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EDITED BY

Antonio P. Gutierrez de Blume,
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REVIEWED BY

Lada Kaliska,
Matej Bel University, Slovakia
Beatriz Beltran-Navarro,
University of Guadalajara, Mexico

*CORRESPONDENCE

David Javier-Aliaga
✉ davidjavieraliaga@gmail.com
Jacksaint Saintila
✉ jacksaintsaintila@gmail.com

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Self-efficacy and stress as predictors of anxiety in Peruvian and Mexican university students: a cross-sectional study

José Anicama¹, Raymundo Calderón², David Javier-Aliaga^{3*},
Graciela Caballero¹, Karina Talla¹, Ruth Pizarro³,
Yaquelin E. Calizaya-Milla⁴ and Jacksaint Saintila^{5*}

¹Escuela de Psicología, Facultad de Psicología, Universidad Nacional Federico Villarreal, Lima, Perú,

²Departamento de Ciencias de la Salud, Universidad Tecnológica de Guadalajara, Guadalajara,

México, ³Escuela de Psicología, Facultad de Ciencias de la Salud, Universidad Autónoma del Perú,

Lima, Perú, ⁴Facultad de Ciencias de la Salud, Universidad Peruana Unión, Lima, Perú, ⁵Facultad de

Ciencias de la Salud, Universidad Señor de Sipán, Chiclayo, Perú

In recent decades, anxiety has increasingly affected the mental health of university students; however, few predictive studies have compared two countries in the Americas. This study examined stress and self-efficacy as predictors of anxiety among university students in Peru and Mexico. A cross-sectional study was conducted with 2,167 university students, including 1,160 from Peru and 1,007 from Mexico. The General Self-Efficacy Scale (GSES), the Communicable Disease Stress Scale (CDSS), and the Generalized Anxiety Disorder Scale (GAD-7) were utilized. Predictive analysis was conducted using multiple linear regression. The results indicated that Mexican students reported significantly higher levels of stress ($M = 9.81$, $SD = 9.81$, $d = 0.277$, $p < 0.001$) and anxiety ($M = 9.46$, $SD = 9.46$, $d = 0.212$, $p < 0.001$) compared to Peruvian students (stress: $M = 8.89$, $SD = 3.04$; anxiety: $M = 8.39$, $SD = 4.86$). In the regression analysis for Peruvian students, stress ($\beta = 0.6072$, $CI [0.5602, 0.6541]$, $p < 0.001$) was the primary predictor of anxiety, followed by self-efficacy ($\beta = -0.0765$, $CI [-0.1230, -0.0299]$, $p < 0.001$), sex ($\beta = -0.0462$, $CI [-0.0907, -0.0018]$, $p = 0.042$), and age ($\beta = -0.0906$, $CI [-0.1344, -0.0468]$, $p < 0.001$). For Mexican students (Model 2), stress ($\beta = 0.685$, $CI [0.640, 0.7301]$, $p < 0.001$) and self-efficacy ($\beta = -0.103$, $CI [-0.148, -0.0575]$, $p < 0.001$) remained significant predictors of anxiety, with stress having the greatest impact. The model explained 42.9% of the variance in anxiety among Peruvian students (adjusted $R^2 = 0.427$) and 52.7% among Mexican students (adjusted $R^2 = 0.526$). These findings underscore the need for interventions focused on enhancing self-efficacy and stress management, taking cultural factors into account, to reduce anxiety among university students.

KEYWORDS

anxiety, mental health, self-efficacy, stress, psychological, students

1 Introduction

In recent decades, anxiety has emerged as an important mental health concern worldwide, significantly affecting the quality of life (Ramos-Vera et al., 2024) and social relationships of individuals, especially in young populations (Faris et al., 2024). This trend is of particular concern in the Latin American context, where a confluence of cultural, economic, and political factors contributes to the complexity of young people's mental well-being (Benjet et al., 2022). In Peru, in 2022, the Ministry of Health reported that 22.17% of the young population suffers

from anxiety, while in Lima alone, 52.2% of the population suffers from stress (Peruano, 2022). In Mexico in 2021, 19.3% of the adult population exhibited symptoms of severe anxiety, while 31.3% exhibited symptoms of minimal or some degree of anxiety; furthermore, more than 73% of the population exhibited stress (INEGI, 2021). Among college students, a systematic review and meta-analysis revealed a 41% prevalence of anxiety (Liyana et al., 2022). The review reported a prevalence of anxiety between 11 and 89%, with 43% of women having anxiety compared to 39% of men (Liyana et al., 2022). University students are more likely to experience stress and other mental health problems than other groups of people (Faris et al., 2024). A study found that 84.4% of university students experience stress (Asif et al., 2020). Anxiety is conceptualized as a psychological disorder characterized by persistent worry that is difficult to control, accompanied by physical symptoms such as restlessness, fatigue, difficulty concentrating, irritability, muscle tension, and sleep disturbances (Spitzer et al., 2006).

It is widely acknowledged that stress and anxiety have a significant impact on the academic and personal lives of university students (Córdova et al., 2023). These mental health problems not only disrupt concentration and learning, but can also lead to impaired academic performance and social interactions (McCurdy et al., 2023). The university environment often demands high levels of performance and autonomy, which can generate chronic stress and, consequently, anxiety (Deng et al., 2022). The situation is further compounded by the additional pressures of uncertainty about future employment and family expectations (Deng et al., 2022). In contexts such as those of Peru and Mexico, where young people also face economic challenges and significant political changes (Díaz-Ruiz et al., 2024; Martínez, 2022), stress becomes a constant that can precipitate or intensify episodes of anxiety, thus affecting not only the mental health of students, but also their ability to cope with the demands of their educational and social environment.

The construct of self-efficacy can be defined as the belief in one's capacity to organize and execute the actions necessary to effectively manage prospective situations (Bandura, 2006b). This concept exerts a profound influence on the way people think, feel, and motivate themselves, as well as on the actions they choose to take (Bandura et al., 2003). The construct of self-efficacy is derived from four primary sources: direct experience (successful performance), vicarious experience (observation of others' successes), verbal persuasion (receiving encouragement from others), and emotional and physiological states (interpretation of one's own emotional and physical reactions; Bandura, 2006a). This belief has been demonstrated to be a significant predictor of academic performance, persistence, and career choice in university students (Greco et al., 2022; Vuong et al., 2010). Empirical evidence indicates that students with high self-efficacy are more likely to persevere in the face of academic challenges and to achieve their educational goals. In contrast, students with low self-efficacy tend to avoid academic difficulties and are less likely to succeed (Shengyao et al., 2024).

The relationship between self-efficacy and anxiety in university students has been the subject of considerable research interest, given the implications for student mental health (Măirean et al., 2022). Several studies have shown that higher self-efficacy is associated with reduced levels of anxiety (Allwin et al., 2023; Hood et al., 2021; Morales and Pérez-Mármol, 2019). For example, research suggests that students who exhibit a robust conviction in their capacity to

navigate and conclude academic endeavors tend to exhibit diminished anxiety in the face of examinations and other academic assessments (Allwin et al., 2023; Hood et al., 2021). This relationship can be partially attributed to the tendency of students with high self-efficacy to adopt more effective coping strategies, such as planning and active regulation of learning, which directly reduce stress and anxiety (Córdova et al., 2023). However, the relationship between self-efficacy and anxiety is not merely unidirectional. The experience of anxiety can, in turn, lead to a decline in self-efficacy (Razavi et al., 2017). Furthermore, students who frequently experience anxiety may begin to question their ability to meet future challenges, which can result in a downward spiral of decreasing self-efficacy and increasing anxiety (Măirean et al., 2022).

Stress is defined as the body's response to uncertainty and fear triggered by external factors (Anicama et al., 2022). Stress is a pervasive phenomenon in the lives of university students, and it often has multiple sources, including academic, financial, social, and personal pressures, and is a risk factor for anxiety disorders (Bedewy and Gabriel, 2015). Furthermore, stress can challenge the body's homeostatic mechanisms, which can result in a cascade of events. In fact, stressful experiences can involve multiple structures to generate a coordinated physical and psychological response to a challenge (Pêgo et al., 2010). This mental disorder arises when students perceive that the demands of their environment exceed their resources to handle them; and it is not merely a response to external demands; rather, it can also act as a catalyst that can trigger or exacerbate anxiety (Morales and Pérez-Mármol, 2019). Research has shown that elevated levels of stress are associated with an elevated prevalence of anxiety symptoms among this population (Manzar et al., 2021). For example, a study demonstrated that academic stressors, such as examinations and high workloads, are significantly correlated with anxiety among students (Misra and McKean, 2000). Furthermore, stress related to uncertainty about future career and family expectations (Racic et al., 2017), also contributes significantly to anxiety levels (Beiter et al., 2015). On the other hand, anxiety can augment the perception of stress by negatively influencing the student's capacity to effectively cope with academic and personal pressures. This, in turn, perpetuates a cycle of heightened stress and anxiety (Worst et al., 2024). Given the detrimental impact of stress and anxiety on academic performance, it is imperative for educational institutions to implement intervention and prevention programs that assist students in more effectively managing stress and developing resilience skills.

The interaction between stress, self-efficacy, and anxiety can be understood through two key theories: the Stress and Coping Theory by Lazarus and Folkman (1984) and Bandura's Social Cognitive Theory (Bandura, 1997). According to Lazarus and Folkman, stress arises from a cognitive appraisal of environmental demands perceived as threatening or overwhelming in relation to an individual's resources, potentially leading to high levels of anxiety when coping strategies are ineffective. Bandura, on the other hand, posits that self-efficacy—defined as the belief in one's own capacity to organize and execute actions necessary to manage specific situations—acts as a moderator in this interaction. High self-efficacy allows individuals to perceive challenges as manageable, thereby reducing stress responses and, consequently, anxiety. Conversely, low self-efficacy increases the perception of threat and hinders effective coping (Bandura, 1997). These principles are supported by research showing

that individuals with high self-efficacy tend to employ more adaptive strategies for managing stress, mitigating its impact on anxiety (Folkman, 2012; Schwarzer and Knoll, 2003). In summary, the cognitive appraisal of stress and beliefs in self-efficacy are key elements for understanding and managing anxiety, particularly in high-demand contexts such as university settings.

The relevance of this study lies in the need to understand the interaction between specific psychological factors, such as self-efficacy and stress, and their impact on anxiety within diverse sociocultural contexts (Díaz-Ruiz et al., 2024; Martinez, 2022). These countries provide a distinct context compared to previous studies conducted in more developed settings or with different educational and social systems. Exploring the differences and similarities between university students in Mexico and Peru will help identify both specific and shared patterns in how they handle stress and utilize self-efficacy to manage anxiety. This perspective not only enhances scientific knowledge of these interactions but also provides a strong foundation for developing culturally tailored educational and therapeutic interventions. Such initiatives have the potential to improve students' psychological well-being and academic performance while contributing to the creation of more inclusive and effective mental health programs across Latin America. The present study explores the relationship between self-efficacy and stress with anxiety among university students from Mexico and Peru.

2 Materials and methods

2.1 Study design

This study employs a cross-sectional comparative and predictive research design, wherein the predictor variables are self-efficacy and stress, and the criterion variable is anxiety. The cross-sectional nature of the study lies in the fact that data were collected at a single point in time, allowing for the examination of relationships between variables without establishing causal direction (Ato et al., 2013; Hernández-Sampieri and Mendoza, 2018).

2.2 Sample

The total non-random sample consisted of 2,167 university students from private universities, of whom 1,160 were Peruvian and 1,007 Mexican. Over 50% of the students in both countries were female. Similarly, the majority of the Peruvian students were between the ages of 21 and 29, while the Mexican students were between the ages of 17 and 20. In the overall sample, the majority of the students

are female and fall within the age range of 21 to 29 years. The sociodemographic data of the participants is presented in Table 1.

A sample size of 74 individuals was determined to be sufficient to detect effects using three predictors and a modest effect size ($f^2 = 0.15$), $\alpha = 0.05$, and power = 0.95 in the G*Power statistical program (Faul et al., 2009). However, the sample size considered for this study was larger than that amount.

2.3 Instruments

2.3.1 General self-efficacy scale of Baessler and Schwarzer

To assess self-efficacy, the Baessler and Schwarzer General Self-Efficacy Scale was employed to ascertain an individual's perceived competence (Schwarzer et al., 1997). The modified scale comprises 10 items designed to assess self-efficacy and four items that assess social desirability. The response alternatives are presented on a Likert-type scale: disagree (1), somewhat agree (2), agree (3) and strongly agree (4). The reliability in the Spanish validation according to Cronbach's alpha was 0.81 (Schwarzer et al., 1997). The result of internal consistency in the Peruvian context according to Cronbach's Alpha and McDonald's Omega had values greater than 0.70 (Anicama et al., 2023). For this study the reliability for the Peruvian sample was 0.856 (Cronbach's alpha) and for the Mexican sample it was 0.867 (Cronbach's alpha).

2.3.2 Stress scale for transmissible diseases (APA scale)

This instrument was developed in Peru by Anicama et al. (2022). This scale evaluates general stress and stress associated with communicable diseases related to Covid-19. It consists of 10 items distributed across two subscales: General Stress (items 1, 2, 3, 4, 5, and 6) and Covid-19-Specific Stress (items 7, 8, 9, and 10). For this study, only the General Stress subscale, comprising the first six items, was considered. The measurement is Likert-type (never, sometimes, many times, and always). The reliability of Cronbach's alpha was 0.861, while McDonald's Omega yielded a reliability of 0.848. The goodness-of-fit indicators for the structure of the *Communicable Disease Stress Scale* were adequate ($\chi^2 = 260$, $p < 0.001$, SRMR = 0.0325, RMSEA = 0.0778, CFI = 0.949, TLI = 0.933). For this study, the reliability for the Peruvian sample was 0.842 (Cronbach's alpha), while for the Mexican sample it was 0.841 (Cronbach's alpha).

2.3.3 Generalized anxiety scale (GAD-7)

To measure anxiety we used the Generalized Anxiety Scale: GAD-7 developed by Spitzer et al. (2006). The scale is composed

TABLE 1 Sociodemographic characteristics of the study sample at the general level and by country.

Characteristics		Peruvians (n = 1,160)		Mexicans (n = 1,007)		General (n = 2,167)	
		n	%	n	n	n	%
Sex	Male	317	27.3	352	35.0	669	30.9
	Female	843	72.7	655	65.0	1,498	69.1
Age (years)	17–20	348	30.0	538	53.4	886	40.9
	21–29	812	70.0	469	46.6	1,281	59.2

TABLE 2 Descriptive analysis of self-efficacy, stress, and anxiety in the general sample and by country.

Group	Variables	M	SD	Sc	K
Peruvians	Self-efficacy	37.00	6.04	-0.02	-0.04
	Stress	8.89	3.04	0.21	0.00
	Anxiety	8.39	4.86	0.50	-0.18
Mexicans	Self-efficacy	37.59	6.82	-0.12	0.00
	Stress	9.81	3.61	0.06	-0.39
	Anxiety	9.46	5.22	0.32	-0.62
General	Self-efficacy	37.27	6.42	-0.06	0.01
	Stress	9.31	3.35	0.18	-0.19
	Anxiety	8.89	5.06	0.42	-0.41

M, Mean; SD, Standard Deviation; Sc, Skewness Coefficient; K, Kurtosis Coefficient.

of seven items, presented in a Likert-type continuous measurement system with four response options each. The response options are “disagree” (coded as 0), “somewhat agree” (coded as 1), “agree” (coded as 2), and “strongly agree” (coded as 3). The minimum total score is 0, and the maximum total score is 21 points. The scale has demonstrated high validity and reliability in a university population in Lima. Its item discriminant validity and convergent validity tests were moderate to high ($p < 0.01$). The confirmatory factor analysis confirmed the unidimensional structure of the scale. The reliability by Cronbach’s alpha was 0.87, and the McDonald’s Omega coefficient was 0.80 (Anicama et al., 2021). For this study, the reliability for the Peruvian sample was 0.877 (Cronbach’s alpha) and for the Mexican sample was 0.866 (Cronbach’s alpha).

2.4 Procedure

The data collection process was completed in 2022. To this end, a sociodemographic card and the self-efficacy, stress, and anxiety scales were employed. The first section included an informed consent form, which was presented with a question to obtain the participant’s acceptance. The second section contained questions about sociodemographic information, and the third section contained the scales for the study variables. The instruments were digitized using the Google Forms tool and distributed to the student community via email and virtual classrooms. The scales were applied to those who gave their approval to the informed consent, which indicated that the questionnaire was anonymous and confidential. The study was carried out after receiving the approval of the research ethics committee of the Universidad Nacional Federico Villarreal (registration and reference number: 8118-2021-CU-UNFV). In addition, informed consent was obtained from the participants. The study was conducted in accordance with the ethical standards and amendments included in the Declaration of Helsinki.

2.5 Statistical analysis

The SPSS version 29 statistical software was utilized for data processing and analysis. Descriptive analysis was conducted using the mean, median, and standard deviation. The sociodemographic

variables were presented in the form of frequency and percentage tables. The differences between the groups were determined using the Student’s *t*-test. The relationship analysis was conducted using Pearson’s correlation coefficient. Similarly, the predictive analysis was performed using multiple linear regression, ensuring that the assumptions of linearity and absence of multicollinearity were met. All analyses were conducted with a significance level of 5% and a 95% confidence interval (CI).

3 Results

Table 2 shows that the skewness and kurtosis coefficients at the general level and by country are within the recommended range (i.e., between ± 1.5). Skewness and kurtosis values within this range indicate an approximately normal distribution, justifying the use of parametric tests in the analysis (Kline, 2011; Pérez and Medrano, 2010).

Table 3 shows statistically significant differences between Peruvian and Mexican students in the variables studied. Mexican students reported higher levels of stress ($M = 9.81$, $SD = 3.61$, $d = 0.277$, $p < 0.001$) and anxiety ($M = 9.46$, $SD = 5.22$, $d = 0.212$, $p < 0.001$) compared to Peruvian students (stress: $M = 8.89$, $SD = 3.04$, $d = 0.277$, $p < 0.001$; anxiety: $M = 8.39$, $SD = 4.86$, $d = 0.212$, $p < 0.001$), with moderate and small effect sizes, respectively. Regarding self-efficacy, Mexican students showed a slightly higher mean ($M = 37.59$, $SD = 6.82$, $d = 0.092$, $p = 0.033$) compared to Peruvian students ($M = 37.00$, $SD = 6.04$, $d = 0.092$, $p = 0.033$), although the difference was minimal. These results reflect a consistent trend toward higher levels of stress and anxiety among Mexican students.

Table 4 presents the correlation analysis of the study variables (self-efficacy, stress, and anxiety) broken down by country (Peru and Mexico) and at the overall level. Among Peruvian students, a negative relationship is observed between self-efficacy and anxiety ($r = -0.292$, $CI [-0.344, -0.239]$, $p < 0.001$) and a positive relationship between stress and anxiety ($r = 0.642$, $CI [0.607, 0.675]$, $p < 0.001$). Similarly, among Mexican students, self-efficacy is negatively associated with anxiety ($r = -0.332$, $CI [-0.386, -0.276]$, $p < 0.001$), while stress is positively associated with anxiety ($r = 0.719$, $CI [0.688, 0.748]$, $p < 0.001$). At the overall level, self-efficacy shows a negative correlation with anxiety ($r = -0.306$, $CI [-0.344, -0.267]$, $p < 0.001$). Similarly, stress exhibits a positive correlation with anxiety ($r = 0.686$, $CI [0.663, 0.708]$, $p < 0.001$).

TABLE 3 Comparison analysis of study variables by country.

Variables	Peruvians		Mexicans		t ^a	d	p
	M	SD	M	SD			
Self-efficacy	37.00	6.04	37.59	37.59	-2.14	0.092	0.033
Stress	8.89	3.04	9.81	9.81	-6.44	0.277	<0.001
Anxiety	8.39	4.86	9.46	9.46	-4.92	0.212	<0.001

***Correlation is significant at the 0.001 level (2-tailed); SD = Standard Deviation; d = d de Cohen.

^aStudent's t test.

TABLE 4 Correlation analysis of the study variables at the general level and by country.

Group	Variables	Self-efficacy	Stress	Anxiety
Peruvians	Self-efficacy	1		
	Stress	-0.347*** [-0.396, -0.295]	1	
	Anxiety	-0.292*** [-0.344, -0.239]	0.642*** [0.607, 0.675]	1
Mexicans	Self-efficacy	1		
	Stress	-0.335*** [-0.389, -0.279]	1	
	Anxiety	-0.332*** [-0.386, -0.276]	0.719*** [0.688, 0.748]	1
General	Self-efficacy	1		
	Stress	-0.331*** [-0.368, -0.293]	1	
	Anxiety	-0.306*** [-0.344, -0.267]	0.686*** [0.663, 0.708]	1

***The correlation is significant at the < 0.001 level (2-tailed); the relationship analysis was performed using Pearson's correlation coefficient; CI, Confidence Interval.

TABLE 5 Multiple regression analysis predicting anxiety from self-efficacy and stress by group.

Group	Model	R ²	Adj R ²	BIC	F	p
Peruvians	1	0.429	0.427	6,350	217	<0.001
Mexicans	1	0.529	0.527	5,469	281	<0.001
	2	0.527	0.526	5,459	559	<0.001
General	1	0.484	0.483	1,178	506	<0.001

Dependent variable: Anxiety; Independent variables: Self-efficacy and stress; BIC, Bayesian Information Criterion.

Table 5 presents the results of the multiple regression analysis for anxiety as the dependent variable, using self-efficacy and stress as independent variables. For Peruvian students, the model explains 42.9% of the variability in anxiety (R² = 0.429, adjusted R² = 0.427, BIC = 6,350, F = 217, p < 0.001). In the case of Mexican students, two models were evaluated: Model 1 explains 52.9% of the variability in anxiety (R² = 0.529, adjusted R² = 0.527, BIC = 5,469, F = 281, p < 0.001), and Model 2 explains 52.7% of the variability in anxiety (R² = 0.527, adjusted R² = 0.526, BIC = 5,459, F = 559, p < 0.001). Given that Model 2 shows a better fit, it is selected as the most appropriate. At the overall level, the model explains 48.4% of the variability in anxiety (R² = 0.484, adjusted R² = 0.483, F = 506, p < 0.001).

Table 6 presents the multiple regression coefficients for predicting anxiety based on self-efficacy, stress, sex, and age. Among Peruvian students, the results are consistent, with stress as the main predictor (β = 0.6072, CI [0.5602, 0.6541], p < 0.001), followed by self-efficacy (β = -0.0765, CI [-0.1230, -0.0299], p < 0.001), sex (β = -0.0462, CI [-0.0907, -0.0018], p = 0.042), and age (β = -0.0906, CI [-0.1344, -0.0468], p < 0.001). For Mexican students, based on the prior analysis in Table 5, Model 2 is selected due to its lower BIC and the non-significant coefficients for sex and age (Table 6). In this model,

stress (β = 0.685, CI [0.640, 0.7301], p < 0.001) and self-efficacy (β = -0.103, CI [-0.148, -0.0575], p < 0.001) remain significant predictors, with stress having the greatest impact. At the general level, stress is the strongest predictor (β = 0.6488, CI [0.6162, 0.6814], p < 0.001), followed by self-efficacy, which shows a significant negative relationship (β = -0.0841, CI [-0.1163, -0.0519], p < 0.001). Sex (β = -0.0317, CI [-0.0627, -0.0007], p = 0.045) and age (β = -0.0698, CI [-0.1002, -0.0395], p < 0.001) also have negative effects. Across all models, the VIF and tolerance values confirm the absence of multicollinearity issues. It is important to note that, to assess the robustness of the model, key sociodemographic variables were included to analyze their impact on anxiety prediction. Although their effects were smaller than those of stress and self-efficacy, the results indicate that being female and younger is associated with higher levels of anxiety. This finding, consistent with previous studies, highlights the importance of controlling for these factors to minimize bias and enhance the model's validity.

In summary, regarding differences by country, Mexican students exhibit significantly higher levels of stress (M = 9.81, SD = 9.81, d = 0.277, p < 0.001) and anxiety (M = 9.46, SD = 9.46, d = 0.212, p < 0.001) compared to Peruvian students (stress: M = 8.89, SD = 3.04; anxiety: M = 8.39, SD = 4.86). In contrast,

TABLE 6 Multiple regression coefficients predicting anxiety by group.

Group	Model	Variables	β	CI (β)	VIF	TOL	t	p
Peruvian	1	Self-efficacy	-0.0765	[-0.1230, -0.0299]	1.14	0.878	-3.22	<0.001
		Stress	0.6072	[0.5602, 0.6541]	1.16	0.862	25.35	<0.001
		Sex	-0.0462	[-0.0907, -0.0018]	1.04	0.962	-2.04	0.042
		Age	-0.0906	[-0.1344, -0.0468]	1.01	0.993	-4.06	<0.001
Mexicans	1	Self-efficacy	-0.0969	[-0.1424, -0.0513]	1.15	0.873	-4.17	<0.001
		Stress	0.6821	[0.6357, 0.7285]	1.19	0.842	28.85	<0.001
		Sex	-0.0157	[-0.0598, 0.0284]	1.08	0.930	-0.70	0.485
		Age	-0.0411	[-0.0839, 0.0017]	1.01	0.987	-1.88	0.060
	2	Self-efficacy	-0.103	[-0.148, -0.0575]	1.13	0.887	-4.46	<0.001
		Stress	0.685	[0.640, 0.7301]	1.13	0.887	29.72	<0.001
General	1	Self-efficacy	-0.0841	[-0.1163, -0.0519]	1.13	0.886	-5.12	<0.001
		Stress	0.6488	[0.6162, 0.6814]	1.16	0.864	39.03	<0.001
		Sex	-0.0317	[-0.0627, -0.0067]	1.05	0.955	-2.00	0.045
		Age	-0.0698	[-0.1002, -0.0395]	1.00	0.997	-4.51	<0.001

Dependent variable: Anxiety; VIF = Variance Inflation Factor, TOL = Tolerance, β = Standardized Beta Coefficient, CI = Confidence Interval.

self-efficacy shows minimal differences (Mexican students: $M = 37.59$, $SD = 37.59$, $d = 0.092$, $p = 0.033$; Peruvian students: $M = 37.00$, $SD = 6.04$). Correlation analyses indicate that, among Peruvian students, stress is positively associated with anxiety ($r = 0.642$, $CI [0.607, 0.675]$, $p < 0.001$), while self-efficacy is negatively correlated with anxiety ($r = -0.292$, $CI [-0.344, -0.239]$, $p < 0.001$). Similarly, for Mexican students, stress is positively associated with anxiety ($r = 0.719$, $CI [0.688, 0.748]$, $p < 0.001$), and self-efficacy is negatively correlated with anxiety ($r = -0.332$, $CI [-0.386, -0.276]$, $p < 0.001$). Regression analysis reveals that, among Peruvian students, stress ($\beta = 0.6072$, $CI [0.5602, 0.6541]$, $p < 0.001$) is the primary predictor of anxiety, followed by self-efficacy ($\beta = -0.0765$, $CI [-0.1230, -0.0299]$, $p < 0.001$), gender ($\beta = -0.0462$, $CI [-0.0907, -0.0018]$, $p = 0.042$), and age ($\beta = -0.0906$, $CI [-0.1344, -0.0468]$, $p < 0.001$). The model explains 42.9% of the variability in anxiety (adjusted $R^2 = 0.427$). Similarly, in Mexican students (Model 2), stress ($\beta = 0.685$, $CI [0.640, 0.7301]$, $p < 0.001$) and self-efficacy ($\beta = -0.103$, $CI [-0.148, -0.0575]$, $p < 0.001$) remain significant predictors of anxiety, with stress being the most impactful. Model 2 explains 52.7% of the variability in anxiety (adjusted $R^2 = 0.526$).

4 Discussion

In the field of higher education, student mental health has emerged as a critical area of interest worldwide, including in Peru and Mexico. Anxiety, in particular, is a prevalent concern that affects not only students' well-being, but also their academic performance and personal development. This study aims to explore how self-efficacy and stress relate to anxiety levels among university students in these two countries. Among the main findings of the current study are that (a) Mexican students report higher levels of stress and anxiety compared to Peruvian students, while showing a minimal advantage in self-efficacy. (b) self-efficacy is negatively and significantly

associated with anxiety, by country and both in the overall sample; (d) stress significantly predicts anxiety by country and both in the overall sample; and (d) The general model explains 48.3% of the variability in anxiety among university students. Additionally, the model explains 42.9% of the variability in anxiety within the Peruvian student group, considering self-efficacy, stress, sex, and age as independent variables; and 52.7% within the Mexican student group, considering only self-efficacy and stress.

The comparative results reveal that Mexican students experience higher levels of stress and anxiety compared to Peruvian students, while showing a minimal advantage in self-efficacy. This suggests that Mexican students may be facing greater academic, social, or cultural demands, contributing to increased stress and anxiety levels (Bandura, 1997; Lazarus and Folkman, 1984). Although the difference in self-efficacy is marginal, it may reflect variations in the perception of their ability to cope with these demands depending on the context (Schwarzer and Knoll, 2007). These findings underscore the need to consider contextual and cultural factors in the design of intervention strategies aimed at reducing stress and anxiety among university students (Tweed et al., 2004). Adapting these strategies to the specific characteristics of each population could enhance their effectiveness, fostering a more balanced emotional well-being in diverse educational contexts (Conrad and White, 2010; Włodkowski and Ginsberg, 2017).

The findings obtained show that self-efficacy is inversely and significantly associated with anxiety, which means that the higher the self-efficacy, the lower the reported level of anxiety. This negative relationship, observed both in the general sample and in the specific samples from Peru and Mexico, underscores the protective role that perceptions of a person's ability to cope with and manage the demands of the academic environment might have. Self-efficacy, by giving students a sense of control over their academic activities and challenges, can reduce the anxiety responses that often arise from situations that are perceived as threatening or challenging (Morales and Pérez-Mármol, 2019). This understanding is important because it suggests that interventions designed to increase self-efficacy may

be effective in reducing anxiety in the student population. These findings are consistent with Bandura's social cognitive theory, which postulates that self-efficacy influences cognitive, affective, and motivational levels (Bandura, 1986, 2006a). High perceived self-efficacy is associated with positive thoughts and aspirations about successfully performing the behavior, lower stress and perceived threat, and therefore lower anxiety (Bandura, 2006b; Bandura and Adams, 1977).

Similarly, several studies have found that self-efficacy is inversely related to anxiety in educational contexts. For example, a study of university students found a significant inverse relationship between self-efficacy and anxiety (Morales and Pérez-Mármol, 2019). Moreover, findings from a study conducted in an academic setting in Iran reported that low self-efficacy was a predictor of anxiety (Worst et al., 2024). In addition, other findings support the idea of this link between self-efficacy and emotional well-being, suggesting that students who have a strong belief in their ability to successfully face and complete their academic responsibilities, including studies, projects, and other curricular obligations, are less likely to suffer from anxiety in evaluative situations such as exams and presentations (Allwin et al., 2023; Hood et al., 2021), supporting the fact that confidence in one's abilities can buffer the impact of mental disorders such as anxiety (Tahmassian and Moghadam, 2011). This idea is supported by considering the variety of academic contexts and assessment methodologies, which underscores the importance of self-efficacy as a cross-cutting and fundamental psychological tool that facilitates better management of academic performance-related anxiety (Gutiérrez García and Landeros Velazquez, 2020). In the context of our findings, the cross-sectional consistency across cultures and educational settings reinforces the idea that self-efficacy is a robust psychological construct with significant implications for students worldwide and is of particular interest to educators and school psychologists seeking to implement intervention and skill development programs aimed at increasing students' confidence in their abilities and thereby improving their overall educational experience.

Another relevant finding is that stress is positively and significantly related to anxiety. This indicates that as stress levels increase, so do anxiety levels among university students. This trend is consistent across the general sample and is replicated in the specific samples of students from Peru and Mexico. The relevance of this relationship can be viewed from two perspectives: (1) it underscores the detrimental nature of unmanaged stress, and (2) it highlights the vulnerability of students to demanding academic environments and stressful situations. This link between stress and anxiety reflects a psychological mechanism in which stress acts as a trigger that can disrupt students' emotional balance, potentially leading to a state of persistent anxiety (Córdova et al., 2023). This phenomenon is particularly important in the university stage, a phase of life where young people face not only academic challenges but also significant life transitions that can be additional sources of stress.

The positive relationship between stress and anxiety is consistent with Lazarus and Folkman's (Folkman et al., 1986) model of stress and coping, which postulates that an individual's cognitive appraisal of the demands of his or her environment and the resources available to cope with those demands can lead to emotional stress responses. Furthermore, these results align with previous research that has also

identified a direct correlation between perceived stress and anxiety symptoms in university students. For example, the results of a study conducted among university students indicated that high levels of stress were correlated with an increased prevalence of anxiety symptoms (Manzar et al., 2021), emphasizing the need for preventive and therapeutic approaches that can address the specificities of student life and the inherent psychosocial challenges. On the other hand, the results of a study indicated that academic stress, particularly that resulting from examinations and demanding coursework, as well as elevated anxiety levels, are prevalent among university students (Misra and McKean, 2000). The results of this study reinforce the critical need to incorporate stress management as an essential component of anxiety prevention and treatment strategies for university students. The consistency of these findings between students in Peru and Mexico not only demonstrates the universality of the experience of stress in educational contexts but also suggests the possibility of common factors at the cultural or educational level in these regions that could influence the way stress affects students.

In addition to the results already discussed, the present study provides a more detailed understanding of the explanatory capacity of self-efficacy and stress variables in relation to anxiety levels among university students. In the total sample, these two variables explained 48.3% of the variability in anxiety, a particularly relevant finding that highlights the interaction between perceived stress and self-efficacy beliefs as key factors in the dynamics of anxiety (Bandura, 1997; Lazarus and Folkman, 1984). This result underscores the importance of implementing targeted programs to enhance self-efficacy beliefs and reduce perceived stress within the university environment, where students face significant academic and social demands (Conrad and White, 2010; Wlodkowski and Ginsberg, 2017).

Although the proportion of variance explained (48.3%) is considerable, a significant percentage of the variability in anxiety remains unexplained by the analyzed variables. This suggests the potential influence of other factors not included in the model, such as personality traits (e.g., neuroticism), prior experiences of stress or trauma, contextual factors like family and social environments, and sociodemographic variables (gender, age, socioeconomic level, among others; Tweed et al., 2004; Wlodkowski and Ginsberg, 2017). These factors could act as moderators or mediators in the relationship between self-efficacy, stress, and anxiety, and their inclusion in future studies would allow for a more comprehensive and robust model. Moreover, when examining the samples by country, the model explains 42.9% of the variability in anxiety among Peruvian students, considering self-efficacy, stress, sex, and age as independent variables, and 52.7% among Mexican students, considering only self-efficacy and stress. These differences in explanatory capacity may indicate the influence of additional contextual factors specific to each country that could moderate or mediate the relationship between the analyzed variables. For instance, cultural, social, and educational factors may play a significant role in how students perceive and cope with stress, as well as in the development and expression of their self-efficacy (Tweed et al., 2004). In Peru, the inclusion of variables such as sex and age may capture aspects related to gender differences in academic and social responsibilities or the psychological development stage of students, which could influence their relationship with anxiety. In Mexico, the greater explanatory

capacity observed with only self-efficacy and stress might reflect a more homogeneous pattern in how these variables interact within that specific context, possibly due to shared characteristics in their educational system or access to support resources (Lazarus and Folkman, 1984; Conrad and White, 2010). These discrepancies highlight the importance of considering sociocultural and structural specificities when interpreting results and designing intervention strategies. Future studies should include additional variables, such as perceived social support, the availability of mental health resources, and the family environment, to more comprehensively explore the underlying dynamics in each national context. This would enable the identification of protective and risk factors that are culturally relevant, contributing to the development of more effective programs for preventing and addressing anxiety among university students (Schwarzer and Knoll, 2007; Wlodkowski and Ginsberg, 2017).

4.1 Limitations and future perspectives

Although the study evaluates a relatively large cross-cultural sample, it is important to note that several limitations exist. First, the cross-sectional nature of the study precludes establishing definitive causal relationships. While we observed a correlation between self-efficacy and stress with anxiety levels, we cannot definitively conclude that an increase in self-efficacy directly causes a reduction in anxiety or that high stress causes an increase in anxiety. Further longitudinal studies may be warranted to ascertain the direction of this relationship. Second, the self-assessment methodology employed to measure the study variables may introduce certain biases, such as social desirability bias, where participants may respond in ways that are perceived favorably. This approach introduces a degree of subjectivity into the data collected, which suggests the need for more rigorous evaluation methods in future studies. Third, the fact that this study focuses exclusively on university students limits the generalizability of the results to other populations. It is important to note that patterns of stress, self-efficacy and anxiety may differ significantly among different demographic groups, such as schoolchildren or young professionals, these groups may face different types and levels of pressures. This highlights the need to replicate the study in different settings to gain a better understanding of the universality of the observed associations. However, it is worth noting that we have considered data from Peruvian and Mexican university students. One limitation of using the general stress dimension of the *Communicable Disease Stress Scale* is that, as a brief tool, it may not fully capture the complexity of the construct. Finally, to strengthen the findings and broaden their applicability, it is recommended to conduct comparative and predictive analyses using additional statistical approaches. Furthermore, incorporating variables related to family environment, executive functions, socioeconomic status, as well as educational, cultural, and sociodemographic aspects, would enable a more comprehensive exploration of the differences between both demographic groups. This approach would contribute to a more ecological and holistic understanding of the issue under study.

4.2 Public health implications

The findings of this study have important implications for public health, especially in the context of the mental health of university students in Peru and Mexico. The evidence that self-efficacy and stress are significant predictors of anxiety highlights the need for universities to incorporate these elements into prevention and mental health promotion programs. A strategy that could be beneficial in reducing anxiety, helping students manage stress, and enabling them to face academic and personal challenges with greater confidence is the development of interventions that strengthen self-efficacy. Furthermore, the identification of stress as a significant contributing factor to anxiety suggests that universities should implement policies and programs that foster a less stressful academic environment, including reducing unrealistic workloads and increasing student support resources. It is also essential to consider the aspects of culture, gender, and age when implementing these programs, adapting them to the specific needs of the students to maximize their effectiveness. By addressing these factors, educational institutions can enhance academic performance and general student well-being, contributing to a healthier and more resilient society.

5 Conclusion

The results of this study show that Mexican students experience significantly higher levels of stress and anxiety compared to Peruvian students, while differences in self-efficacy are minimal. Regression analysis indicates that, in both groups, stress is the primary predictor of anxiety, followed by self-efficacy, which has a significant protective effect. However, the magnitude of these relationships varies between countries, with the impact of stress being stronger among Mexican students. These findings highlight the importance of designing interventions focused on stress reduction and strengthening self-efficacy as key strategies to improve the mental well-being of university students. Furthermore, they emphasize the need to develop culturally adapted approaches that take into account contextual differences between countries to effectively address these issues within the university population.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by Universidad Nacional Federico Villarreal (registration and reference number: 8118-2021-CU-UNFV). The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

JA: Conceptualization, Supervision, Writing – original draft, Writing – review & editing, Formal analysis, Investigation, Methodology. RC: Conceptualization, Writing – review & editing, Supervision, Investigation, Methodology. DJ-A: Conceptualization, Formal analysis, Investigation, Methodology, Writing – review & editing, Supervision. GC: Conceptualization, Writing – review & editing, Supervision, Investigation. KT: Conceptualization, Writing – review & editing, Supervision, Investigation. RP: Conceptualization, Writing – review & editing, Supervision, Investigation. YC-M: Conceptualization, Investigation, Methodology, Supervision, Writing – original draft, Writing – review & editing, Formal analysis. JS: Conceptualization, Methodology, Writing – review & editing, Supervision, Writing – original draft, Investigation, Formal analysis.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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