Problematic internet use, cyberbullying and mental health in Brazilian, Spanish, and Portuguese university students

Uso problemático de internet, ciberacoso y salud mental en universitarios brasileños, españoles y portugueses

巴西、西班牙和葡萄牙大学生的问题性网络使用、网络欺凌和心理健康

Проблемное использование Интернета, кибербуллинг и психическое здоровье студентов бразильских, испанских и португальских университетов

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Abstract

Introduction: The Internet and new technologies have become an indispensable resource in our era, although, if not used properly, they can have serious consequences. This study analyses problematic Internet use, cyberbullying and mental health (anxiety and depression), at an international level, in university populations in Spain, Portugal and Brazil, as well as differences according to age and gender.

Method: A stratified study sample of 1957 university students from Spain, Portugal and Brazil was used, with a mean age of 21.4 years (SD=3.28) and 62.3% female.

Results: Brazilian university students have higher scores on depression, problematic internet use, mobile phone addiction and cyberbullying than Spanish and Portuguese university students, with no differences between the latter two countries. However, anxiety is similar in all 3 countries. Being a female university student implies higher scores on depression, anxiety and more problematic mobile phone use, but less problematic internet use and less cyberaggression than men. With respect to age, younger university students show higher scores on anxiety, more problematic internet and mobile phone use and more cyber aggression. However, age does not show differences in depression and cyber-victimization.

Conclusions: Brazil is the country with the highest mental health difficulties and risks associated with internet use. Female university students are more likely to have mental health difficulties. Younger university students score higher on all variables except depression and cybervictimisation.

Keywords: problematic Internet use, cyberbullying, university students, comparative analysis, mental health.

Resumen

Introducción: Internet y las nuevas tecnologías se han convertido en un recurso indispensable en nuestra era, aunque, si no se utilizan adecuadamente, pueden tener graves consecuencias. Este estudio analiza el uso problemático de Internet, el ciberacoso y la salud mental (ansiedad y depresión), a nivel internacional, en población universitaria de España, Portugal y Brasil, así como las diferencias en función de la edad y el género.

Método: Se utilizó una muestra de estudio estratificada compuesta por 1957 estudiantes universitarios de España, Portugal y Brasil, con una edad media de 21.4 años (*SD*=3.28) siendo un 62.3% mujeres.

Resultados: Los universitarios brasileños tienen puntuaciones más altas en depresión, uso problemático de internet, adicción al móvil y ciberacoso que los universitarios españoles y portugueses, sin diferencias entre estos dos últimos países. Sin embargo, la ansiedad es similar en los 3 países. Ser mujer universitaria implica puntuaciones más altas en depresión, ansiedad y un uso más problemático del móvil, pero menos uso problemático de internet y menos ciberagresión que los hombres. Con respecto a la edad, los universitarios más jóvenes muestran mayores puntuaciones en ansiedad, mayor uso problemático de internet y del móvil y mayor ciberagresión. Sin embargo, la edad no muestra diferencias en depresión y cybervictimización.

Conclusiones: Brasil es el país con mayores dificultades en salud mental y riesgos asociados al uso de internet. Las mujeres universitarias serán más proclives a tener dificultades en salud mental. Los universitarios más jóvenes puntúan más alto en todas las variables excepto en depresión y cybervictimización.

Palabras clave: uso problemático de Internet, ciberacoso, estudiantes universitarios, análisis comparativo, salud mental.

摘要

导言：互联网和新技术已成为当今时代不可或缺的资源，但如果使用不当，也会造成严重后果。本研究从国际层面分析了西班牙、葡萄牙和巴西大学生存在的互联网使用的问题、网络欺凌和心理健康（焦虑和抑郁），以及不同年龄和性别的差异。

方法：对来自西班牙、葡萄牙和巴西的 1957 名大学生进行分层抽样研究，他们的平均年龄为 21.4 岁（SD=3.28），女性占 62.3%。

结果：巴西大学生在抑郁、有问题的互联网使用、手机成瘾和网络欺凌方面的得分高于西班牙和葡萄牙大学生，后两个国家之间没有差异。然而，这三个国家的焦虑程度相似。与男生相比，女大学生在抑郁、焦虑和手机使用问题方面的得分更高，但在互联网使用问题和网络欺凌方面的得分较低。就年龄而言，年轻大学生在焦虑、互联网和手机使用问题以及网络侵犯方面的得分更高。然而，年龄在抑郁和网络伤害方面并无差异。

结论：巴西是心理健康问题和网络使用风险最大的国家。女大学生更容易出现心理健康问题。除抑郁和网络受害外，年轻大学生在所有变量上的得分都较高。

关键词： 有问题的互联网使用，网络欺凌，大学生，比较分析，心理健康。

Аннотация

Введение: Интернет и новые технологии стали незаменимым ресурсом в нашу эпоху, хотя при неправильном использовании они могут привести к серьезным последствиям. В данном исследовании анализируется проблематичное использование Интернета, кибербуллинг и психическое здоровье (тревога и депрессия) на международном уровне в университетской популяции Испании, Португалии и Бразилии, а также различия в зависимости от возраста и пола.

Метод: В стратифицированной выборке исследования приняли участие 1957 студентов университетов Испании, Португалии и Бразилии, средний возраст которых составил 21,4 года (SD=3,28), 62,3% - женщины.

Результаты: Студенты бразильских университетов имеют более высокие показатели по депрессии, проблематичному использованию Интернета, зависимости от мобильного телефона и кибербуллингу, чем студенты испанских и португальских университетов, при этом различий между двумя последними странами нет. Однако тревожность одинакова во всех трех странах. Студенты женского пола имеют более высокие показатели по депрессии, тревожности и более проблематичному использованию мобильного телефона, но менее проблематичное использование Интернета и меньшую кибергрессию, чем мужчины. Что касается возраста, то молодые студенты показывают более высокие баллы по тревожности, более проблематичному использованию Интернета и мобильного телефона и большей киберагрессии. Однако по депрессии и кибервиктимизации различий в возрасте нет.

Выводы: Бразилия - страна, в которой отмечается наибольшее количество трудностей с психическим здоровьем и рисков, связанных с использованием Интернета. Студенты университетов женского пола чаще испытывают трудности с психическим здоровьем. Молодые студенты университетов имеют более высокие показатели по всем переменным, кроме депрессии и кибервиктимизации.

Ключевые слова: проблемное использование Интернета, кибербуллинг, студенты университетов, сравнительный анализ, психическое здоровье.

Introduction

According to the World Bank (2022), 78% of the general Portuguese population and 93% of the Spanish population had internet access in 2020, with Brazil having 74% in 2019 (latest figure available). Within these populations, adolescents and young people aged 20-24 are the ones who use the Internet the most in Spain (97.9%) (Instituto Nacional de Estadística [INE], 2021), with this range being similar in Portugal (INE, 2021) and Brazil (Instituto Brasileiro de Geografia e Estatística [IBGE], 2021). In Spain, according to the INE (2024), Internet use figures in 2023 increased compared to 2022. Internet use is generally universal among 16- to 24-year-olds, with no inequalities in usage in terms of gender. 97.3% of women surveyed and 94.8% of men say they surf the Internet daily (INE, 2021). The same occurs in Portugal, with 83.6% of men and 81.2% of women (INE, 2021), and in Brazil with a proportion of 77.1% of men and 78.3% of women (IBGE, 2021). The progress of this tool offers many positive elements, such as learning and socialization. However, the problematic Internet use (PIU) can increase the likelihood of cyberbullying and the inability to control Internet use (Lukavská et al., 2020). In some cases, generating dependence and lack of control over its use and thus impacting the development of their daily lives (Martínez-Ferrer et al., 2021). In this way, Marín-Díaz et al., (2019) in their study with Spanish university students state that students manifest PIU but are not addicted to the Internet. In the present study, we will take the concept of PIU as a reference, used internationally in the scientific community (an individual's inability to keep network use under control) (Hinojo-Lucena, 2021; Fineberg et al., 2022).

Previous studies in Spain showed figures between 11.25% (Moral & Fernández, 2019) and 12.4% of Spanish university students with PIU (Romero-Rodriguez et al., 2021). In Portugal, 17.23% of university students had moderate problematic internet use (Monteiro et al., 2020). However, in Brazil a percentage of 15.9% was obtained (De Ávila et al., 2020). Taking gender and PIU into consideration, no differences were found in different previous studies in both countries, Spain (Moral & Fernandez, 2019) and Brazil (Andrade et al., 2020). However, in Portugal, males are more prone to PIU (Monteiro et al., 2020). This diversity of results requires a cross-sectional study that can shed light on gender differences in different countries at the same time and with the same measurement instrument.

On the other hand, due to the anonymity and invisibility provided by social networks, acts of online harassment have developed (Stuart et al., 2022). In this way, cyberbullying can be defined as any intentional aggressive act carried out by an individual or group, online, repeatedly against a victim who cannot defend himself (Calmaestra et al., 2020). The social problem of cyberbullying has experienced a considerable increase in recent years, regardless of the country or culture in which it is carried out (Ojeda & del-Rey, 2021; Ojeda et al., 2023). However, most research on this phenomenon has been conducted by elementary and middle school students. Therefore, it is still necessary to provide more scientific information around university population in Spain (Serrano García et al., 2021) and at international level (Rudnicki et al., 2022). The present study attends to the following questions: Will there be differences as a function of belonging to Portugal, Spain, and Brazil? Does cyberbullying behave in the same way in different countries? Will gender and age play a role in this comparison?

From an evolutionary point of view, the university educational level is mostly composed of adolescents and young adults. During these stages, they are more vulnerable to suffering from psychosocial disorders associated with the cyberbullying phenom-

enon, which in turn can cause depressive or anxious symptoms (Silva Salazar, 2020) with negative effects on their self-esteem (Núñez et al., 2021). The study conducted by EU Kids Online (Smahel et al., 2020) highlights a frequency of cyber victimization in Europe of 9% and 5% of cyber aggression. Another study called The Global Kids Online (UNICEF, 2019) points out that between 6% and 29% of those surveyed report being attacked online (Calmaestra et al, 2020), where a large portion of cyberbullying perpetrators have been victims previously. More specifically, Spain has an incidence of cyber victimization ranging from 52.7% to 56% of university students surveyed (Yubero et al., 2017). Regarding the prevalence of cyberbullying in Portugal, 47.1% of the university students surveyed claimed to have been victims of cyberbullying and 39.9% claimed to have played the role of a bully (Oliveira et al., 2021). On the other hand, in Brazil, Mallmann et al. (2018) found that 67.3% of respondents mentioned having experienced at least one incident of cyberbullying. However, 63.8% confirmed at least one event of cyber victimization.

In relation to *gender* and cyberbullying, Machimbarrena et al. (2018), determined that victimization was higher in girls than boys between the ages of 11 and 21 in Spain, as well as in Brazil and Portugal (Souza et al., 2016), although there are other investigations that have stated that there are no differences (Machimbarrena, 2018). However, there are other studies that claim the opposite (Donoso-Vázquez et al., 2017; Donoso-Vázquez et al., 2021). Male stands out as a risk factor because they tend to be more impulsive and therefore more prone to losing control, increasing the risk of cyberbullying and PIU (Kapitány-Fövény, 2022). As for female, there is a greater link between social media use and cyber perpetration, observing a significant relationship between both aggression and cyberbullying victimization with social media use (Kapitány-Fövény, 2022; Herry & Mulvey, 2023).

Regarding age, according to Livazović & Ham (2019), younger men are more likely to cyberattack other individuals. However, as they get older greater behavioral control is determined.

Regarding mental health, depression is an emotional change that manifests as a state of unhappiness, discouragement, and weakness (Vázquez et al., 2008). Similarly, anxiety disorder is an emotional response caused by fear and, consequently, fear is the appraisal of danger; anxiety is the state of negative feeling evoked when fear is stimulated (Beck, 2013). Regarding anxiety and depression in university students, 1 in 4 students is affected by this problem (Carceller, 2022) where women have a higher depressive tendency in Portugal (Chyczij et al., 2020) and Spain (Martínez et al., 2021) and in Brazil (Vargas-Granda, 2021).

The current study

The study of experiences related to the internet, cyberbullying, depression, and anxiety has proven very relevant in recent years (Martínez-Líbano et al., 2022). Although there are several research, cited earlier, that have studied these variables in each country, in most cases it has been produced in a particular way, with very localized samples, and with different assessment tools, hindering the international comparison of results (Aznar-Díaz et al., 2020). Therefore, it is essential to develop studies with large, international samples that can provide data with the same measurement tool and with comparable populations from different countries. In this way we will be able to know how these variables behave internationally. The authors reviewed the most relevant databases (APA PsycInfo, PSICODOC, Psychology and Behavioral Sciences Col-

lection, MEDLINE, WOS and Scopus) and found no previous studies that contrasted cyberbullying, PIU and anxiety and depression along with the international university population, specifically in Ibero-American countries such as Spain, Portugal and Brazil. The aim of this study is to analyze the influence of country of origin (Spain, Portugal and Brazil), gender and age (17-20, 21-23 and 24 or older), on problematic Internet and cell phone use, cyberbullying (victim and aggressor) and symptoms in depression and anxiety.

Method

Participants

As for the descriptive data of the overall sample, 62.14% (n=1216) of the participants are Spanish, 21.77% (n=426) are Portuguese and 16% Brazilians. Considering the total sample, there was a predominance of female participants, with 62.3% (n=1221). However, when checking the gender frequencies in each country, it was observed that there were no statistically significant differences between men and women in Portugal (47.65% and 52.35%) and in Brazil (47.3% and 52.7%) (p> .05). The mean age of the overall sample was 21.4 years. The mean age was not significantly different according to the gender and country of the participants, ranging from 20.37 (SD = 1.68) to 23.41 (SD = 8.87). Table 1 presents this information in detail. The sample was composed of a representative form from each of the three participating universities. A stratification method was used, considering a heterogeneous margin of error of 4%, a heterogeneous population of 50%, and a confidence level of 95%.

Table 1

Demographic characteristics of the participants from the three countries

COUNTRIES	PARTICIPANTS		GENDER			AGE		
	N	%	Male	Female	p	Male	Female	p
Spain	1216	62.14	384 (31.76)	825 (68.24)	<.01	21.43 (3.48)	21.52 (2.77)	.67
Portugal	426	21.77	203 (47.65)	223 (52.35)	.33	20.51 (1.64)	20.37 (1.68)	.39
Brazil	315	16.1	149 (47.3)	166 (52.7)	.34	22.13 (4.31)	23.41 (8.87)	.11
Total	1957	100	736 (37.7)	1221 (62.3)	<.01	21.30 (3.31)	21.56 (4.11)	.13

Instruments

Sociodemographic variables: *Gender:* male and female*; Age:* From an evolutionary point of view, the university educational level is mostly composed of adolescents and young adults. In this study we called the age intervals *beginner* (between 18 and 19

years), *medium* (between 20 and 22 years) and *experienced* (more than 22 years old) (Santoya Mountains, 2018).

The Internet-Related Experiences Questionnaire (CERI): is a 10-item instrument that aims to assess PIU (Beranuy et al., 2009). The questionnaire has a Likert scale format from 1 (not at all) to 4 (very much). Regarding internal consistency, the CERI showed adequate consistency (α = .75).

The Mobile-Related Experiences Questionnaire (CERM) is also a 10-item self-report instrument and focuses on symptoms associated with cell phone addiction (Beranuy et al., 2009). The scale is in Likert format from 1 to 4. In this study, the CERM showed adequate internal consistency (α = .74).

The Cell Phone and Internet Victimization in Adolescents Scale (CYBVIC) is composed of 18 items and aims to assess the presence of behaviors present in victims of cyberbullying, such as aspects associated with harassment, violation of privacy, and social exclusion (Buelga et al., 2012). The scale has a Likert format from 1 (never) to 4 (always), in which the experiences lived by the respondent using cell phones and the Internet in the last year are evaluated. As for internal consistency, the instrument showed adequate consistency (α = .76).

The Cell Phone Aggression Scale (CYB-AGRESS) (Buelga & Pons, 2012) has 10 items and measures the number of aggressions committed via cell phone by the respondent, based on the previous year's cutoff. The scale is in Likert format from 1 (never) to 4 (always) and assesses behaviors associated with aggression committed online, such as harassment, stalking, defamation, violation of privacy, social exclusion, and identity theft. All the scales originally presented and constructed in Spanish were adapted and translated for application in the Portuguese and Brazilian sample (in Portuguese). In this study, the CYB-AGRESS instrument showed adequate internal consistency (α = 0.78).

The Beck Depression Inventory (BDI-II) is a self-report instrument focused on the assessment of aspects associated with depression symptoms. It is currently in its second version and is routinely used in clinical settings and in research (Wang & Gorenstein, 2013). It is composed of 21 items that present symptoms and attitudes associated with behavioral, cognitive, and somatic changes present in depressive symptoms. Each category has a Likert scale of 0 to 3 points as a scoring format, where zero indicates absence of the symptom and 3 the presence of symptoms with greater intensity. The instrument showed adequate consistency (α = .89). Furthermore, it shows evidence of validity in studies conducted both in Spain (Vega-Dienstmaier et al., 2014), Portugal (Campos & Gonçalves, 2011), and Brazil (Wang & Gorenstein, 2013).

The Beck Anxiety Inventory (BAI) is a self-report instrument that has 21 items, which aim to locate the severity of the presence of anxiety symptoms. These items are categorized according to the intensity of the presence or absence of the symptom, using a Likert scale of 0 to 3 points. The final score can range from 0 to 63. This instrument presents validity evidence in studies in Spain (Magán et al., 2008), Portugal (Quintão et al., 2013), and Brazil (Reis, 2010). In this study, the instrument showed adequate internal consistency (α = .90).

Procedure

A stratified sample of all the degrees represented at the three universities was used. Degrees from different universities were randomly selected. Once the degree was chosen, the course to be surveyed was randomly selected. This was done until the representative sample size for each participating university was equal or exceeded (see participants section). A face-to-face on paper survey was conducted on university students from Extremadura (Spain), Rio de Janeiro (Brazil), and Coimbra (Portugal). All surveys were conducted with the approval of the ethics committees of the corresponding institutions. (Ref nº 92/2014).

All participants were informed about the purpose of the research by presenting and reading the Informed Consent Form and were oriented on how to participate in the study. The participant's answers was anonymous. Voluntary and confidentiality guidelines were followed according to the ethical principles of the American Psychological Association (APA, 2017).

Statistical Analysis

The data was analyzed according to its level of measurement. Categorical variables were analyzed by means of frequencies and proportions. For continuous variables, the results were presented as means and standard deviations. To test the hypothesis of differences in the scales used according to the country of the participant, a one-way analysis of variance (one-way ANOVA) model was performed. Tukey's post-hoc test was used to determine differences in each country and to control for type 1 error for multiple comparisons. To check for differences in mean scale scores according to the gender of the participants, a t-test for independent samples was performed. These tests were performed to ensure that the underlying residuals were hypothetically distributed, as recommended in the literature (Pek et al., 2018). In addition, multiple regression models were performed to verify the main predictors related to the scale scores. Thus, 6 multiple linear regression models were developed, where the predictor variables were the same and only the outcome changed, which in this case were the mean scores of the applied scales. This type of analysis aims to verify when a variable (in this case the socio-demographic and contextual variables) affects the outcome of the scale scores by controlling for other predictor variables. The variables used to compose the model were country, gender, and age. Age was classified into 3 age groups: 17-20 years, 21-23 years, and 24 years or older. The predictors were included, and collinearity was checked using the VIF, which verified that there was no collinearity between the predictor variables. For all inferential analyses, a significance level of 5% (p = .05) was considered. All analyses were performed in R and Rstudio software (version 4.1), using the packages Tidyverse, Psyco, SummaryTools, and Janitor.

Results

Regarding the presence of symptoms of depression, the BDI-II results indicated significant differences according to the country of the participant $F(1946) = 8.85$, $p < .01$). *Post hoc tukey* showed that participants from Brazil ($M = 10.90$, $SD = 8.30$), when compared to participants from Spain ($M = 8.86$, $SD = 7.54$) showed significantly different results ($t_{(1946)} = 4.17$, $p_{tukey} < .001$) . Similarly, participants from Portugal showed significantly different results than those from Brazil ($t_{(1946)} = 3.21$, $p_{tukey} = .004$). Brazilian

university students have higher scores in depression, PIU, mobile phone addiction and cyberbullying than Spanish and Portuguese university students, with no differences between the latter two countries. However, anxiety is similar in all 3 countries.

Table 2

Scale results according to the participant's country

Scales	Spain M(SD)	Portugal M(SD)	Brazil M(SD)	ANOVA F	p	SPx PT	SP x BR	PT x BR
CERI	17.55 (4.27)	17.80 (4.43)	19.66 (4.70)	29.51	<.01*	.56	< .01*	< .01*
CERM	16.05 (3.56)	15.92 (3.57)	16.51 (4.14)	2.63	.07	.80	.11	.07
CYB-VIC	12.33 (2.67)	12.46 (2.71)	13.28 (3.22)	14.85	< .01*	.67	< .01*	< .01*
CYB-AGRES	11.49 (2.74)	11.70 (3.32)	12.61 (3.25)	18.02	< .01*	.39	< .01*	< .01*
BDI-II	8.86 (7.54)	9.05 (7.73)	10.90 (8.30)	8.85	< .01*	.89	< .01*	< .01*
BAI	8.55 (8.06)	7.92 (8.04)	9.01 (8.40)	1.75	.17	.33	.61	.14

Regarding the gender of the participants Being a female university student implies higher scores in depression, anxiety and more problematic mobile phone use, but less PIU and less cyberaggression than male. These results can be seen in table 3.

Table 3

Results of the scales according to gender

Scales	FEMALE (N= 1214) M(SD)	MALE (N = 736) M(SD)	F Fisher	p	Eta² partial	IC Eta² partial
CERI	17.67 (4.37)	18.41 (4.52)	8.28	.04*	< .01	[.00, .01]
CERM	16.38 (3.62)	15.63 (3.70)	20.47	< .01*	.01	[.00, .02]
CYB-VIC	12.39 (2.80)	12.70 (2.79)	3.36	.67*	< .01	[.00, .01]
CYB-AGRES	11.35 (2.31)	12.33 (3.77)	43.29	< .01*	.02	[.01, .03]

Scales	FEMALE (N= 1214) M(SD)	MALE (N = 736) M(SD)	F Fisher	p	Eta² partial	IC Eta² partial
BDI-II	9.59 (7.73)	8.68 (7.74)	8.92	.03*	< .01	[.00, .01]
BAI	9.47 (8.45)	6.77 (7.14)	53.07	< .01*	.03	[.00, .01]

Note. * = P significant value < .05

Finally, Table 4 shows the regression analyses of the variables depression (BDI), anxiety (BAI), PIU (CERI), problematic cell phone use (CERM) and cyberbullying (CYB-VIC and CYB-AGRESS) depending on the country, gender, and age of the university students.

Table 4

Regression analysis of survey variables by country, gender and age

Models	CERI	CERM	CYB-VIC	CYB-AGRES	BDI-II	BAI
Variables	β	β	β	β	β	β
Intercept	18.56 (< .001)	15.62 (< .001)	12.92 (< .001)	11.56 (< .001)	10.6 (< .001)	8.87 (< .001)
countryPORTUGAL	- .2 (< .001)	- .09 (< .001)	- .14 (< .001)	- .16 (<.001)	0.11 (< .001)	- .07 (.03)
countrySPAIN	- .22 (< .001)	- .07 (.013)	- .17 (< .001)	- .17 (< .001)	- .13 (< .001)	- .05 (.1)
Gender (Male)	.06 (.004)	- .10 (< .001)	.04 (.07)	.15 (< .001)	- .07 (< .001)	- .17 (< .001)
Age-Beginner	.16 (< .001)	.25 (< .001)	.08 (.02)	.17 (< .001)	.07 (.03)	.09 (.007)
Age-Medium	.07(.03)	.17 (< .001)	.05 (.14)	.10 (.002)	.05 (.12)	.11 (.002)
R² Model	R2 = .048 95% CI(.03,-.07)	R2 = .040 95% CI(.02,- .06)	R2 = .020** 95% CI(.01,.03)	R2 = .055** 95% CI(.03, .07)	R2 = .016 95% CI(.01, .03)	R2 = .035 95% CI(.02, .05)

Note. * = P significant value < .05

The table presents the results of six regression models (CERI, CERM, CYB-VIC, CYB-AGRES, BDI-II, BAI) with different independent variables (country, gender, and age group) and their corresponding *beta* coefficients and *p*-values. The intercept values for all models are significant (*p*< .001). The country variable shows a significant negative effect on all models except for BDI-II, with Portugal having a smaller effect compared to Spain. Gender has a significant positive effect on CERI, CYB-AGRES, and BAI, but a negative effect on CERM. Age group has a positive effect on all models except for CYB-VIC, with the medium group having the smallest effect.

Discussion and conclusion

The main objective of this study was to contrast PIU and cell phone use, cyberbullying, anxiety and depression, taking into account country of origin, gender and age, simultaneously with the international university population from Spain, Portugal, and Brazil.

PIU: Differences across countries, gender, and age.

Firstly, considering PIU, there are no differences between Spain and Portugal, but both countries in relation to Brazil do. Other studies by Romero-Rodríguez et al. (2021) in Spain, Monteiro et al. (2020) in Portugal, Andrade et al. (2020) and De Ávila et al. (2020) in Brazil, found no significant differences between the percentages of PIU in the different countries. However, these research develop a comparison in terms of percentage described in the published paper, but not using a unique research in the three countries at the same time. However, a study by Seabra et al. (2017) states that Brazilians have higher levels of Internet dependence than the Portuguese. This diversity of results may be due to the use of different instruments, mood, social relations, and age disproportion, which makes it difficult to compare the results. However, in our study, we can demonstrate the differences in the problematic use of Spain and Portugal with Brazil, presenting Brazilian university students a higher risk of PIU than European ones.

If we focus on the entire sample, In relation to gender and PIU, we obtain a higher incidence in males than in females in all three countries. These results are consistent with the results obtained by Seabra et al. (2017), Moral and Fernandez (2019), Monteiro et al. (2020), and Romero-Rodriguez et al. (2021). It is found that PIU suffering is more likely to appear in men than in women.In terms of age, younger university students are more likely to develop problematic internet use than older ones. Consistent with our results, Bernal-Ruiz and Rosa-Alcázar (2022) corroborate that beginner college students are more vulnerable and more likely to experience emotional crises and instability. Therefore, Internet use can act as a way of dealing with the worry thoughts as a copy strategic to social anxiety in the first university stages (Ding et al., 2023).

Problematic cell phone use: differences across countries, gender, and age.

On the other hand, considering problematic cell phone use, we do not obtain significant differences between Portugal and Spain, but both countries do in relation to Brazil, with greater problematic use. This variable is relevant since cell phone use may be associated with greater depressive symptoms and emotional difficulties (Horwood & Anglim, 2019).

The female gender has a greater tendency. It is located that in women problematic cell phone use is more likely than in men, results that go in line with those of García-Oliva et al. (2017). Regarding age, the younger university students are more likely to develop problematic cell phone use than the eldest one. That confirms age like a factor that as well as it advances can decrease the risk of problematic cell phone use, thus corroborating the study of Seabra et al. (2017).

Cybervictim: Differences between countries, gender and age.

Regarding cyber victimization scores, no differences were observed between Spain and Portugal. However, Brazil scored higher than Spain and Portugal. Research with university students from Portugal and Brazil found that Brazilian university students who were cyber victims were more likely than Portuguese students to be victims and

aggressors (Souza & Simão, 2017). Both the incidence and the meaning of these behaviors change from one cultural environment to another. This event could be explained, for example, by the degree of individualism-collectivism that each country presents (Souza et al., 2016), presenting a link with aggression, both direct and indirect, with culture playing a key role in students' aggressive behavior (Souza et al., 2016).

Regarding gender and cyber victimization, the results show no significant differences in victimization. However, the previous scientific literature is inconclusive regarding gender. Mallmann et al. (2018) found no statistically significant differences in their study. There are also no significant differences in terms of university student age and cyber victimization scores. In this sense, it appears that victimization is more widespread and does not comprise gender or age, affecting the entire study population equally.

Cyber aggression: differences between countries, gender, and age.

There are differences between countries. Being Brazilian is more likely to be a cyberaggressor than being Portuguese and Spanish. However, being Portuguese increases the likelihood of being a cyber aggressor compared to being Spanish. The research conducted by several authors (Oliveira et al., 2021) coincide with our results, where the percentage differences between Spain and Portugal do not differ much from each other, and yet the higher incidence in the Brazilian population should be highlighted. A reason could be because Brazil has a higher rate of violence than Portugal and Spain, so students may manifest cyberbullying as a form of violence they experience (Souza et al., 2017).

Regarding gender and being a cyber aggressor, the results show that males are more likely to be cyber aggressors than females. Similar results to those of Souza et al. (2016) and Machimbarrena et al. (2018). This could be due to a risk factor associated with the male gender, such as impulsivity and lower self-control ability (Kapitány-Fövény, 2022). According to the age of the university student, it stands out that the younger group is more prone to be cyber aggressors than the older ones. Livazović and Ham (2019) stated that younger men were more likely to cyberattack other individuals. Therefore, it appears that male and younger university students will be more likely to be cyber aggressors.

Depression: differences between countries, gender, and age.

Regarding depression, the results, by country, show that Brazilian students have more depressive symptoms than Portuguese and Spanish students. However, there are no significant differences between Spain and Portugal. These data are important to explain the high prevalence of depression in Brazil. According to the WHO, Brazil is the country with the highest anxiety rates in the world and the highest depression rate in Latin America (De Souza et al., 2017).

Regarding gender, it is observed that women show a higher depressive tendency than men. These higher depression scores in women occur similarly in the 3 countries studied. These results are consistent with those of Chyczij et al. (2020), Martinez et al. (2021), and Vargas-Granda (2021). However, we found no differences regarding student age and depressive symptomatology. It appears that depression does not distinguish between ages in university students.

Anxiety: Differences across countries, gender, and age.

Finally, regarding anxiety, no significant differences are presented in relation to the country of origin. Ruscio et al. (2017) state that anxiety is more prevalent in northern countries of the world. However, countries with lower socioeconomic indexes, such as Brazil, have high rates. These symptoms can be affected by the presence of other everyday stressors, such as financial difficulties and political disorganization, for example. Other factors influencing the prevalence of anxiety disorders are low education, income, and employment status, as well as comorbidity with major depression, which could explain the influence of being Brazilian in the regression model. Although in our study Brazil has higher scores, they are not statistically significant.

Regarding gender, female are more likely to suffer from anxiety than male. These results are similar to other research conducted with university students (Almeida, 2022). In addition, according to the age of the university student, it is obtained that the younger group is more likely to suffer from anxiety than the older ones. This may be due to the decision-making and prospects associated with starting university, decreasing anxiety levels when they clearly identify their thoughts and adapt to the new situation (Almeida, 2022).

In conclusion, in relation with the country, Brazilian university students have higher scores in depression, PIU, cell phone addiction, and cyberbullying (victim and aggressor) than Spanish and Portuguese university students, with no differences between the last two countries. However, anxiety is an international phenomenon that does not comprise nationalities, being similar in the 3 countries.

According to gender, being a university woman means higher scores on depression, anxiety, and more problematic cell phone use, but less PIU and less cyber aggression than men. However, there were no differences in cyber victimization between women and men.

With respect to age, younger university students show higher anxiety, higher PIU, higher problematic cell phone use, and higher cyber aggression scores. However, age shows no significant differences in depression and cyber victimization.

With these results, it seems necessary to continue promoting social and educational policies that can prevent and detect situations of PIU, cyberbullying and mental health in the university environment both in Spain and internationally. It is recommended to try to act in the first years of university, focusing on mental health and cell phone use in women, as well as PIU and cyber aggression in men. Finally, it seems that these policies should be even stronger in the university population in Brazil compared to the Spanish and Portuguese university populations.

Limitations

The findings of this study have some limitations. This research included measurements taken at a single point in time, which made it impossible to establish causal relationships among the study variables. In addition, when self-report instruments are used, there may be a social desirability and acquiescence bias where. However, self-report is considered a usual methodology in research with large populations, and its use is traditionally recommended at the international level. Another limitation to be considered is the exclusive use of quantitative methodology, which can be complemented by interviews with the students themselves or their families. Finally, for future

research the mixed victim/offender profiles could be incorporated and expanded to other universities in selected countries. Knowing all the possibilities will allow for a deeper understanding of how these phenomena may manifest.

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Conflict of interest

The authors declare that there is no conflict of interest.

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