



Understanding Academic Anxiety in the Digital Age: An Exploratory Analysis Among University Students and the Influence of New Technologies

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Abstract. The problem of academic anxiety is a recurrent issue among university students. Therefore, this study seeks to analyze the Ecuadorian context regarding the perception that students have about exam anxiety, mitigation methods, and its relationship with their academic performance. A total of 1274 students ($M = 630$, $F = 644$) from the three largest cities in the country, from multiple majors and semesters, were surveyed to determine their respective correlations. The significant findings demonstrate that, indeed, the sensation of anxiety produced by exams is more linked to women than to men, and also depends on the major and semester they are in. On the other hand, regarding anxiety mitigation, although there is no correlation with gender, major, or semester, it is evident that non-pharmacological options such as deep breathing, exercise, and meditation are the most common. Finally, academic digital performance with anxiety only has a significant correlation with the semester. In conclusion, it has been shown that academic anxiety produced by exams and academic performance is a common multifactorial complex phenomenon in Ecuador that needs to be addressed consistently with strategies that enhance the well-being of students in higher education institutions.

Keywords: Academic Anxiety · Ecuador · Higher Education · Students · Evaluation · New Technologies

1 Introduction

School performance is related to the student's abilities and skills to perform in a specific area of knowledge. Several elements, such as motivation, self-efficacy, and academic self-perception, are integrated to achieve good school performance. The absence or alteration of any of these elements deteriorates school performance causing anxiety, which negatively influences learning because it affects concentration, attention, and memory [1]. Students with high anxiety levels show symptoms of embarrassment, shyness, sleep disturbances, behavioral changes, insecurity, and excessive preoccupation with academic issues such as evaluation [2, 3].

Anxiety regarding academic performance has not been sufficiently studied in the academic environment. That is why the need arises to implement strategies and tools to emotionally address university students who have anxiety problems by adopting appropriate teaching methods and taking actions to prevent students from considering themselves incapable of performing and fulfilling their tasks and even to prevent them from dropping out of the educational institution. Considering this scenario, we pose some questions to analyze this situation in the university environment.

1. To what extent are the effects of anxiety associated with academic performance?
2. In which gender and major is anxiety most frequently evidenced?
3. What actions can be taken to prevent anxiety?
4. How practical is applying pharmacological and non-pharmacological measures to cope with and treat anxiety problems?
5. Are there reasons that trigger anxiety in students?
6. What are the symptoms of college students with anxiety?

2 Theoretical Framework

Anxiety is a pathology characterized by constant worries and fears in the individual caused by actual or unreal events. Anxiety is common in people between 14 and 65 years of age and is produced as a response to a threat or an unpleasant situation [4]. Epidemiological studies in Ecuador show that 4 out of 10 people, mainly young adults and women, suffer from anxiety disorders [5]. According to the analyses, most anxiety disorders are more frequent in women and people between 25 and 34 years of age with a low educational level. Some factors that can provoke anxiety are living alone, unemployment, and having experienced some trauma [6, 7]. These patients may have palpitations, excessive sweating, difficulty swallowing, dyspnea, increased respiratory rate, gastric discomfort, stuttering, hyperactivity, repetitive movements, and increased consumption of substances such as cigarettes or coffee [8].

In education, it was believed that low anxiety levels could increase intellectual engagement and even motivate students to improve their performance. However, different studies on this topic have shown that anxiety disorders do not benefit students, so they should be treated to help students define the importance of each task and have a positive attitude [9].

Education is the only way to achieve the fullness of skills [10, 11]. For this reason, teachers must develop adequate didactics to approach and teach students, positively influencing their learning [12]. Neuro-didactics allows the teacher to understand how the brain works to keep students focused on the content being taught through electrical brain stimulation, generating emotions and interactions that promote learning [13, 14]. Academic anxiety is an emotional response of cognitive, motor, and physiological reactions to academic situations that may seem dangerous or threatening to students. Academic anxiety can be caused by changes in daily routine, activities, assessments, or meeting new people, and its effects can cause inhibition of learning and performance of complex tasks. Another element related to anxiety is self-efficacy because low grades and a lack of confidence to face academic challenges can cause anxiety disorders in students [15–17]. Anxiety negatively influences learning as it decreases concentration, information

processing, and attention, causing the student to feel low self-esteem, insecurity, and shyness [18–21]. To address anxiety disorders in students, alternative teaching strategies adapted to the teacher's educational needs and planned assessments that consider the characteristics of the students should be used.

University education should focus not only on academic training and summative evaluation based on grades but also on the emotional state of students. The results of this research show the need to implement measures to detect and treat anxiety to achieve the integral formation of students, focusing the evaluation on the criteria of a formative and diagnostic model.

3 Materials and Methods

This research aims to analyze university students' perceptions of anxiety and the learning process when taking their exams or tests. For this purpose, a quantitative study was conducted with two specific objectives: 1. to examine the connection between anxiety and university exams, 2. to identify alternatives to decrease the anxiety provoked by exams. From this, we posed the null hypothesis H0: There is no significant relationship between students' anxiety and university exams, deriving the following alternative hypotheses:

H1: Gender, major, and semester of university students significantly influence the perception of anxiety caused by summative evaluation.

In elementary education, there is a tendency for anxiety levels to increase when taking exams as the course progresses [22]. The demands of higher levels of schooling provoke more anxiety in students. Gender is also related to anxiety, as evidenced by the difference between anxiety disorders experienced by males and females [23]. Regarding the university major, some studies show that specific professions, such as Nursing [24] or Dentistry [25], are highly connected with anxiety. Other studies associate anxiety with clinical disorders like depression or stress [26]. Some bibliographic references address anxiety as a primary variable but only in countries such as Saudi Arabia [27], Malaysia [28], and the United States [29]. Because of this, we intend to perform a similar analysis of anxiety related to gender, major, and semester in the Ecuadorian university context.

H2: There is a significant relationship between gender, major, and semester of college students and their perception of anxiety mitigation in learning assessment processes.

The academic literature shows that most of the research on the perception of anxiety in learning assessment processes was conjunctural to the issue of the pandemic and online learning [30, 31], and [32]. According to the literature review, some studies focus on foreign language learning [33, 34]. It can be stated that academic performance is directly related to anxiety [35]. Therefore, considering that the post-pandemic context has modified learning processes, it can be noted that there are no previous studies that support the direct relationship between anxiety mitigation and learning assessment processes.

H3: The gender, major, and semester of university students are related to their perception of the relationship between anxiety and academic performance.

Academic performance is directly related to anxiety [36]. Some studies state that low anxiety levels can improve academic performance and increase motivation [37]. High anxiety levels can have the opposite effect, decreasing academic performance [38]. Some

studies show that anxiety is also related to gender [38], but its possible relationship with the major or the semester is unknown.

This research has a descriptive-mixed scope defined as measuring the characteristics or variables of a phenomenon or group of individuals without intervention [39]. For this purpose, a survey was elaborated with 17 questions, 13 closed and 4 open, divided into 3 sections: 4 on sociodemographic data, 8 on anxiety, and 5 on the learning process.

The survey was validated by 7 experts with more than 5 years of experience in Education and Psychology at the Universidad Politécnica Salesiana, Ecuador, Universidad del Azuay, Ecuador, Universidad de Cuenca, Ecuador and Universidad Rey Juan Carlos, Spain. These experts suggested changing the wording of the items, delimiting the constructs of anxiety, performance, and learning, and revising the response options in 4 questions. The questionnaire was then administered to a sample of 34 students to assess the quality of comprehension of the questions. The number of questions was reduced from 20 to 17, thus reducing the time to answer the questionnaire. At the statistical level, the reliability index of the questions was calculated, obtaining a value of 0.7403 which shows the high reliability of the data collection instrument.

The final version of the survey was applied to a non-probabilistic random sample of 1274 higher education students ($M = 630$ and $F = 644$) in Ecuador's three most important cities: Quito, Cuenca, and Guayaquil. The surveyed students study one of the following 25 majors: Business Administration, Architecture, Anthropology, Biomedicine, Biotechnology, Computer Science, Accounting and Auditing, Law, Local Development, Multimedia Design, Education, Economics, Basic Education, Initial Education, Intercultural Bilingual Education, Electricity, Electronics and Automation, Nursing, Environmental Engineering, Automotive Engineering, Civil Engineering, Industrial Engineering, Mechatronics, Digital Business, Physical Activity and Sports Pedagogy, Psychology, Telecommunications, and Theology. The questionnaire was applied from January 18 to March 5, 2023, and the data generated were coded and articulated through SPSS v.29 software to facilitate the interpretation of the data mentioned in the specific objectives. Depending on the variables, Pearson's coefficient and chi-square analysis were performed in the study.

4 Results

4.1 The Gender, Major, and Semester of College Students Significantly Influence the Perception of Anxiety Caused by Summative Evaluations

To address this hypothesis, the relationship between anxiety and university exams was analyzed, considering the perception of the students surveyed. For this purpose, a linear correlation was established between the independent variables: gender, major, and semester, and the dependent variables: feeling anxiety during exams and emotional or physiological changes when hearing the word "exam" or when taking tests or exams.

There is a statistically significant relationship between anxiety perception and gender, with a Pearson's coefficient of -0.115 and sig. (bilateral) of 0.000037 . The negative correlation implies that, on average, women experience more anxiety caused by exams than men. However, the correlation could be stronger, suggesting that there is not much of a relationship between these two variables. The value of the sig. (bilateral) is low,

indicating that the probability of obtaining a correlation as strong or stronger than that observed by chance is very low. Therefore, it is concluded that the correlation is statistically significant and that the relationship between gender and anxiety caused by exams is very likely to be non-random (Table 1).

On the other hand, the Pearson correlation of -0.056^* and a sig. (bilateral) of 0.044 between major and anxiety caused by exams indicates a weak but statistically significant negative correlation between these two variables. The negative correlation implies that, on average, people studying specific majors may experience less distress during exams than those studying other majors. However, the strength of the correlation is weak, suggesting that there is not much of a relationship between these two variables. The value of the sig. (bilateral) is low, so it is concluded that the correlation is statistically significant and that the observed relationship between major and distress during exam times is probably real (Table 1). Specifically, Intercultural Bilingual Education, Mechatronics, Biotechnology, Accounting and Auditing, Civil Engineering and Telecommunications are the majors in which it demonstrates the highest perception of anxiety, while Electronics and Automation and Physical Activity and Sports Pedagogy are the least self-perceived anxiety by students.

The correlation between semester and anxiety caused by exams is 0.70, indicating a moderately strong positive relationship between the two variables. The sig. (bilateral) of 0.012 suggests that the probability of observing a correlation of at least 0.70 between semester and exam period distress by chance alone is very low. Therefore, the observed correlation is statistically significant, suggesting that the anxiety caused by exams increases as the semester progresses (Table 1).

It can be affirmed that there is a direct and statistically significant relationship between gender and anxiety during exams. Although the relationship decreases, it is still substantial concerning major and semester.

For the dependent variables: emotional or physiological changes when hearing the word “exam” or when taking exams, the Chi-Square calculation was used since these were dichotomous option responses, showing that there is a correlation with gender ($p = 0.002$) but not with major ($p = 0.385$) or semester ($p = 0.419$). These two questions, “Do you notice any emotional or physiological change when you hear the word “exam” in the teaching-learning process?” and “Do you notice any emotional or physiological change when you take exams or tests?” are statistically significant only for gender.

Analyzing the gender data, 498 (77.3%) female students and 440 (69.8%) male students noticed an emotional or physiological change when they heard the word “exam” and 522 (81%) female students and 465 (73.8%) male students noticed an emotional or physiological change when they took exams. The most frequent manifestations are palpitations (48.7%), increased or decreased appetite (47.4%), loss of sleep (46.8%), sweating (39%), empty stomach (32%), need to go to the bathroom (31.5%), desire to smoke (9.4%) and desire to drink alcohol (4.8%).

Table 1. Pearson correlation between anxiety caused by exams and gender, major, and semester.

Gender		
		Do you commonly experience anxiety or other manifestations or disturbances during university exams?
2. Gender	Pearson correlation	−,115**
	Sig. (bilateral)	<,001
	N	1274
**. Correlation is significant at the 0.01 level (bilateral)		
Major		
		Do you commonly experience anxiety or other manifestations or disturbances during university exams?
3. Major	Pearson correlation	−,056*
	Sig. (bilateral)	,044
	N	1274
*. Correlation is significant at the 0.05 level (bilateral)		
Semester		
		Do you commonly experience anxiety or other manifestations or disturbances during university exams?
Semester	Pearson correlation	,070*
	Sig. (bilateral)	,012
	N	1274
*. Correlation is significant at the 0.05 level (bilateral)		

4.2 Gender, Major, and Semester of College Students and Their Perception of Anxiety Mitigation in Learning Assessment Processes

Analyzing the Chi-square calculation, the data show that there is no significant correlation between gender ($p = 0.638$), major ($p = 0.137$), and semester ($p = 0,735$) with the routines or processes to reduce anxiety caused by exams or tests. It is proven that 813 students (63.8%) do not perform activities to reduce academic stress, while 461 students (36.2%) do. Some activities that students prioritize to mitigate anxiety are deep breathing (304 students), pharmacological prescription (88 students), exercise (41 students), and Yoga/meditation (28 students) (Fig. 1).

When asked about the benefits of teacher participation and the implementation of academic strategies to reduce anxiety, there were 90.7% positive and 9.3% negative responses. With the teacher’s involvement and help, students could know the specific topics they need to study, clarify their doubts, and feel more confident to take the exam. The teacher’s help and guidance would reinforce learning, psychologically prepare students to take their evaluations, enhance feedback, and synthesize and summarize the results.

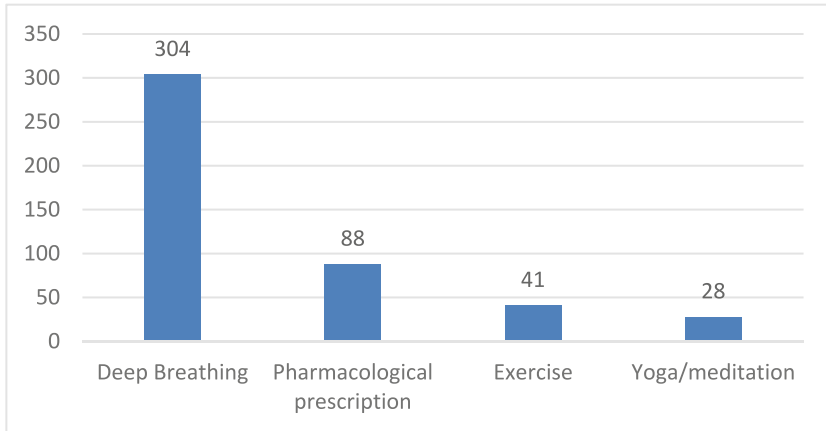


Fig. 1. Mitigation of anxiety among students

4.3 Gender, Major, and Semester of College Students and Their Perception of the Relationship Between Anxiety and Their Academic Performance

The correlation between the proposed sociodemographic data and the questions related to academic performance was reviewed. Pearson's coefficient analysis showed that only the semester is statistically significant within this section of questions. On the other hand, there was no direct correlation between gender and major with anxiety in the learning process. However, it is correlated statistically significant with semester.

The analysis of the correlation between semester and the effect of anxiety on academic performance showed that 47.3% (602 students) responded "almost always" or "always." The highest values were obtained in the 10th semester with 53.7%, the 9th semester with 52.4%, and the 7th semester with 51.3%. The lowest values were obtained in the 1st semester with 40.2%, the 2nd semester with 40.4%, and the 3rd semester with 46.3%. This is why we can conclude that the perception of the effect of anxiety on academic performance is higher in the last semesters and lower in the first semesters.

5 Conclusions

This study's results show a significant correlation between exams and anxiety because anxiety levels are higher during academic evaluations [40]. As corroborated by previous studies, women experience these disorders with greater intensity and frequency [41], same as has been demonstrated in this study, women perceived more anxiety on the learning experience caused by exams than men.

Also, Students from Intercultural Bilingual Education, Mechatronics, Biotechnology, Accounting and Auditing, Civil Engineering and Telecommunications majors from Ecuador are more prone to anxiety as they advance through the professional formative levels, showing that although there is a certain tendency to evidence that anxiety is more oriented to technical majors [42], the results showed that other majors more oriented

to social sciences can also be perceived as anxious by students. In which the following are added based on other variables that could be explored in further studies as the accumulation of tasks and the rigorousness of pre-professional learning practices.

Regarding the hypothesis about the semester and their perception of anxiety [22], it is indeed evident that students perceive greater anxiety as they climb levels in the major. As the semester progresses, the self-perception of anxiety is gradually becoming higher.

As for the second hypothesis, it is rejected because that there are no previous studies in the scientific literature that relate anxiety mitigation in college students, the results of this study showed that there is no direct relationship between the ways of mitigating anxiety with gender, major or semester, this implies that the strategies used by young people to mitigate the effect of anxiety are general and are applied by all without a determination of their profile, these strategies are deep breathing, pharmacological prescription, physical exercise and yoga/meditation.

Taking into consideration the third hypothesis raised about the perception that students have about anxiety and their academic performance, it has been shown in previous studies that there is a relationship with gender [38], but there is no information about major or semester. However, when reviewing the data obtained in this study, it was shown that there is no relationship between anxiety produced by academic performance and anxiety with gender or major, but there is a significant relationship with the semester, demonstrating that when the semester increases, it is perceived that it can affect anxiety in academic performance.

Academic anxiety is a complex and multifactorial phenomenon influenced not only by the “exam” variable but also by various aspects of personality and the context in which students develop.

The results also suggest that personality, previous experience in taking academic tests, and even family and social pressure are relevant aspects to consider when discussing academic anxiety. The economic situation of low-income students is another factor since this is crucial for them to continue their studies and often to have access to student scholarships [43].

This research could be very beneficial for educators and health personnel to determine the factors associated with education and emotions to implement strategies that favor school performance during evaluation periods. It is worth noting that in some cases, the simple fact of hearing the word exam immediately causes mental alterations and emotional and physiological changes in students [44].

It is worth mentioning that we faced some obstacles during the research was the time it took us to apply the surveys and the fact that the anxiety issue can be subjective considering the participants’ self-perception.

University teachers are fundamental in the teaching-learning process, so they must implement methods and strategies to strengthen student learning. Teachers and professionals working in the student wellness and health departments need to be aware of the effects of academic anxiety to work together for students’ well-being and mental health.

It is recommended that teachers reinforce the content to be evaluated in the exams, provide feedback (tutorials), and design evaluation rubrics. These actions improve the evaluation process and academic performance and reduce uncertainty, thus reducing academic anxiety in students. It is also recommended that students study and prepare

academically and psychologically to perform complex tasks and take school tests and exams with optimism and confidence.

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