, sleep, social interaction, and overall quality of life (Muñoz, 2025). Anxiety disorders rank among the most prevalent mental health problems, and the digital environment has introduced potentially relevant contributing factors, including constant availability, pressure to respond immediately, social comparison, and information overload (Alarcón et al., 2023; Chui & Valdivia, 2023). These factors do not operate in isolation but interact with personal characteristics, academic demands, support networks, and socioeconomic conditions.

Recent literature has documented associations between problematic or intensive Internet use and higher levels of anxiety, stress, depression, and social anxiety. Among university students, cyberostracism and the pursuit of approval in virtual spaces can heighten feelings of exclusion and encourage compensatory connection (López-Ráez et al., 2025). Prolonged digital exposure has also been reported to interfere with sleep quality and the balance among academic, social, and self-care activities, processes

closely tied to emotional well-being (Chen et al., 2023; Chu & Li, 2022; Rodríguez-Sáez et al., 2025). These associations, however, are heterogeneous and do not warrant assuming a single causal direction.

A distinction must be drawn among duration of use, intensive use, and problematic use. Time spent connected is a purely descriptive indicator that says nothing on its own about loss of control, functional impairment, interference with responsibilities, or withdrawal symptoms. An individual may spend many hours on academic, work-related, or caregiving activities without this amounting to a clinical problem. Conversely, even a modest amount of connection time can be dysfunctional if it stems from avoidance, isolation, or an inability to regulate one's own behavior. This conceptual distinction is particularly relevant at the graduate level, where virtual participation is often a structural requirement of the training itself.

In Peru, mental health problems among young people have gained greater visibility. The National Youth Secretariat reported that 32.3% of individuals aged 15 to 29 had experienced some form of mental health or emotional problem during the twelve months preceding the survey, with sex-based differences pointing to the need for approaches sensitive to disparities in well-being (Senaju, 2023). At the same time, the Ministry of Health has reported substantial demand for counseling related to mood and anxiety problems among young users of its support services (Ministerio de Salud del Perú [Minsa], 2025). While these figures cannot be used to infer the state of any specific university community, they underscore the value of generating local, context-specific evidence.

Public discourse tends to link hyperconnectivity to the fear of missing out on relevant experiences, comparison with idealized lifestyles, and constant exposure to notifications. Research with adolescent and university populations has suggested that emotional regulation, digital literacy, social support, and sleep quality can all shape this relationship (Chachapoya et al., 2025; Kiviruusu, 2024; Zhang et al., 2026). From this standpoint, simply recommending an across-the-board reduction in screen time is not enough; what matters is understanding the purpose of use, the context in which connection occurs, and its perceived interference with everyday life.

Graduate students at public universities constitute a population of particular interest. Many juggle their studies with employment, family responsibilities, and commuting, so the Internet can function simultaneously as an indispensable academic resource and as a space into which obligations spill over. The accumulation of assignments, after-hours connectivity, and the need to remain constantly available can heighten this subjective burden. Even so, evidence specific to this population in southern Peru remains scarce, which complicates the design of university interventions tailored to local conditions.

Against this backdrop, the present study set out to examine the association between daily Internet use and anxiety levels among master's students at the National University of the Altiplano. The working hypothesis was that the distribution of anxiety levels differs across categories of Internet use. The study does not aim to establish that Internet use causes anxiety, nor does it attempt to diagnose Internet addiction; rather, it seeks to provide an empirical description capable of guiding well-being promotion efforts, early detection, and future longitudinal research.

Methodology

This study followed a quantitative approach, with an observational, analytical, cross-sectional design. The quantitative approach was chosen because the variables of interest were operationalized through categories and scores that allowed their distribution to be described and their statistical independence to be tested. The observational nature of the design reflects the fact that neither digital exposure nor anxiety levels were manipulated; the analytical component was aimed at assessing the association between the two constructs; and measurement took place at a single point in time, consistent with the methodological principles of cross-sectional designs (Hernández Sampieri et al., 2014).

The reference population comprised students enrolled in various master's programs at the National University of the Altiplano, Puno, Peru. The analytic sample consisted of 393 participants selected through non-probability convenience sampling. Recruitment took place cross-sectionally among accessible

graduate students during the data collection period. Given the nature of the sampling procedure, no quotas or proportional allocation by program or faculty were established, so participation from each academic unit depended on students' availability and voluntary consent. This feature limits the extent to which the results can be generalized proportionally to the full set of the university's master's programs.

Inclusion criteria were being enrolled in a master's program during the data collection period, being 18 years of age or older, and answering the Internet use and anxiety items in full. Questionnaires with incomplete responses on the core variables were excluded. The unit of analysis was the individual student. To preserve data quality, the analysis was conducted on a cleaned matrix of 393 valid records, with no missing data on the variables included in the contingency tables.

Daily Internet use was collected through self-report and grouped into three operational categories: less than three hours, three to four hours, and more than four hours per day. This classification reflects an approximate duration of connection and should not be read as a diagnostic scale of dependence. In particular, the reported time may include academic, work-related, communicative, and recreational activities. For this reason, the terms "time of use" and "intensive use" are employed throughout the manuscript in a strictly descriptive sense, while the term "problematic use" is reserved for studies that rely on instruments specifically designed to capture impairment or loss of control.

Anxiety was assessed using the anxiety subscale of the Depression Anxiety Stress Scales–21 (DASS-21). The instrument comprises seven items for each of the depression, anxiety, and stress dimensions, with response options ranging from 0 to 3 according to the intensity or frequency of the symptom over the preceding week. The anxiety subscale captures manifestations such as autonomic arousal, trembling, breathing difficulty, tachycardia, situational fear, and panic. This study used the interpretive categories of no anxiety, mild, moderate, severe, and extremely severe anxiety. The scale functions as a screening and symptom-profiling tool; it does not replace a clinical interview, nor does it establish a diagnosis of an anxiety disorder on its own.

The sociodemographic characteristics considered were age, grouped into under 34 years, 34 to 46 years, and over 46 years. This grouping was retained for consistency with the available descriptive dataset and makes the overall sample profile easier to interpret. Adjusted inferences by age, sex, employment status, or other covariates were not included, because the summarized dataset used for this version did not contain those breakdowns in full. This limitation helps avoid attributing to digital connectivity associations that might, in part, be explained by unmeasured factors.

Data collection relied on voluntary participation, and information was handled in aggregate form for analysis. The reporting of results is limited to frequencies and percentages, with no data disclosed that could identify any individual participant. Data were collected online through an electronic form, the link to which was circulated among students enrolled in the master's programs during the application period. Before beginning the form, participants were informed of the study's purpose, the voluntary nature of their participation, and the confidential treatment of their information. Only complete records from participants who met the inclusion criteria were considered for analysis.

The analysis was performed using JASP, version 0.18.3. Absolute frequencies and percentages were calculated to characterize the sample and to describe the distribution of Internet use and anxiety categories. The bivariate association was examined using Pearson's χ^2 test of independence. The null hypothesis stated that the distribution of anxiety levels is independent of Internet use category, whereas the alternative hypothesis proposed a different distribution across categories. The significance level was set at $\alpha = 0.05$, and degrees of freedom together with the exact p value or corresponding threshold are reported.

In addition to statistical significance, Cramér's V was estimated as a measure of effect size, in order to assess the practical magnitude of the association. This step matters because, with relatively large samples, even a small difference can reach statistical significance. The expected cell values were also

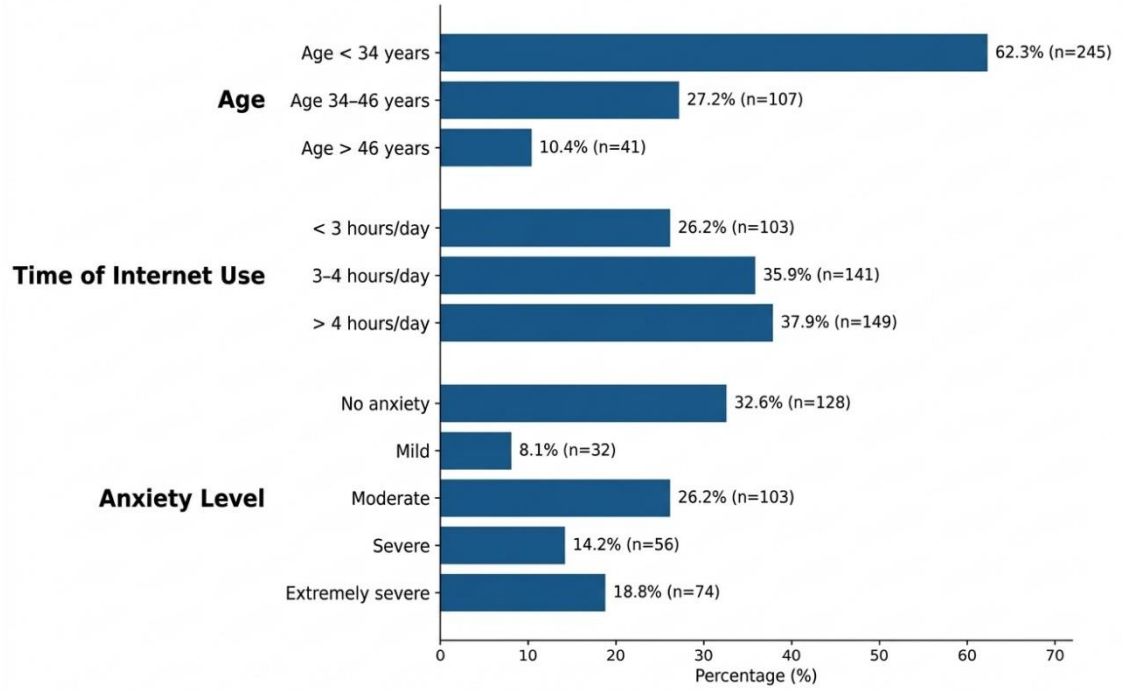
inspected to verify the test's assumptions: the smallest expected value was 8.39, above the conventional threshold of five. Percentages in the contingency table are reported primarily by row, which allows the anxiety profile within each Internet use category to be compared.

To promote transparency and reproducibility, Table 1 presents the absolute frequencies for every cell of the 3 × 5 contingency matrix used in the independence test. These aggregate data make it possible to reproduce Pearson's χ^2 test, Cramér's V, the expected frequencies, and the standardized residuals used to interpret the results. The anonymized individual-level dataset is not currently deposited in a public repository.

Results and discussion

The sample consisted of 393 master's students. Participants under 34 years of age predominated (n = 245; 62.3%), followed by those between 34 and 46 years (n = 107; 27.2%) and the group over 46 years (n = 41; 10.4%). This age structure points to a predominance of young adults, although more than a third of participants were 34 years of age or older. Such heterogeneity is consistent with the typical composition of graduate programs, which bring together individuals at different stages of their professional and family life.

Figure 1. *Descriptive characteristics of the sample.*



Note. Percentages were calculated based on the total number of participants. The "no anxiety" category corresponds to scores falling within the symptom-free range according to the classification criteria used for the DASS-21 anxiety subscale.

With regard to daily Internet use, 103 students (26.2%) reported connecting for less than three hours a day, 141 (35.9%) reported three to four hours, and 149 (37.9%) reported more than four hours of use. Taken together, 290 participants (73.8%) reported using the Internet for three or more hours daily. This distribution confirms that connectivity occupies a central place in participants' everyday lives; the duration

categories, however, do not indicate whether this connection was driven mainly by academic, work-related, communicative, or recreational activities.

With respect to anxiety, 128 students (32.6%) fell into the no-anxiety category. The remainder reported mild (n = 32; 8.1%), moderate (n = 103; 26.2%), severe (n = 56; 14.2%), or extremely severe anxiety (n = 74; 18.8%). Combining the four symptomatic categories, 265 participants (67.4%) presented some level of anxiety. This proportion should be interpreted as a distribution of symptoms as measured by the DASS-21, not as the prevalence of a clinical diagnosis, given that the instrument is self-reported and the study did not include a professional diagnostic evaluation.

Table 1 shows the joint distribution of both variables through absolute frequencies and row percentages. Reading across each row makes it possible to see how the anxiety profile is composed within each time-of-use category. Among those who used the Internet for less than three hours a day, 51.5% reported no anxiety, while 48.5% fell into one of the four symptomatic levels. In the three- to four-hour group, the proportion of participants with some level of anxiety rose to 78.0%. Among those exceeding four hours a day, 70.5% presented symptoms in one category or another.

Table 1. *Distribution of anxiety levels by daily Internet use time.*

Time of use	No anxiety	Mild	Moderate	Severe	Extremely severe	Total
< 3 hours/day	53 (51.5 %)	1 (1.0 %)	15 (14.6 %)	13 (12.6 %)	21 (20.4 %)	103 (100.0%)
3–4 hours/day	31 (22.0 %)	21 (14.9 %)	48 (34.0 %)	16 (11.3 %)	25 (17.7 %)	141 (100.0%)
> 4 hours/day	44 (29.5 %)	10 (6.7 %)	40 (26.8 %)	27 (18.1 %)	28 (18.8 %)	149 (100.0%)
Total	128 (32.6 %)	32 (8.1 %)	103 (26.2 %)	56 (14.2 %)	74 (18.8 %)	393 (100.0%)

Note. n and row percentages are shown in parentheses, except in the Total row, where the percentage is calculated on N = 393. χ^2 Pearson (8) = 42.80; $p < 0.001$; Cramér's V = 0.233.

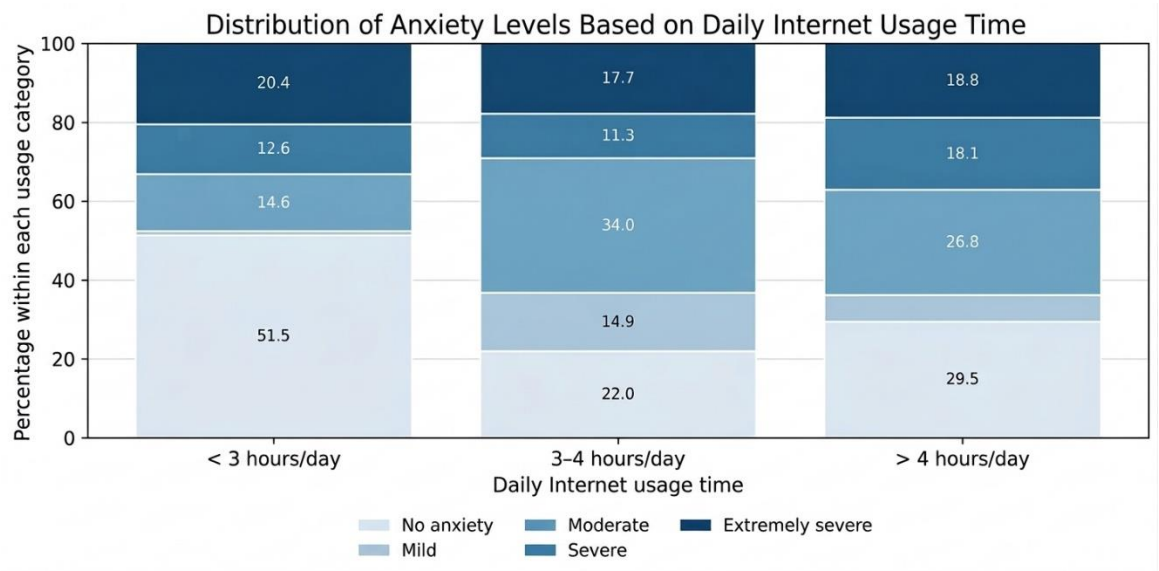
The pattern was not linear across all categories. Moderate anxiety was relatively concentrated among those who reported three to four hours of use: 48 of the 141 students in that group (34.0%) fell into this category, compared with 14.6% in the lower-use group and 26.8% in the higher-use group. Mild anxiety was likewise more common within the three- to four-hour group (14.9%) than in the other two categories. Severe anxiety, by contrast, showed its highest proportion among students connected for more than four hours daily (18.1%), followed by the under-three-hours group (12.6%) and the three- to four-hour group (11.3%).

The extremely severe anxiety category showed a more differentiated distribution. Among those who reported more than four hours of daily use, 28 of the 149 students (18.8%) fell into this level, compared with 17.7% in the three- to four-hour group and 20.4% in the under-three-hours group. Viewed by column, the largest share of extremely severe cases corresponded to the over-four-hours group (37.8% of the 74 cases), followed by the three- to four-hour group (33.8%) and the lower-use group (28.4%). This difference

underscores the value of reporting both row and column percentages, and of avoiding interpretations that reduce the finding to a simple, ever-increasing relationship between hours and symptoms.

Figure 2 depicts the percentage composition of anxiety within each Internet use category. Visually, the no-anxiety category carries the greatest weight in the group reporting less than three hours a day, whereas the three- to four-hour group shows a relatively greater presence of mild and moderate anxiety. In the over-four-hours group, the combined share of severe and extremely severe anxiety reaches 36.9%, compared with 33.0% among those using the Internet for less than three hours and 29.1% among those reporting three to four hours. The figure helps illustrate that the statistical association reflects a multidimensional profile rather than a uniform gradient.

Figure 2. *Percentage anxiety profile within each category of daily Internet use.*



Note. Percentages were calculated by row. The figure was constructed from the frequencies reported in Table 2.

Pearson's χ^2 test indicated that the distribution of anxiety levels differs in a statistically significant way according to daily Internet use time, $\chi^2(8) = 42.80$, $p < 0.001$. Because three use categories were crossed with five anxiety categories, the degrees of freedom were eight. The null hypothesis of independence was rejected at the preset significance level. Substantively, this means that, in this sample, the anxiety profile was not distributed in the same way across the three duration-of-use groups.

Statistical significance should not be equated with a large association. Cramér's V was 0.233, a value consistent with a low-to-moderate relationship. This result suggests that Internet use time is part of a broader web of factors linked to anxiety and is not, by itself, sufficient to explain the variability in symptoms. Table 2 summarizes the test statistics, the effect size, and the verification of the test's assumptions.

Standardized residuals help pinpoint the cells that deviate most from the expected independence. The largest positive residual corresponded to mild anxiety among those using the Internet for three to four hours (standardized residual = 2.81), while the largest negative residual was observed for mild anxiety in the under-three-hours group (-2.55). In the no-anxiety category, the under-three-hours group showed a higher frequency than expected under independence (3.36), whereas the three- to four-hour group showed a lower frequency (-2.20). These indicators should be read as descriptive support for the overall pattern rather than as additional independent tests.

Taken together, the results support the associative hypothesis put forward, while also clarifying its scope. The data reveal a differential distribution of anxiety symptoms across time-of-use categories rather than a strictly monotonic progression. This nuance strengthens the interpretive validity of the study, since it avoids overstating the role of connection duration and steers the discussion toward contextual and personal mechanisms that may coexist with the academic use of technology.

Table 2. *Indicators of the association between Internet use time and anxiety levels.*

Indicator	Value	df	p	Interpretation
Pearson's χ^2 test	42.80	8	< 0.001	Statistical independence is rejected.
Cramér's V	0.233	—	—	Association of low-to-moderate magnitude.
Minimum expected value	8.39	—	—	Meets the assumption of expected frequencies ≥ 5.
Sample size	393	—	—	Complete 3 × 5 category matrix.

Note. Significance level α = 0.05. df = degrees of freedom. Cramér's V is calculated as an effect-size measure for contingency tables.

These results show a statistically significant association between daily Internet use and anxiety levels among the 393 master's students evaluated. The association was low to moderate, meaning that connection time is a related factor rather than a sole explanation for the symptoms. This finding aligns with the work of Antón et al. (2023), López-Ráez et al. (2025), and Rodríguez-Sáez et al. (2025) on the link between digital experiences and distress among university populations. Rather than attributing the problem to the Internet itself, these results invite consideration of what it is used for, how, and under what circumstances.

Nor was the observed distribution strictly linear. The group reporting three to four hours a day concentrated a higher proportion of mild and moderate anxiety, whereas those exceeding four hours showed a notable presence of severe and extremely severe anxiety. Basodan et al. (2024) and Gou et al. (2026) note that the relationship between digital exposure and well-being is also shaped by rest, activity load, and how each person copes with everyday demands.

A reasonable explanation is that this is a multifactorial relationship. Prolonged connection may come bundled with interruptions, pressure to respond, social comparison, and reduced rest. At the same time, individuals with higher anxiety may turn to the Internet to distract themselves, seek information, regulate their emotions, or avoid difficult situations. Haddadi Barzoki (2024), Kiviruusu (2024), and Zhang et al. (2026) suggest that the links among intensive Internet use, anxiety, sleep, and other mental health indicators can be complex and bidirectional. Accordingly, the cross-sectional design identifies an association but cannot establish whether anxiety precedes more intensive connection or whether the two processes reinforce one another.

This distinction matters especially at the graduate level. For many master's students, the Internet is a necessary tool for accessing course readings, participating in classes, organizing assignments, and communicating with instructors and classmates (Miao et al., 2024). Many also juggle their studies with employment and family responsibilities. Total hours of use therefore do not distinguish between necessary academic use and use that interferes with sleep, concentration, or personal life. Future studies should differentiate time devoted to academic activities, work, messaging, social media, and leisure (Ojeda-Martín et al., 2021).

The frequency of anxiety symptoms deserves attention, though it should not be read as the prevalence of a clinical disorder. The DASS-21 anxiety subscale captures the intensity of self-reported

symptoms but does not substitute for a professional evaluation. Nor do the results justify labeling students on the basis of their screen time, or assuming that more extensive connection necessarily amounts to problematic use. Chachapoya et al. (2025) emphasize that social comparison, the pursuit of approval, and the quality of the digital experience can be just as relevant as the duration of use itself. This perspective helps avoid overly simple explanations of student well-being.

These findings carry implications for university well-being services. Rather than imposing blanket restrictions, it would be more useful to promote mindful technology use through actions targeting study planning, notification management, active breaks, sleep hygiene, and critical engagement with social media (Doğan et al., 2022). Alarcón et al. (2023) and Oliveira et al. (2023) point to the potential of psychological and digital interventions for addressing anxiety symptoms, while the Ministry of Health of Peru (Minsa, 2024) highlights the need to keep accessible counseling channels open for young people. These efforts should be complemented by confidential support and referral pathways. This study contributes local evidence and reports significance, effect size, and frequencies. Nonetheless, the convenience sample, the reliance on self-report, and the absence of variables such as sleep quality, social support, and work demands limit the generalizability of the findings.

In summary, Internet use time is one among a set of factors associated with anxiety in master's students. The institutional response should not focus on indiscriminately cutting connection hours, but rather on fostering digital routines compatible with rest, learning, and personal life. Longitudinal studies incorporating measures of problematic use and contextual variables will make it possible to better understand this relationship and to design interventions more closely tailored to students' actual needs.

Conclusions

In a sample of 393 master's students, daily Internet use time was significantly associated with the distribution of anxiety levels, $\chi^2(8) = 42.80$, $p < 0.001$. The magnitude of the association was low to moderate (Cramér's V = 0.233), indicating that connection duration is a related factor but not the sole determinant of emotional distress. The evidence does not support the inference that Internet use causes anxiety, nor that individuals with longer connection times necessarily engage in problematic use.

The pattern identified was heterogeneous. Moderate anxiety had a greater relative presence in the three- to four-hour group, whereas the severe and extremely severe levels showed a substantial concentration in the group exceeding four hours. This distribution reinforces the need to assess the purpose, quality, and perceived interference of digital use, in addition to its duration. University well-being programs could incorporate digital hygiene strategies, academic workload management, sleep education, and timely, confidential pathways to psychological counseling.

Future studies are encouraged to use probabilistic or multicenter samples, instruments specifically designed to assess problematic Internet use, analyses adjusted for sociodemographic variables, and longitudinal designs. Likewise, the final version submitted to a journal should include the corresponding ethical approval and keep the anonymized dataset and analytical protocol available to support scientific traceability. These improvements will help delineate more precisely the modifiable factors linked to anxiety and strengthen the healthy use of digital technologies in graduate education.

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