# Gender Differences in the Use of Smartphones: A Quantitative Study among Mexican University Students

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**Abstract**

Smartphones have become a ubiquitous element of modern life, especially among the young. This study characterizes and differentiates the use of smartphones among university students according to their gender. A total of 1,089 students from a Mexican public university participated. A questionnaire was administered that assessed the history of smartphone use, current use in various situations, and indicators of excessive use. Mann-Whitney and Chi-square tests were performed and the Bayes factor was calculated. Results showed that women spend more time using their phones for messaging and social networking. Women also experience more visual problems and musculoskeletal discomfort associated with excessive phone use. Conversely, men more frequently use their phones in the bathroom and while driving. The results suggest the need for interventions and awareness campaigns to promote healthy smartphone habits.

**Keywords:** university; student behavior; health; new technologies; smartphone; gender

**Resum.** *Diferències de gènere en l'ús de telèfons intel·ligents: un estudi quantitatiu entre universitaris mexicans*

Els telèfons intel·ligents s'han convertit en elements omnipresents en la vida moderna, especialment entre els joves. Aquesta investigació caracteritza i diferencia l'ús dels telèfons intel·ligents entre estudiants universitaris segons el gènere. Van participar-hi 1.089 estudiants d'una universitat pública mexicana. Es va aplicar un qüestionari que avaluava l'historial d'ús, l'ús actual en diverses situacions i indicadors d'ús excessiu. Es van fer proves Mann-Whitney i khi quadrat i es va calcular el factor de Bayes. Es va observar que les dones passaven més temps utilitzant els telèfons per a missatgeria i xarxes socials. A més, les dones experimentaven més problemes visuals i molèsties musculoesquelètiques associades a l'ús excessiu del telèfon. D'altra banda, els homes van utilitzar els telèfons amb més freqüència al bany i mentre conduïen vehicles. Els resultats suggereixen la necessitat d'intervencions i campanyes de conscienciació per fomentar hàbits saludables d'ús dels telèfons intel·ligents.

**Paraules clau:** universitat; comportament dels estudiants; salut; noves tecnologies; telèfon intel·ligent; gènere

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**Resumen.** *Diferencias de género en el uso de teléfonos inteligentes: un estudio cuantitativo entre universitarios mexicanos*

Los teléfonos inteligentes se han convertido en un elemento omnipresente de la vida moderna, especialmente entre la población joven. Esta investigación caracterizó y diferenció el uso de teléfonos inteligentes entre estudiantes universitarios en función de su género. Participaron 1.089 estudiantes de una universidad pública mexicana. Se aplicó un cuestionario que evaluaba el historial de uso de teléfonos inteligentes, el uso actual en diversas situaciones e indicadores de uso excesivo. Se realizaron pruebas Mann-Whitney y ji cuadrado y se calculó el factor de Bayes. Se observó que las mujeres pasaban más tiempo utilizando sus teléfonos para mensajería y redes sociales. Además, las mujeres experimentaban más problemas visuales y molestias musculoesqueléticas asociadas al uso excesivo del teléfono. Por otra parte, los hombres utilizaron más frecuentemente sus teléfonos en el baño y mientras conducían vehículos. Los resultados sugieren la necesidad de realizar intervenciones y promover campañas de concienciación para fomentar hábitos saludables de uso de los teléfonos inteligentes.

**Palabras clave:** universidad; comportamiento de los estudiantes; salud; nuevas tecnologías; teléfono inteligente; género

**Summary**



## 1. Introduction

Smartphones have spread throughout society, leading to a revolution in communication, information access and social interaction. The widespread adoption and integration of smartphones in daily life has raised questions regarding their potential influence on individuals' behaviors and well-being. Understanding how different demographic groups use smartphones is crucial for developing tailored interventions and awareness initiatives aimed at promoting healthy smartphone practices. College students rely on smartphones for various purposes, such as academic pursuits, social interactions and entertainment.h

Research exploring gender differences has been a topic of scientific inquiry for at least a century (Poeschl, 2021), and concepts of sex and gender have been used interchangeably (Bottorff et al., 2012). According to Bottorf, gender is a social construct that intersects with cultural dimensions. Therefore, various perspectives within social phenomena deserve research using a gender-oriented approach. In this context, gender emerges as an important factor that can influence smartphone usage behavior. Previous research, such as Anshari et al. (2016), has indicated that men and women may exhibit contrasting attitudes and patterns of smartphone use.

In this study, a gender-based approach was adopted to analyze smartphone use among Mexican undergraduate students. The study is aimed mainly at differentiating smartphone use, taking into account several aspects including

ownership patterns, usage conditions, hours and locations of use, as well as the presence of associated health symptoms. By acknowledging these disparities and by devising strategies to encourage a healthy balance between digital engagement and other aspects of life, it is possible to assist individuals to optimize their smartphone use and improve their overall well-being.

This research was driven by the research question: What differences exist in smartphone use among Mexican university students based on their gender? The objective of the study was to characterize and compare smartphone usage patterns between male and female undergraduate students. The research hypotheses were framed around the notion of significant differences regarding historical background of smartphone use, hours of current smartphone use, smartphone use in everyday situations, and indicators of excessive smartphone use.

The following section provides a literature review followed by a presentation of the methodology employed in this study. Next, the results are elaborated upon. Finally, a discussion of the findings is presented, along with potential future lines of work.

### *1.1. Literature Review*

Modes of communication have changed radically in recent years, particularly in the 21st century, first with the widespread popularity of the internet and later with the introduction of the smartphone (Apple Inc., 2007). These new forms of communication channel have been adopted by individuals of all age groups, ranging from children under five to individuals over 80. According to the web portal *es.statista.com*, as of 2021, there were approximately 6,259 billion smartphone subscriptions worldwide, a figure close to the global population count. Research has revealed that in Spain, the most prevalent device for accessing the internet is the smartphone. Studies show that 92% of the population use smartphones for internet access, rising to 99% among young people (Ruiz-Palmero et al., 2019).

The use of smartphones has become prevalent in the daily activities of university students. The amount of time spent using their devices exceeds five hours a day, which can be considered problematic or indicative of addictive behavior (Aznar-Díaz et al., 2020; Martínez-Sánchez et al., 2020). Pathological dependence, insecurity and excessive smartphone usage have been linked to various disorders prevalent among today's youth (Pérez Cabrejos et al., 2021). Within the scientific community, there is an ongoing discussion regarding the most appropriate terminology to be attributed to this phenomenon. While some refer to it as *problematic use of the device*, others prefer to call it *smartphone addiction* (Marín-Díaz et al., 2020). The purpose of this study is not to engage in the ongoing debate regarding terminology but to characterize smartphone usage patterns across gender.

According to Aznar-Díaz et al. (2020), women exhibit higher levels of smartphone addiction, mainly due to social networking. Nevertheless, Ruiz-

Palmero et al. (2019) suggest that men tend to engage in excessive use of electronic devices, and often neglect other activities. However, women may experience greater emotional impact in terms of feelings of boredom, impatience and irritability. While smartphones offer unique opportunities for communication, it has been demonstrated that their excessive use can have negative consequences. According to Harris et al. (2020), excessive smartphone usage can lead to a decline in social relationships, emotional intelligence and empathy. Moreover, it can cause an increased incidence of conflicts with others. Research on the topic reveals a strong correlation in some individuals between smartphone usage and social dysfunction, mental health issues and poor academic performance. Additionally, excessive device use has been linked to physical issues such as neck pain, sleep disorders and traffic accidents involving pedestrians or drivers (Harris et al., 2020; Martínez-Sánchez et al., 2020; Ruiz-Palmero et al., 2019). This is particularly prominent among adolescents and young adults.

According to Ratan et al. (2021), smartphone addiction has been associated with musculoskeletal issues such as cervical problems, nerve thickness, psoriatic arthritis, cervical spine repositioning errors of flexion, extension, and right and left lateral flexion, cervical disc degeneration, nerve injury, and higher signs of inflammation in the musculoskeletal system and hand joints. Wacks & Weinstein (2021) found that excessive smartphone use was associated with problems in sleep onset, insomnia, lowered physical activity, lower muscle mass and higher fat mass, increased ocular symptoms, headache, chronic neck pain, higher cervical disc degeneration, and higher median nerve cross-sectional areas in their dominant hands.

Furthermore, Martínez-Sánchez et al. (2020) indicate that the existing research has primarily focused on adults, while research on young people must be prioritized because they are more susceptible to the risks. Notably, Mengistu et al. (2023) conducted a study of university students in southern Ethiopia during the COVID-19 pandemic to explore the effects associated with escalated mobile phone usage during this time. Their findings revealed that university students exhibited excessive mobile phone usage, particularly for social networking. They had difficulty controlling their usage time. This negatively impacted their academic productivity and contributed to the onset of mental health issues such as anxiety and depression. This highlights the importance of promoting education on safe and healthy smartphone and internet usage practices.

In their study of 589 participants from various sociodemographic backgrounds in Brunei, Anshari et al. (2016) found that 38% of the respondents used their phones for less than six hours, while a similar percentage used them for between six and 12 hours. Further, 25% of the participants reported being constantly connected to their phones, 80% of the participants used it in their classroom or workplace, and 36% admitted using their phone in the bathroom. Moreover, the study found that more women (72%) used their mobile phones while driving than men (64%). They also displayed a higher frequen-

cy of mobile phone usage in their classroom or workplace compared to men. However, men tended to spend more time connected to their phones, with a significant proportion reporting 24-hour usage compared to women, who had an average of six to 12 hours.

Further, Celikkalp et al. (2020) studied 502 medical and nursing students and found that the average daily use of smartphones was 5.07 hours. The study also revealed that, on average, individuals owned 2.58 smartphones. Similarly, 44.2% of the participants used their phones during class, irrespective of the subject, while 39% reported experiencing challenges in their classes directly attributable to mobile phone use. A total of 16.1% had been involved in an accident caused by being distracted by their phone. Additionally, the study revealed that 19% of the participants reported at least one health problem associated with mobile phone use. Among the respondents, 6% admitted to using their phones while walking, 3% while engaged in a conversation, 41.6% while riding a bus, 3.4% while eating, and 1% during sporting events.

Kuss et al. (2018) conducted research with two validated instruments, the problematic mobile phone use questionnaire (PMPU-Q) and the problematic mobile phone use questionnaire-revised (PMPU-Q-R). These are designed to assess problems associated with mobile phone use across three factors: phone dependence, dangerous driving and antisocial phone use. The results indicate that excessive smartphone use can lead to problematic behaviors.

Additionally, Carbonell et al. (2018) examined the perception of problematic internet and smartphone use among university students from 2006 to 2017. They found that the aspects related to problematic internet and smartphone use were perceived as more serious in 2017 compared to 2006, particularly in three key factors: academic performance, sleep quality and interpersonal relationships. The study also identified social networks as a significant factor responsible for the increase in problematic internet and smartphone use. The authors emphasize the importance of implementing prevention and intervention programs specifically targeted at students who are at risk of developing problematic internet and smartphone use behaviors.

Roig-Vila et al. (2020) conducted a study focusing on university students in Spain and Italy to identify their levels of smartphone use. The findings revealed that a significant percentage (53.4%) of students from both countries exhibited habitual smartphone use. Moreover, 10.2% of the participants could be classified as individuals with problematic smartphone use. The research indicated that Spanish students tend to use smartphones mostly for social networking purposes, whereas Italian students show a preference for using smartphones for video games. The study concludes that problematic smartphone use is on the rise among college students, emphasizing the need for further research aimed at understanding the causes and consequences of this issue. They also suggest that universities should develop programs to assist students in reducing their smartphone usage and improving their overall well-being.

Saadeh et al. (2021) conducted a study of students from Jordan during a ten-week home quarantine period in 2020 amidst the pandemic. The instru-

ment included sections for collecting different data using the short scale of smartphone addiction. According to the report, 85% of those surveyed stated an increase in smartphone usage, and 42% stated that they use their phone for more than six hours a day. The research findings indicated that factors such as female gender, residing in urban areas, undergoing apartment quarantine, higher income levels, and pursuing scientific and medical careers were associated with higher and significant scores of excessive smartphone use.

In summary, the following sources are relevant to the objectives of the present study: smartphone ownership patterns – Celikkalp et al. (2020) and Ruiz-Palmero et al. (2019); usage conditions – Aznar-Díaz et al. (2020) and Roig-Vila et al. (2020); hours and locations of usage – Saadeh et al. (2021), Mengistu et al. (2023) and Anshari et al. (2016); and the presence of associated health symptoms – Harris et al. (2020), Martínez-Sánchez et al. (2020), Ratan et al. (2021) and Wacks & Weinstein (2021).

## 2. Method

### *2.1. Context of the study*

This research was conducted from March to May 2023 at a Mexican state public university located in an urban region bordering the southern United States. All participants were enrolled on an undergraduate academic program at this university at the time of the study and attended face-to-face classes during the study period. The students were invited to participate and provided their informed consent to be included. All information was treated confidentially.

### *2.2. Characterization of the population and the sample*

Table 1 shows the population and sample size distribution based on educational programs. Table 2 presents the classification of participants according to their self-reported gender in the survey. The survey included options to indicate gender as feminine, masculine and other. One participant answered "Other," and their response was excluded from this study. The remaining participants selected either "male" or "female" as their gender. The average age of the women in the study was 21.1 years, with a standard deviation of 3.11, while the average age of the men was 21.2 years, with a standard deviation of 2.85. Nine women and 11 men reported not owning a smartphone at the time of the study. However, they were familiar with using such devices.

**Table 1.** Number of students in the population and the sample

| Educational program | Population: Total number of enrolled students | Percentage of the population | Participants in the sample | Sample percentage |
|---|---|---|---|---|
| Administration | 588 | 29.3% | 322 | 29.5% |
| Foreign trade | 791 | 39.4% | 416 | 38.2% |
| Public accountancy | 434 | 21.6% | 211 | 19.4% |
| Information technology | 196 | 9.7% | 140 | 12.8% |
| **Total** | **2009** | **100%** | **1089** | **100%** |

Source: Own elaboration.

**Table 2.** Research participants by educational program and gender

| Educational program | Male students in the population | Female students in the population | Male students in the sample | Female students in the sample | Students in the sample |
|---|---|---|---|---|---|
| Administration | 256 | 332 | 117 | 205 | 322 |
| Foreign trade | 405 | 386 | 190 | 226 | 416 |
| Public accountancy | 208 | 226 | 89 | 122 | 211 |
| Information technology | 141 | 55 | 96 | 44 | 140 |
| **Total** | **1010** | **999** | **492** | **597** | **1089** |

Source: Own elaboration.

### *2.3. Instrument*

The instrument used in this research (See Table 3) is based on the work of Anshari et al. (2016) and Celikkalp et al. (2020), which have addressed most of these questions. Once the categories and items were defined, they were reviewed and structured by two experts who hold doctoral degrees and possess extensive teaching experience in the areas of technology and education. The process described by Oktavia et al. (2018) and the guidelines presented by Casas Anguita et al. (2003) were adopted in this work. The questionnaire was electronically administered using Microsoft Forms, with a generated hyperlink shared among the student community through Microsoft Teams. Additionally, during face-to-face class sessions, a QR code was made available for students. Informed consent was obtained from all participants.

**Table 3.** Data collection instrument

| Category | Questions | Measurement scale |
|---|---|---|
| Historical background of smartphone use | In what year did you use a smartphone for the first time? | |
| | In what year did you acquire your first own smartphone? | |
| | How many cell phones have you had so far? | 0–10 |
| Hours of current use of the smartphone | How many hours per day do you use your smartphone? | 0–24 |
| | How many hours per day do you use your smartphone for messaging purposes? (text messages, WhatsApp, etc.) | |
| | How many hours do you use your smartphone for social media? | |
| | How many hours do you use your smartphone for Internet browsing? | |
| Indicators of excessive smartphone use | Do you use your smartphone for non-educational purposes during classes? | Yes/No |
| | Do you have trouble keeping up with the topics in the subjects you are studying? | |
| | Have you had any accidents due to being distracted while using your smartphone? (e.g., falling, tripping, colliding, etc.) | |
| | Have you experienced any visual health problems due to the use of your smartphone? (e.g., irritated eyes, tired eyesight) | |
| | Have you experienced any problems such as muscle pain, joint pain, back pain, or neck pain associated with the use of your smartphone? | |
| Smartphone usage in everyday situations | Walking | Never/Sometimes/Always |
| | In a face-to-face conversation | |
| | While driving a vehicle | |
| | While being a passenger in a vehicle | |
| | Eating | |
| | In the bathroom | |
| | During sports activities | |
| | During the night, after going to bed to sleep | |

Source: Own elaboration.

### *2.4. Data Analysis Techniques*

Data analysis was performed using JAMOVI 2.3.21.[1] To achieve the study's objectives, descriptive statistics, hypothesis tests, association measures, effect size measures and the Bayes factor were used. The alpha level was set at 0.05 to determine statistical significance.

Descriptive statistics, including the median and interquartile range, were calculated for ordinal variables, whereas frequencies and percentages were used for dichotomous variables. The non-parametric Mann–Whitney test was utilized to compare ordinal variables because it was impossible to determine a normal distribution in the responses obtained from the participants. The effect size was calculated using the rank-biserial correlation. The Chi-square test was utilized to analyze the dichotomous variables, and Cramer's V was calculated to assess the strength of the association. Further, the Bayes factor was used in all analyses to measure the strength of the evidence supporting the research hypothesis.

The Bayes factor provided a valuable complement to the p-values obtained from hypothesis tests. For the Mann-Whitney tests, the Bayes factor was calculated using an *a priori* value of 0.707. In the case of contingency tables, the Bayes factor was calculated using an independent multinomial sampling approach with fixed rows and a prior concentration of 1. For the Bayes factor of Spearman's correlation, the value of 1 was used for the "Stretch Beta prior width" parameter.

### *2.5. Reference Values Adopted*

The rank-biserial correlation can serve as an indicator of the effect size for the Mann-Whitney test. Effect sizes can be interpreted as follows: less than 0.1 indicates a trivial effect size, 0.1 suggests a small effect size, 0.3 indicates a medium effect size, and 0.5 represents a large effect size (Goss-Sampson, 2020). Conversely, the value of Cramer's V determines the strength of an association between two categorical variables in a Chi-square test, as indicated in Table 4 (Akoglu, 2018). The Bayes factor assesses the relative strength of evidence between two competing hypotheses by evaluating their conditional probabilities based on observed data. Although the Bayes factor itself provides a measure of evidence in favor of a hypothesis, the criteria presented in Table 5 can be adopted as a rule of thumb (Goss-Sampson, 2020).

1. <https://www.jamovi.org/>.

**Table 4.** Interpretation of Cramer's V values

| Cramer's V | Association is… |
|---|---|
| >0.25 | Very strong |
| >0.15 | Strong |
| >0.10 | Moderate |
| >0.05 | Weak |
| >0 | No association |

Source: Adapted from Akoglu (2018).

**Table 5.** Interpretation of the bayes factor

| $BF_{10}$ values | Evidence is… | In favor of |
|---|---|---|
| >100 | Decisive | H1 |
| 30–100 | Very strong | |
| 10–30 | Strong | |
| 3–10 | Moderate | |
| 1–3 | Anecdotal | |
| 1 | No evidence | None |
| 1–0.33 | Anecdotal | H0 |
| 0.33–0.1 | Moderate | |
| 0.1–0.033 | Strong | |
| 0.033–0.01 | Very strong | |
| < 0.01 | Decisive | |

Source: Adapted from Goss-Sampson (2020).

## *2.6. Special considerations for analyses*

To investigate the number of smartphones owned by participants throughout their lives, the analysis specifically focused on including responses that reported a range of one to ten phones (n=1051; 586 women and 465 men). This was decided after considering the distribution points and observing that the remaining participants reported owning an unusually high number of smartphones. The inclusion of these extreme data points would have had a significant impact on the analyses.

When examining the total hours of phone use per day, some participants reported using their phones for 24 hours. In a follow-up question, it was decided not to exclude any records because after the study, some participants explained that music used to be played throughout the night while they slept or as an alarm clock.

## 3. Results

Table 6 presents the descriptive values for each question in the case of men and women. Similarly, the results of the Mann-Whitney difference hypothesis tests and their respective Bayes factor are provided. Statistically significant differences were found in the daily hours spent using the phone (U=123828, p<.001), for messaging (U=122315, p<.001) and for social networks (U=117229, p<.001). The analysis also revealed that 11 men and 11 women reported using their mobile phones 24 hours a day; nonetheless, no relationship was found between gender and continuous smartphone connectivity ($Xi^2$=0.30, p=.58).

**Table 6.** Characterization of responses collected and analysis of differences between genders

| Category | Question | Women n=597 Median (Interquartile Range) | Men n=492 Median (Interquartile Range) | Differences |
|---|---|---|---|---|
| Historical background of smartphone use | Year of fist use of smartphone | 2013(4) | 2013(4) | U=96893<br>p=0.993<br>ES=3.66e-4<br>$BF_{10}$=0.077 |
| | Year of first owned smartphone | 2015(3) | 2015(3) | U=98100<br>p=0.16<br>$E_S$=0.05<br>$BF_{10}$=0.216 |
| | Number of owned cellphones | 4(3) | 5(4) | U=134826<br>p=0.768<br>ES=0.01<br>$BF_{10}$=0.136 |
| Hours of current smartphone use | Daily smartphone usage time | 8(5) | 6(5) | U=123828<br>p<.001<br>ES=0.15<br>$BF_{10}$=30.31 |
| | Messaging (text messages, WhatsApp) | 4(6) | 3(4) | U=122315<br>p<.001<br>ES=0.16<br>$BF_{10}$=138.80 |
| | Social media browsing | 5(5) | 3(4) | U=117229<br>p<.001<br>ES=0.20<br>$BF_{10}$=317.24 |
| | Internet browsing | 3(4) | 2(4) | U=143181<br>p=0.472<br>ES=0.02<br>$BF_{10}$=0.0783 |

Note: U is the Mann-Whitney statistic, p is the significance value, ES refers to the effect size, and $BF_{10}$ represents the Bayes Factor in favor of the research hypothesis.

Source: Own elaboration.

Table 7 displays the percentages of men and women who responded to the dichotomous questions aimed at characterizing possible excessive smartphone use. Similarly, the results of the Chi-square dependency test and their respective Bayes factors are presented, along with the Cramer's V values that indicate the strength of the detected dependency between the analyzed aspects and the gender of the participants. Only two aspects demonstrated significance – the presence of visual problems ($Xi^2$=20.1, p<.001) and musculoskeletal discomfort ($Xi^2$=9.09, p=0.003) – were attributed to smartphone use. In both cases, women were found to have a higher incidence of both complaints (40.9% for visual problems and 29.8% for musculoskeletal discomfort). Gender showed a moderate association (V=0.13) with visual problems and a weak association (V=0.09) with musculoskeletal complaints. In both cases, the Bayes factors provided evidence in favor of the research hypothesis, with the visual problems showing decisive evidence and musculoskeletal discomfort showing moderate evidence.

**Table 7.** Characterization of possible problematic or excessive use of the smartphone

| Question | Women | | Men | | Association with gender |
|---|---|---|---|---|---|
| | No | Yes | No | Yes | |
| Use of smartphone during classes for non-educational purposes | 56.8% | 43.2% | 55.1% | 44.9% | $Xi^2$=0.317<br>p=0.573<br>V=0.01<br>$BF_{10}$=0.088 |
| Trouble keeping up with the academic subjects | 83.1% | 16.9% | 83.5% | 16.5% | $Xi^2$=0.04<br>p=0.841<br>V=0.006<br>$BF_{10}$=0.058 |
| Accidents due to being distracted while using the smartphone | 84.4% | 15.6% | 84.6% | 15.4% | $Xi^2$=0.003<br>p=0.953<br>V=0.001<br>$BF_{10}$=0.055 |
| Visual health issues due to smartphone use | 59.1% | 40.9% | 72.2% | 27.8% | $Xi^2$=20.1<br>p<.001<br>V=0.13<br>$BF_{10}$=1823 |
| Issues such as muscle pain, joint pain, back pain, or neck pain associated with smartphone use | 70.2% | 29.8% | 78.3% | 21.7% | $Xi^2$=9.09<br>p=0.003<br>V=0.09<br>$BF_{10}$=6.42 |

Note: $Xi^2$ is the Chi-square test statistic, p is the significance value, V indicates the strength of association indicated by the Cramer's V value, and $BF_{10}$ refers to the Bayes Factor value in favor of the research hypothesis.

Source: Own elaboration.

Table 8 presents the description of smartphone usage in everyday situations. It was found that men use smartphones more frequently than women while in the bathroom and while driving a vehicle. The association between gender and the use of mobile phones in the bathroom was strong ($Xi^2$=47.0,

p<.001, V=0.20). Similarly, the association between gender and the use of the phones while driving was also strong ($Xi^2$=37.6, p<.001, V=0.18). Concurrently, while the use of phones in face-to-face conversations demonstrated significance, this association was weak ($Xi^2$=8.39, p=0.015, V=0.08). Hence, the Bayes factor provided moderate evidence in favor of the null hypothesis – it did not favor the research hypothesis.

**Table 8.** Characterization of the use of the smartphone in various daily situations

| Situation | Women | | | Men | | | Comparison |
|---|---|---|---|---|---|---|---|
| | Never | Sometimes | Always | Never | Sometimes | Always | |
| Walking | 16.1% | 77.4% | 6.5% | 19.9% | 73% | 7.1% | $Xi^2$=3.06<br>p=0.216<br>V=0.05<br>$BF_{10}$=0.02 |
| In a face-to-face conversation | 37.5% | 59% | 3.5% | 45.3% | 50.2% | 4.5% | $Xi^2$=8.39<br>p=0.015<br>V=0.08<br>$BF_{10}$=0.29 |
| In a vehicle as the driver | 81.4% | 16.2% | 2.3% | 65% | 30.9% | 4.1% | $Xi^2$=37.6<br>p<.001<br>V=0.18<br>$BF_{10}$=473697 |
| In a vehicle as a passenger | 8% | 61% | 31% | 6.1% | 63.2% | 30.7% | $Xi^2$=1.65<br>p=0.43<br>V=0.03<br>$BF_{10}$=0.01 |
| Eating | 17.6% | 59.3% | 23.1% | 14% | 58.7% | 27.2% | $Xi^2$=3.99<br>p=0.136<br>V=0.06<br>$BF_{10}$=0.05 |
| In the bathroom | 36.7% | 48.6% | 14.7% | 23.2% | 46.3% | 30.5% | $Xi^2$=47.0<br>p<.001<br>V=0.20<br>$BF_{10}$=1.43e+8 |
| In sports activities | 73% | 23.3% | 3.7% | 67.7% | 26.8% | 5.5% | $Xi^2$=4.40<br>p=0.111<br>V=0.06<br>$BF_{10}$=0.03 |
| During the night, after going to sleep | 10.2% | 50.4% | 39.4% | 13% | 49% | 38% | $Xi^2$=2.07<br>p=0.355<br>V=0.04<br>$BF_{10}$=0.01 |

Note: $Xi^2$ is the Chi-square test statistic, p is the significance value, V refers to the Cramer's V value, and $BF_{10}$ refers to the Bayes Factor value in favor of the research hypothesis.

Source: Own elaboration.

## 4. Discussion

This study aimed to characterize and compare the use of smartphones among university students according to their gender. Regarding daily smartphone usage, women report using them for longer durations compared to men. The higher number of hours reported by women could indicate their greater involvement in messaging and social networking activities. This finding suggests that women may perceive smartphones as essential tools for communicating, social interaction and maintaining connectivity. This gender gap in smartphone usage may be influenced by social expectations, cultural norms and personal, family and social development contexts because women may experience more pressure to engage with others through their smartphones.

Moreover, women reported a higher incidence of visual and musculoskeletal health issues associated with excessive smartphone use. Prolonged engagement in conversations, social media and other activities that require intense eye activity could contribute to the occurrence of eyestrain. Further, non-ergonomic postures while using the smartphone could cause musculoskeletal discomfort, especially in the neck, arms, shoulders and back. Therefore, it is crucial to promote education on proper ergonomics practices and encourage regular breaks to prevent prolonged smartphone use and alleviate these discomforts. These findings suggest the importance of promoting responsible smartphone use and fostering a healthy balance between virtual interactions and other aspects of life.

Conversely, men admitted to using their mobile phones while driving vehicles more frequently than women. This finding is crucial because the use of mobile devices while driving poses a risk to road safety. It is essential to emphasize the dangers associated with distracted driving. The university can contribute to promoting safe driving rules and raising awareness about the consequences of careless phone use, such as the use of hands-free systems or safely pulling over to an appropriate location before using their phones.

Men also reported using their smartphones in the bathroom more frequently than women. This raises another crucial concern because it signifies the use of mobile devices in situations that may compromise personal hygiene and privacy. Using phones in the bathroom can have unfavorable health consequences, as users may be at increased risk of infection from the germs present on their devices. Furthermore, this behavior can violate privacy, given the potential for personal data such as messages, photographs or confidential information to be accessed by unauthorized individuals through inadvertent exposure. In a public toilet, individuals' privacy may be put at risk if images are captured or conversations are recorded without their consent. It is important to raise awareness about these risks and promote the establishment of boundaries regarding the use of smartphones in particular situations and places.

The results of this study are consistent with those of Celikkalp et al. (2020) in terms of the following aspects: the percentage of people who have had

accidents while being distracted by their smartphone (around 16%); the high percentage of individuals who use their mobile phone while they are passengers in a vehicle (approximately 30% in our study); the high proportion of participants who use their phone in the classroom regardless of the subject (43% of women and 44% of men in our research); the significant percentage of students who have reported health issues due to phone usage (up to 40% of women and up to 27% of men in our study). Similarly, our findings agree with those of Anshari et al. (2016), showing that just over 75% of the participants use their phone between one and 12 hours per day (in our case, women and men presented median values of eight and six hours respectively). They also correspond with Saadeh et al. (2021), with over 40% of participants using their smartphones for more than six hours daily. Additionally, the findings are in line with the results of Aznar-Díaz et al. (2020), although they contradict Ruiz-Palmero et al. (2019), who indicate that women use smartphones more frequently.

Nevertheless, our results indicate that the participants have owned more smartphones than those reported in Celikkalp et al. (2020). However, this is understandable because of a three-year difference between the two studies. We found that approximately 16% of men and women experience problems in their classes due to smartphone use, which is significantly lower than the 39% reported by Celikkalp et al. (2020). The results also differ from those reported by Anshari et al. (2016) because we found men exhibit higher phone usage while driving (35%). Additionally, no differences were observed between men and women in terms of smartphone use during classes (44%), nor in the percentage of men and women (approximately 2%) who reported being connected 24 hours a day.

It is important to acknowledge that one limitation of this study is its focus on university students from a specific higher education institution, which may not be representative of the general population. Future research should aim at broadening the scope by incorporating other demographic groups and contexts to better understand the potential social and cultural influences on smartphone usage.

Understanding the gender differences found in this work is decisive for educators and administrators in devising strategies to integrate smartphones into academic activities. For example, educators can consider incorporating smartphone-based activities into the curriculum that cater to the preferences and habits of both male and female students. This may include using smartphones for interactive learning exercises, group projects or research activities that align with the usage patterns identified in the study.

Furthermore, the findings also highlight the need for promoting responsible smartphone use among students. For instance, addressing the musculoskeletal and visual health issues associated with excessive smartphone use among female students can prompt educational institutions to provide guidelines for ergonomic smartphone use and encourage regular breaks from screen time during academic activities.

The study's findings also contribute to a new understanding of the challenges in students' behavior and use of smartphones. Acknowledging these challenges and differences is important for the proposal of targeted interventions and awareness programs that promote responsible smartphone use. Thus, we can address the associated health and safety concerns and assist individuals in maintaining a healthy balance between their digital life and overall well-being. By addressing the gender disparities in smartphone usage, educators, parents and administrators can contribute to assisting individuals in cultivating healthy smartphone usage habits and minimizing the potential negative effects on the health and safety of all individuals involved.

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