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Original Article

Impact of Procrastination on Academic Performance of University Students in Lima, Peru: A Multiple Logistic Regression Study

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Abstract *- Academic procrastination is highly prevalent among university students, affecting up to 60% of them worldwide; however, Peruvian evidence quantifying its adjusted association with academic performance remains limited. This study aimed to determine the impact of procrastination on the academic performance of university students in Lima, Peru, using multiple logistic regression analysis. Following a quantitative, non-experimental, correlational, and cross-sectional approach, the Academic Procrastination Scale (EPA) and the University Academic Performance Scale (RAU) were administered to 174 first- and final-year students from four different undergraduate programs. Procrastination and academic performance were significantly related (p=0.000). The model showed acceptable discrimination (AUC=0.7336). Major was associated with procrastination (p=0.020), and accounting students exhibited a higher likelihood of procrastination than their peers in other programs (OR=2.995; p=0.030). Taken together, these findings indicate that greater procrastination is associated with lower academic performance among university students, and suggest prioritizing specific interventions tailored to the sociodemographic context to reduce procrastination and support academic development.*

Keywords *- Academic performance, University students, Multiple logistic regression, Procrastination.*

1. Introduction

Currently, procrastination among university students is one of the main causes of poor performance and student dropout worldwide. In this regard, in 2018, it was reported that between 30% and 60% of university students were behind in completing assignments, studying for exams, or participating in classes [1]. Procrastination, as a habitual behaviour, can affect students' academic achievement, exacerbating an existing problem. In fact, according to the United Nations (UN) [2], almost 300 million students are unable to demonstrate basic skills in key areas like mathematics, which is why the UN has made the case for including quality education as one of the Sustainable Development Goals (SDGs) to be implemented by 2030. Procrastination in education is a clear and present issue on a worldwide scale among university students. In a recent research study in China, it was determined that approximately one in every two students engaged in postponement at least once with curricular activities [3]. In other like-minded research accomplished at seven different universities in Cuba, 17% admitted to postponing assigned materials and readings; on many of those occasions, they never resumed their work, which negatively impacted their academic performance and final grade. These examples demonstrate that levels of procrastination are commonly identified in educational and pedagogical contexts and have the potential to affect student learning.

In Latin America, procrastination in the university environment has become an alarming trend. Research conducted at ten universities in Latin America revealed that about a third of the university-aged youth surveyed self-reported that they procrastinate regularly [4]. This information indicates a trend that has worsened. Moreover, a literature review of studies examining university students established an association between age and procrastination, finding that students under the age of 25 years were more prone to postponing homework and other academic duties, which negatively affects their performance and accessibility to time management. In Peru, approximately 60% of students in higher education demonstrate high levels of procrastination.

Studies conducted in the Arequipa region indicate that a male student aged 16 to 27 is likely to delay his academic obligations over females two out of every four times. This manifests as a difference that could arise due to personal, social, or cultural circumstances. Moreover, other studies have indicated that as much as 70% of students experience procrastination and that their anxieties related to evaluations, caused by the poor management of time, can be the most frequent sources of the delay [5]. This is an issue that affects student performance because the delay not only affects performance, but it can also affect the mental health of students, causing stress and worry continually. Students' procrastination is a widespread phenomenon characterized by students delaying academic and extracurricular activities by participating in lower-priority activities that provide instant, brief periods of satisfaction. Procrastination appears to thrive in the collegiate setting because of the multitude of demands placed on college students: classes, assignments, projects, evaluations, and, to a lesser extent, other activities that are not as structured, demanding, or disciplined as college tasks. Because of this, multiple competing time-related commitments from various college demands, many students are likely to feel overwhelmed if they do not manage their time effectively and responsibly. Therefore, it is essential for us to assess the level of vulnerability many college students may be experiencing with this behavior and collectively consider ways to manage their procrastination [6].

The issue is complex and has several sources, such as emotional, cognitive, and motivational ones. Many students procrastinate because of common psychological problems, including refusing to complete tasks, having high standards for oneself (perfectionism), fear of failing, struggling to manage emotions, having difficulty with managing frustration levels, not being able to manage time, and lacking organizational skills. Additionally, demotivated students will often procrastinate because they perceive that it takes too much effort to complete an assignment compared to the benefit or enjoyment they would receive from completing it.

When students view assignments as meaningless or purposeless, they are less likely to continue working on them. Thus, if a student is not motivated to work hard at a specific assignment because they do not find it enjoyable or rewarding (or thinks it is not worth doing), then they are likely to perform poorly on that assignment or stop attending their classes altogether. Although willpower is important in addressing procrastination, it does not address all aspects of this issue (skills, beliefs, and environment).

Procrastination can have a negative impact on a student's mental and emotional well-being. For example, research has shown that procrastination is associated with increased symptoms of anxiety, academic-related stress, decreased feelings of self-worth, and depression, which may progress to suicidal thoughts/behaviour in some cases [8]. In addition to being detrimental to performing academic tasks, procrastination may reduce a student's self-efficacy and subsequent performance. This creates a self-perpetuating cycle in which low self-esteem results in procrastination and, thus, further reduces self-efficacy [9]. The opposite end of the spectrum is to consider Academic Performance (AP), which is the quantitative representation of what a student knows, can do, and is able to achieve. Good AP allows a student to continue in an academic program, successfully complete that program to meet degree completion requirements, and develop an in-depth understanding through meaningful learning. Failure to act as scheduled results in a loss of time and effort, which will increase the volume of work required, cause delays in completing assignments, increase stress, and decrease the quality of academic work produced. The impact of procrastination is not limited to academics but will carry over into all aspects of a student's personal life; it diminishes their desire to learn and could ultimately result in the development of less competent professionals, as well as missed opportunities to achieve their professional goals. Therefore, it is critical that this phenomenon is studied in higher education in order to create prevention and intervention strategies that can be used to assist in alleviating the impacts of procrastination on performance.

Although descriptive evidence on procrastination and its effects on academic performance is abundant, correlational studies investigating the sociodemographic factors that influence both procrastination and performance are scarce. Furthermore, the literature rarely uses multivariate models capable of quantifying the association between main variables and subvariables such as age, employment status, academic level, or program of study. Moreover, when such models are used, the diagnosis, goodness of fit, and effect size are not always adequately reported, which weakens comparability between studies and complicates the translation of results into concrete educational decisions. More robust analyses are needed.

This research intends to investigate the effect of procrastination on the academic achievement of college/ university students studying in Lima, Peru, through a multiple logistic regression analysis. The hypothesis of this study is that as students procrastinate more, they are also more likely to experience poor academic performance. This approach addresses a gap in academic research, as the statistical methodology supports the search for a significant relationship between predictor and outcome variables, while also enabling a precise estimation of the probability of being classified in a particular academic category. Furthermore, the research utilizes valid and reliable measurement tools to ensure the collection of high-quality data. Therefore, the overall objective is to provide current, useful empirical evidence on the association between procrastination and academic performance to support the development and implementation of interventions to improve student well-being.

2. Related Work and Theoretical Background

Arenas et al. [10] carried out a cross-sectional study at a university in Lima with 139 students between 18 and 28 years of age. The aim was to examine academic procrastination and how it relates to different forms of motivation, while taking into account sociodemographic variables such as age, sex, academic cycle, and performance.

They used the Academic Procrastination Scale along with the Educational Motivation Scale. The analysis showed inverse associations between procrastination and intrinsic motivation, as well as with perceived and internalized regulation, and a positive correlation with demotivation. No significant association emerged between procrastination and academic performance. The authors recommend continuing to study these variables with attention to contextual differences and institutional realities.

Estrada et al. [11] conducted a descriptive cross-sectional design study with the purpose of measuring academic procrastination in young Peruvian university students. Their research, with a quantitative approach, was applied to a sample of students in the Education career through a field study and the application of the Academic Procrastination Scale. The results showed a high level of procrastination in 38.4%, very high in 11.3%, and moderate in 25.8%. The low level was rare. Likewise, a higher prevalence of procrastination was evidenced in men (42.9%) compared to women (36.3%), attributing this difference to better time management in women.

Rodríguez and Clariana [12] conducted research with the aim of determining whether academic procrastination decreases over time and whether this variation is related to factors such as age or academic year. To do this, they applied the Procrastination Assessment Scale for Students (PASS) to a sample of students classified by university year and by age groups, differentiating between under and over 25 years of age. The results revealed that the level of procrastination is associated only with age, with no significant relationship with the subject studied. Likewise, it was identified that most students who present high levels of procrastination are under 25 years of age, which suggests a generational trend in this behavior.

Conducted a quantitative analysis on 113 students from the Faculty of Nursing of a university in Mexico. The study, with a quantitative approach, aimed to determine the level of academic procrastination in undergraduate students of this career, using the Procrastination Assessment Scale for Students. The most relevant results indicate that most of the participants presented a high level of academic procrastination. The most frequently postponed activities were the preparation of final projects and preparation for exams. Likewise, the students identified the main causes of their procrastinating behavior as a lack of self-control, poor assertiveness, low personal confidence, and reduced energy levels.

Cordovez et al. [13] conducted a non-experimental study with 181 university students from several institutions to examine whether academic procrastination is linked to psychological well-being, while accounting for sociodemographic factors. They administered the Buzko Academic Procrastination Scale (1998), the Ryff Psychological Well-Being Scale, and a brief sociodemographic questionnaire. The analysis indicated a positive association between procrastination and multiple dimensions of well-being, particularly self-acceptance, positive relations with others, purpose in life, and personal growth. These findings point to a complex interplay between delaying academic tasks and how students perceive and construct their well-being, suggesting that procrastination may relate differently to motivational and relational aspects than to purely performance-based outcomes.

Through study on academic procrastination and academic stress in a sample of 189 university students, a quantitative non-experimental approach was taken. To measure academic procrastination and academic stress, two measures were used: the Academic Procrastination Scale and the SISCO Inventory of Academic Stress. Using these measures, the study revealed that the average level of procrastination reported by participants was at a moderate level, while participants' ratings of academic stress were high.

An analysis conducted within the study also found a statistically significant relationship between academic procrastination and academic stress. In practical terms, as students placed courses or tasks on hold, the level of stress they experienced during this time in college appeared to increase. Therefore, these findings indicate that academic procrastination contributes to academic stress rather than being a by-product, and therefore, there is a need for the implementation of preventative measures that promote time management, task planning, and coping strategies through university support services.

In 2017, Montañano [14] was conducted to identify the relationship between academic procrastination and anxiety among early-cycle university students in Jaén by a non-experimental quantitative cross-sectional study, using the Zung Self-Rating Anxiety DSM-IV Scale and the academic procrastination scale. The results found that 38% of the 80 students exhibiting enough academic procrastination had low levels of anxiety. When we look at the remaining 62% of the students who experienced moderate to severe academic procrastination, 33.8% of those students had a moderate level of anxiety. This is often attributed to the student feeling that they can improve their academic performance, but feeling the overwhelming pressure to perform better. A broad conclusion drawn from these findings is that students who exhibit lower

levels of postponements also experience lower levels of anxiety, and that students exhibiting perceived underperformance may increase anxiety symptoms. Thus, it may be important for students to have early intervention that helps support proper planning, feedback, and developing positive coping mechanisms.

The researchers Domínguez et al. [15] carried out an empirical study with 379 students from a private university in Peru, who were aged between 16 and 40 years. Domínguez et al.'s objective was to assess the psychometric validity of the EPA scale. Their findings support the scale as having sufficient reliability and validity to be used in future research. In light of these findings, the authors suggest that the EPA can be used to measure procrastination behavior. Furthermore, they suggest that additional validation studies should be carried out in order to optimize the additional use of the EPA scale in other academic and professional contexts using a range of other methods.

3. Materials and Methods

3.1. Research Approach and Design

The method utilized in this research was quantitative, where data were analyzed through processing numerical data using a computerized process; the methodology was non-experimental since no manipulation of variables took place, and cross-sectional because data were collected once rather than through multiple periods for longitudinal analysis. A correlational analysis was used to determine the extent to which procrastination has a negative effect on academic performance. Through the correlation analysis, patterns and associations of significance were uncovered between these two constructs, which are helpful for understanding the links between these two types of variables, and to assist with planning future university-based interventions [16].

3.2. Population, Sample, and Sampling

To conduct this study, a finite population was drawn from the University of Sciences and Humanities in Lima, selected based on accessibility and convenience factors. A representative program from each of the four faculties (Nursing, Early Childhood Education, Accounting, and Systems Engineering) was selected randomly, and a pilot study was conducted to evaluate the accessibility of classrooms and student participation. The pilot study revealed that students in both the first and tenth semesters were more willing to participate than students in the second to ninth semesters; those cohorts were used as the target participants for the survey. Based on these results, the total number of students who met the criteria to participate in this study, who were enrolled on campus in 2025 as per the records of the Universidad de Ciencias y Humanidades, was 338 students.

3.2.1. Sample Size

The sample size was determined using Gpower 3.1, using a prior power estimate ($\alpha = 0.05$, two-tailed), assuming a small to moderate effect size (OR ≈ 1.8), a proportion of outcomes ≈ of 0.60, and up to five covariates (R^2 other ≈ 0.10). This indicated that ≥160 participants would achieve 80% power. This calculation yielded a sample of 174 students, meeting the threshold (Reproducible Methodological Details: Tests → Logistic Regression → z-Tests; options available in the supplement).

3.2.2. Sample Selection

The sampling was non-probabilistic because the participants were selected mainly due to their availability and their interest in participating in the study. In addition, the following criteria were established for the selection of participants.

3.2.3. Inclusion Criteria

- University students enrolled in the first and last cycles of the Nursing, Early Education, Accounting, and Systems Engineering careers.
- Students over 18 years of age.
- Students of both sexes.
- Students who agree to participate in the research voluntarily.

3.2.4. Exclusion Criteria

- Students of educational levels other than university, such as high school or graduate students.
- Students with communication limitations.
- Students who have withdrawn or transferred to another university.
- Students who refuse informed consent.

3.3. Study Variables

3.3.1. Procrastination

- Conceptual definition: It is the persistence of postponing important tasks or decisions, generally motivated by lack of motivation, insecurity, or avoidance of effort, which directly interferes with the fulfillment of personal or academic goals [17].
- Operational definition: It is the inclination that university students have to delay curricular activities, which causes the evasion of their priority, a situation that compromises individual performance.

3.3.2. Academic Performance

- Conceptual definition: It is the degree of achievement achieved by a student in his or her academic training, evaluated according to the results obtained in teaching and learning processes, both in quantitative and qualitative terms, in accordance with the established educational requirements.
- Operational definition: It is the result of the evaluation of the performance of university students in the academic field, which is associated with the achievements and shortcomings identified during this training process.

3.4. Measuring Technology and Instruments

3.4.1. Data Collection Technique

For the collection of study data, the survey technique, commonly used in quantitative and descriptive research, was used.

3.4.2. Measuring Instruments

- Procrastination: The instrument called the Academic Procrastination Scale (EPA) is used, which has been adapted to be applied at the national level and is made up of 12 items and two dimensions [14].
  - Academic self-regulation (9 items).
  - Postponement of activities (3 items).

  Each of the items is evaluated using a Likert scale (Never: 1, Almost Never: 2, Sometimes: 3, Almost always: 4, Always: 5). Subsequently, the scores resulting from each item are summed to be interpreted as follows:
  - Low level of procrastination: 0 – 20 points
  - Average level of procrastination: 21 – 40 points
  - High level of procrastination: 41 – 60 points

  In this sense, the interpretation of the first dimension, academic self-regulation, indicates that the higher the score obtained, the lower the student's level of self-regulation. In the second dimension, procrastination, a higher score reflects a greater tendency to procrastinate. Regarding the validity of the instrument used, an expert judgment was applied, made up of five research specialists, who gave an Aiken V coefficient of 0.936. Regarding reliability, Cronbach's Alpha index was used, whose result was 0.80, evidencing that the instrument presents acceptable levels of validity and reliability for the context in which it will be applied.
- Academic performance: The University Academic Performance Scale (RAU) is used, which is made up of 20 items and three dimensions [18]:
  - Contribution to academic activities (10 items).
  - Dedication to study (5 items).
  - Organization of teaching resources (5 items).

  The rating of the items that make up this instrument is also mediated by a Likert scale that assumes the values (Never: 0, Almost Never:1, Sometimes: 2, Regularly: 3, Often: 4, Almost Always: 5, and Always: 6). These scores are consolidated by dimensions, and the scores are classified as follows:
  - Contribution to academic activities

    Low: 0 – 23 points

    Medium: 24 – 38 points

    High: 39 points or more
  - Dedication to study

    Low: 0 – 17 points

    Medium: 18 – 26 points

    High: 27 points or more
  - Organization of teaching resources

    Low: 0 – 5 points

    Medium: 4 – 14 points
  - High: 15 points or more

    The results of the three dimensions indicated that higher scores were indicators of university students' academic success. The development of the instrument relied on extensive review by multiple experts, with Aiken's V calculation (0.936) demonstrating its theoretical validity, as with the first instrument used in this research. Cronbach's Alpha was calculated to confirm internal consistency, yielding a coefficient of 0.87, indicating that it has adequate internal consistency, confirming the validity of the instrument, as well as its reliability in this study. Age, Gender, Work- study status, program, cycle were considered as prior covariates. The instruments were administered as validated, maintaining original scoring ranges and decision rules for all instruments; in addition, Scoring Code Book and Blank Forms were used as a supplement to the results of the sample evaluated.

3.5. Procedure for Data Collection

3.5.1. Prior Authorization and Coordination

To collect data, a cover letter was sent to the Academic Research Department of the University of Sciences and Humanities. The letter obtained the approval necessary to conduct the survey and access the schedules for each semester of the study sample from each of their faculties. The letter also included an explanation of the purpose and scope of the research project to obtain permission to enter the classrooms, once permission was granted, to send the interviewers into the classrooms. Upon obtaining authorization, five interviewers were sent to each of the classrooms to begin the surveys. Before conducting the surveys, instructors provided consent for interviewers to enter the classrooms and administer the questionnaires.

3.5.2. Application of the Instruments

Teachers approved each selected class in order to inform students of this project; its purpose, scope, and effect on college life were explained, which encouraged students to be involved in the project. The students who elected to get involved voluntarily were given informed consent. A questionnaire was distributed through WhatsApp to the students over a period of approximately 10 minutes to fill out. At the end of the questionnaires, each student's questionnaire was reviewed to ensure the forms were completed accurately and to ask any clarifying questions regarding any of the questions. Lastly, students received brochures containing information regarding procrastination and practical suggestions for how to reduce procrastination immediately and refer to resources available to them.

3.6. Methods of Statistical Analysis

Initially, the data collected were arranged using a matrix created within Excel. Then, they were transferred into Stata,

where the work of cleaning, coding, and performing statistical analyses was completed. The frequency of occurrences, the percentage of those occurrences, and the mean (average) would be generated using the formula for calculating each of these measures, as well as for conducting a correlation analysis.

The results will be represented in both tabular and graphical forms in order to assist with the ability to compare data and interpret the information visually while still maintaining trade-offs between clarity and methodology [19].

3.6.1. Analytic Plan

Multiple logistic regression estimated the odds of low academic performance (RAU) as a function of procrastination level (EPA) and covariates (age, sex, work–study status, program, cycle).

3.6.2. Assumptions and Diagnostics

Multicollinearity was checked with VIF (<3 acceptable); linearity of the logit for continuous predictors was examined via Box-Tidwell; influential observations via Cook's distance and dfbetas; overall fit with Hosmer–Lemeshow; discrimination with ROC-AUC and 95% CI; calibration with calibration plot and Brier score.

3.6.3. Effect Sizes and Precision

Adjusted Odds Ratios (aOR) are reported with 95% confidence intervals and p-values. Pseudo-R^2 (Nagelkerke) and classification metrics (accuracy, sensitivity, specificity) are presented.

3.6.4. Subgroup/Interaction Analyses

Exploratory interactions tested whether the procrastination–performance association varied by program and sex; stratified models are reported in Supplementary Table 2. [20].

3.7. Ethical Aspects

Bioethical principles are essential to safeguarding the integrity and dignified treatment of participants. In compliance with these guidelines, which are especially relevant in health research, the protocol was submitted to the Ethics Committee of the University of Sciences and Humanities for review before the study began. After a thorough evaluation, the committee granted its approval, recorded in the ACTA CEI Nº. 145, Code-162-25. This authorization ensured that the procedures, data management, and informed consent adhered to standards of safety and respect.

3.7.1. Principle of Autonomy

This principle manifests the ability to set rules for oneself to make decisions without influence from the environment, whether internal or external. In this study, this principle is manifested by verbally inviting them to participate in the study, followed by informed consent approved and authorized by the Ethics Committee of the University of Sciences and Humanities. It should be noted that participation in this study will be voluntary.

3.7.2. Principle of Beneficence

This principle encompasses the duty to act for the benefit of people without causing harm or, in the most important case, minimizing risks, always seeking the best for them. In this study, participants will obtain benefits such as the possibility of acquiring knowledge about the subject, obtaining informative brochures, and, at the end of the research, they will have the opportunity to know the results that can serve as a background for their future research.

3.7.3. Principle of Non-Maleficence

The principle of non-maleficence refers to evading any action that may cause harm or put people at risk. It is worth mentioning that any action must be in favor of the benefits. The intervention of the participants in this study does not present any type of inconvenience or risks, because they will only be asked to answer a few questionnaires. In the same way, they will be informed about the use we will give to the data obtained with the respective anonymity, in order to promote confidentiality.

3.7.4. Principle of Justice

It is a principle that promotes the moral norm of good treatment of people, with the purpose of reducing inequality. The university students who have undergone surgery will be treated with total cordiality and respect without distinction of any kind.

4. Results

The main findings of the study are shown below using statistical tables, which are essential for the analysis and interpretation of the data collected. The data that were collected are relevant because there is a balance between the different representative groups of the aforementioned characteristics; therefore, it is of vital importance because a real comparison of variables can be made.

Table 1. Sociodemographic characteristics of university students

Sociodemographic characteristics	N=174	
	fi	**%**
Gender		
Female	92	52,90%
Male	82	47,10%
Age		
Young	104	59,80%
Adult	70	40,20%
Employment status		
Study only	83	47,70%
Study and work	91	52,30%
Race		

Nursing	42	24,1 %
Early Childhood Education	44	25,3%
Accounting	43	24,7%
Systems Engineering	45	25,9 %
Shift		
Morning	77	44,3 %
Night	97	55,7%
Study cycle		
First cycle	85	48,9 %
Last cycle	89	51,1 %

Table 1 presents the distribution of the sociodemographic data of the surveyed university students. In terms of gender, 52.9% (92) corresponded to women and 47.1% (82) to men. Regarding age, 59.8% (104) identified themselves as young people, while 40.2% (70) were categorized as adults. In relation to the employment situation, 47.7% (83) only study, and 52.3% (91) study and work. By professional career, 24.1% (42) study Nursing, 25.3% (44) Early Childhood Education, 24.7% (43) Accounting, and 25.9% (45) Systems Engineering. As for the study shift, 44.3% (77) attend in the morning and 55.7% (97) at night. Finally, 48.9% (85) are in the first cycle and 51.1% (89) in the tenth cycle.

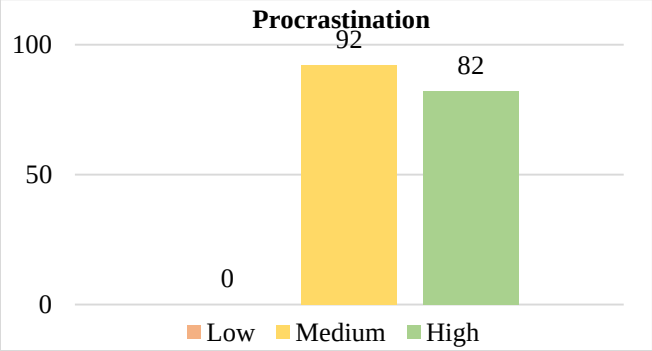

Fig. 1 Level of procrastination

Figure 1 shows the levels of procrastination in university students, where there were no cases with a low level; 52.87 % (92) showed medium procrastination, and 47.13 % (82) presented a high level.

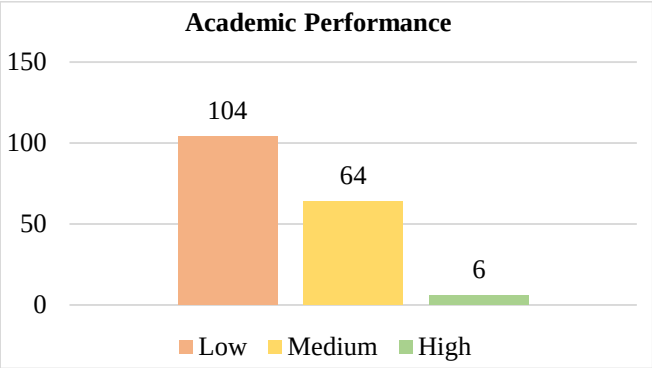

Fig. 2 Level of academic performance

Figure 2 shows the distribution of academic performance by levels, where it is observed that 59.77 % (104) of the students have a low performance, 36.78 % (64) a medium level, and only 3.45 % (6) a high level.

Table 2. Procrastination and academic performance according to gender

Gender	Procrastination		Academic performance			
			Low	Middle	High	Total
Female	Middle	n	42	9	0	51
		%	45.65	9.78	0	55.43
	High	n	14	22	5	41
		%	15.22	23.91	5.43	44.57
	Total	n	56	31	5	92
		%	60.87	33.7	5.43	100
Male	Middle	n	26	15	0	41
		%	31.71	18.29	0	50
	High	n	22	18	1	41
		%	26.83	21.95	1.22	50
	Total	n	48	33	1	82
		%	58.54	40.24	1.22	100

Table 2 shows that among the female participants, 45.65% (42) have a medium level of procrastination and low academic performance, and no one was identified with a medium level of procrastination and high academic performance. As for the male gender, 31.71% (26) have a medium level of procrastination and a low academic performance; likewise, only 1.22% (1) have a high level of procrastination and achieve a high academic performance.

Table 3. Procrastination and academic performance by age

Age	Procrastination		Academic performance			
			Low	Middle	High	Total
Young	Middle	n	41	15	0	56
		%	39.42	14.42	0	53.85
	High	n	16	27	5	48
		%	15.38	25.96	4.81	46.15
	Total	n	57	42	5	104
		%	54.81	40.38	4.81	100
Adult	Middle	n	27	9	0	36
		%	38.57	12.86	0	51.43
	High	n	20	13	1	34
		%	28.57	18.57	1.43	48.57
	Total	n	47	22	1	70
		%	67.14	31.43	1.43	100

Table 3 reveals that 39.42% (41) of young students have a medium level of procrastination along with low academic performance. In the case of adults, 38.57% (27) show the same combination of characteristics. On the other hand, high academic performance is rare in both age groups, although it is observed with a higher incidence in young people, with 4.81% (5), compared to adults, where only 1.43% (1) reach this level.

4.1. Multiple Logistic Regression Model

This model was applied with the purpose of statistically analyzing the relationship between the main variables of the study, as well as their possible association with certain sociodemographic characteristics. To do this, the following formula was used as the basis of the analysis:

$$P = 0.205967 + 3.994251(V1) + 2.59022(V2) + 0.3758049 (V3) + 2.160717 (V4) + 1.456999 (V5)$$

Where:

P : Procrastination
V1 : Academic Performance
V2 : Age
V3 : Cycle of study
V4 : Employment Status
V5 : Race

This statistical formula supports the validity of the applied Multiple Logistic Regression Model, since it has a value of (p=0.00), which evidences its significance. Likewise, the model manages to explain the behavior of the analyzed sample in a statistically significant way.

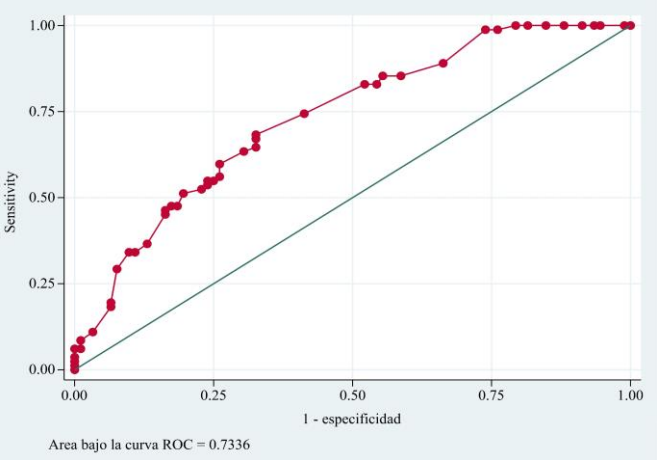

Fig. 3 ROC curve to evaluate model quality

Figure 3 presents the ROC curve used to evaluate the predictive capacity of the model. In this, the red curve represents the performance of the model, and its distance from the diagonal line, which indicates chance, reflects an adequate capacity for discrimination. In this case, the curve deviates from this line, suggesting that the model is acceptable for distinguishing between the categories analyzed. In addition, the Area Under the Curve (AUC) is 0.7336, which shows an adequate level of precision to classify positive versus negative cases in the sample studied correctly.

Table 4. Procrastination and academic performance according to the statistical model

P value (< 0.05)	Procrastination
Academic Performance	0.000

Table 4 shows the relationship between procrastination and academic performance, analyzed through the model previously described. A value (p=0.000) is observed, which is lower than the significance threshold of 0.05. This result indicates that, from a statistical point of view, procrastination influences the academic performance of the students evaluated.

Table 5. Procrastination and sociodemographic characteristics according to the statistical model

P value (< 0.05)	Procrastination
Age	0.085
Employment status	0.062
Professional career	0.020
Study cycle	0.069

Table 5 shows the relationship between procrastination and sociodemographic characteristics, according to the statistical model applied. The results indicate that the p-value is higher than 0.05 in most of the variables analyzed, with the exception of professional career, whose value (p=0.020), evidences a statistically significant relationship between this variable and procrastination.

Table 6. Procrastination and running according to the statistical model

Professional career	Procrastination	
	Odds Ratio (OR > 1)	P value (< 0.05)
Nursing	2.127915	0.0681
Early Childhood Education	2.208082	0.105
Accounting	2.995791	0.030
Systems Engineering	1.230681	0.670

Table 6 shows the relationship between procrastination and university career. It is identified that the Odds Ratio is greater than one in accounting students (OR=2.995791), this being the only statistically significant result, with a value (p=0.030). This indicates that students in this career have a higher risk of engaging in procrastinating behaviors compared to other specialties.

5. Discussion

Multiple logistic regression analysis was conducted on the effect of procrastination on the academic performance of university students in Lima, Peru. The results of this analysis indicated the development of a statistically significant formula (p=0.00) to describe 13% of the study sample. This indicates that the model is both representative and replicable. The ROC curve developed for this model provided an opportunity to evaluate the efficiency of the model, with an area under the curve of 0.7336, which indicates that the model has good predictive capability to distinguish between positive and negative cases.

There was a significant correlation identified between procrastination and academic performance (p=0.000), as well as a significant relationship between procrastination and major (p=0.020); in particular, the study found that there was a very strong association between procrastination and major in Accounting (OR=2.995791; p=0.030). This study's findings are different from those reported by Arenas et al. [10], who found no significant association between the two variables and thereby rejected their hypothesis. The differences between the findings from this study and those reported by Arenas et al. [10] may be attributable to the differences in methodology, particularly regarding how the model was developed. Based on the circumstances of this study, it appears that multiple logistic regression is a valid method for identifying these associations.

The descriptive data indicate that the sample consisted of a higher percentage of female participants (52.9%) and a majority of younger individuals (59.8%) as compared to other samples. The percentage of participants who are working while studying is also relatively high (52.3%). The participants were primarily enrolled in the evening classes (55.7%). The percentage of participants who were in their tenth semester is slightly higher (51.1%). A higher number of younger participants is consistent with the data reported by Arenas et al. 2015; they also found that this group represented the largest number of individuals in their samples. The higher proportion of younger individuals in both samples is not surprising, given the expected course of education; in general, most individuals will attend college immediately following graduation from high school. In contrast, the number of older adults enrolled in college programs is typically significantly lower than that of younger adults, which provides some explanation for their lower percentage in this population but does not imply that there is no interest in pursuing a college degree or that these individuals are any less committed to their education than younger students.

No participant was identified as a low procrastinator, and all students had exhibited academic procrastination at some level before entering university. In this group, most students (52.87%) were at an average level of procrastination, and only 47.13% had a high level of procrastination as measured by this study. This pattern corroborates the findings from Estrada et al., where most of their participants experienced high (49.7%) and very high levels of procrastination. These findings may be influenced by a similar context, as both studies occurred in Peru, which provides a very limited amount of educational support. These limitations impact how motivated students feel and how much time they can allocate to completing university assignments. Other limiting factors include poverty and the necessity of balancing school work with employment commitments, which hinders students' ability to prioritize school-related responsibilities. In contrast to the students in Peru, Morales reported that her participants in Guatemala demonstrated much higher levels (73%) of procrastination than their Peruvian counterparts. Likewise, López et al reported in their study that students from Mexico also experienced very high levels of (55.8%) procrastination.

These results from Morales and López et al. could be attributed to cultural differences, limitations of the educational system, and specific characteristics of the populations studied. 59.77% of the students surveyed had exhibited low academic performance. This is commonly tied to an absence of sufficient educational supports and to students' continued lack of commitment during the early years of post-secondary education. Many of the students in this study were also in their first year of education and in the transitional period of adjusting from high school to an increasingly challenging college/university environment, which included revised study, evaluation, and time management techniques. The continued emergence of low performance at the end of their education is particularly troubling for these students. This group is made up of young people who are about to graduate and, therefore, will not have the time necessary to develop the study skills and conceptual understanding necessary to perform successfully in their chosen careers. In order to support these students during this transition into the workforce, and to prepare them for the future, support for academic success, adequate tutoring, and training programs must be in place that ensure they have developed the necessary knowledge, skills, and attitudes to perform the job they are preparing for prior to graduating. Although the completion of these tasks will enhance the competitiveness of the institution, the implementation of these activities will also ensure that the ethical and technical knowledge and abilities of future graduates will be upheld.

Additionally, the results revealed that a high amount (45.65%) of females have either low or moderate levels of procrastination, compared to only 31.71% of males in the same categories. This presents evidence of each sex having the same tendency toward moderate levels of procrastination, which have been linked with significantly lower academic achievement. This finding is of particular importance since a correlation has been shown between moderate anxiety and low academic performance; 33.8% of students at the university level experiencing moderate anxiety among students with lower academic achievement (Montaño, 2001) are likely to experience an ongoing effect on their psychological health if further intervention does not take place. The stressful nature of university life creates a situation that contributes to procrastination; there are frequent tests, tightly imposed deadline constraints, and a multitude of tasks that require time management and perseverance. Therefore, procrastination is a risk factor for increased stress, reduced self-regulation, and decreased quality of study. These results thus underline the need for preventive strategies and psychoeducational support to facilitate the development of time management, study, and emotional management skills for especially vulnerable members of society.

Limitations of the study included one limitation being related to the reluctance of students to initially participate on a substantial basis in this phase of the study. To overcome this limitation, each student received an assigned individual motivation plan that identified reasons relating to the specific area(s) of interest and provided motivation associated with participation based on those areas, resulting in an increase in the number of students who volunteered, allowing for the planned sample size to be achieved. The second limitation was the selection of a complex Statistical Analysis Software (SAS) for analysis purposes when most, if not all, of the researchers in the study had little or no experience in this statistical area.

To overcome this limitation, the researchers scheduled six training sessions on how to use the statistical analysis tool, which allowed for effective collaboration among the researchers when conducting statistical analysis of the collected data. The researchers also recognized that with the wealth of advanced tools and approaches to integrating AI into correlation analysis with predictive capabilities available today, more in-depth results could have been obtained. In the future, researchers could employ these tools when conducting studies of this nature, following completion of appropriate training.

6. Conclusion

Ultimately, the applied method of multiple logistic regression provided sufficient evidence to confirm that procrastination has an effect on the academic performance of college students in Lima, Peru, in accordance with the initial hypothesis. The results suggest that when students engage in more procrastination, there is an increased likelihood of obtaining lower grades. Diagnostic tests indicated acceptable discriminatory power and calibration for this method. Therefore, it may be beneficial to provide more detailed and systematic mechanisms of support based on theory while additional longitudinal studies and experimental studies of causal relationships are conducted. It appears that moderate levels of procrastination are common; the majority of students who procrastinate tend to achieve moderately low grades. In the future, college administrators should consider providing a comprehensive strategy for addressing this issue by including improvements in mental health, stimulating student engagement, and taking other relevant factors into account. To enhance and encourage this type of support, colleges should establish awareness programs and initiatives.

In addition, research must also take place regarding the specific factors related to university students that contribute to Procrastination levels being increased. The findings from these studies will aid in developing preventative methods, which will help decrease Academic procrastination, for those stakeholders (e.g., Faculty) who are involved in an Academic environment. It is also suggested that the development of Interventions to reduce Academic procrastination be Based on the Unique Characteristics of each Student Group. These characteristics would include their Contextual Factors and Curriculum Requirements, as well as Routine and Practices. As a First step in Helping Each student develop their ability to Manage Time, set realistic and attainable goals, Break Down Large and Difficult Assignments into Smaller Steps, Develop Structured Planning Skills, Eliminate Distractions from their Learning Environments, and Receive Timely Assistance through Student Feedback that Helps Develop Self-Regulation Skills while committing time to maintain their Studies.

In order to reduce procrastination and improve academic achievement, universities should provide programs that teach time management skills, acceptance and commitment therapy, adaptive skills, and course development strategies. The findings from this study are descriptive and correlational; therefore, making causal inferences should be done carefully. There are potentially unmeasured variables (e.g., mental health status, quality of sleep) affecting the data. Future research may include longitudinal studies examining how behavior changes over time after participating in the interventions, follow-up studies evaluating the effectiveness of the interventions, and a broader array of behavioral measures.

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