

# Academic Stress: A Critical Perspective for Optimizing Mental Health in University Settings

Estrés Académico: perspectiva crítica para optimizar la salud mental  
en entornos universitarios

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## SUMMARY

**Introduction:** Academic stress affects the well-being and mental health of university students. In view of this, it is necessary to promote andragogical approaches to strengthen interpersonal and intrapersonal skills in higher education comprehensively.

**Objective:** To analyse the relationship between academic stress levels and mental health indicators in students, considering differential variables such as gender and risk profiles through the psychometric validation of the SISCO SV-21 Systemic Cognitive Inventory of Academic Stress.

**Design and setting:** Observational, analytical, cross-sectional study conducted at a university in Montería (Córdoba, Colombia).

**Participants:** 209 participants from the University of Sinú, selected through stratified random sampling.

**Method:** The SISCO SV-21 was administered, and factor analyses, internal consistency estimates, group comparisons, correlations, and k-means segmentation were performed, with all results reported with 95 % confidence intervals.

**Results:** The instrument showed high internal consistency ( $\alpha = 0.91$ ; 95 % CI: 0.88–0.93). Cluster analysis identified two student profiles: one resilient and one vulnerable. Associations were observed between stressors, physiological reactions, and coping strategies. Women reported higher levels of stress (mean difference = 0.42; 95 % CI: 0.18–0.65), whereas no significant variation was observed by age.

**Conclusion:** The measurement instrument demonstrated psychometric consistency, providing evidence of differentiated patterns and highlighting the dynamic and non-homogeneous nature of academic stress. Therefore, strengthening differentiated actions to promote well-being based on risk profiles is necessary to enhance mental health in the higher education system.

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**Keywords:** *Academic stress, university wellbeing, social-emotional skills, educational humanisation.*

## RESUMEN

**Introducción:** *El estrés académico afecta el bienestar y la salud mental de los universitarios, ante ello, es necesario promover enfoques andragógicos orientados al fortalecimiento integral de competencias inter e intrapersonales en la educación superior.*

**Objetivo:** *Analizar la relación entre los niveles de estrés académico e indicadores de salud mental en estudiantes, considerando variables diferenciales como el género y los perfiles de riesgo, mediante la validación psicométrica del Inventario Sistemático Cognoscitivista del Estrés Académico (SISCO SV-21).*

**Diseño y escenario:** *Estudio observacional, analítico y transversal realizado en una institución universitaria de Montería (Córdoba, Colombia).*

**Participantes:** *209 de la Universidad del Sinú, seleccionados mediante muestreo aleatorio estratificado.*

**Método:** *Se aplicó el SISCO SV-21 y se realizaron análisis factoriales, estimaciones de consistencia interna, comparaciones entre grupos, correlaciones y segmentación mediante k-means, reportando todos los resultados con intervalos de confianza del 95 %.*

**Resultados:** *El instrumento mostró una alta consistencia interna ( $\alpha = 0.91$ ; IC95 %: 0.88–0.93). El análisis de clúster permitió identificar dos perfiles estudiantiles: uno resiliente y otro vulnerable. Se observaron asociaciones entre los estresores, las reacciones fisiológicas y las estrategias de afrontamiento. Las mujeres reportaron niveles superiores de estrés (diferencia de medias = 0.42; IC95 %: 0.18–0.65), mientras que no se observaron diferencias significativas por edad.*

**Conclusión:** *El instrumento de medición presentó consistencia psicométrica, aportando evidencia sobre patrones diferenciados y evidenciando la naturaleza dinámica y no homogénea del estrés académico, por lo que es necesario fortalecer acciones diferenciadas para la promoción del bienestar por perfiles de riesgo, necesarias para promover la salud mental en el sistema de educación superior.*

**Palabras clave:** *Estrés académico, bienestar universitario, habilidades socioemocionales, humanización educativa.*

## INTRODUCTION

The higher education system faces the challenge of ensuring the development of

competent professionals without compromising students' psychological well-being. University programmes entail high levels of academic stress, particularly due to curricular demands, a phenomenon reported in Colombia to affect 62.23 % of students with moderate or severe symptoms (1). This scenario is exacerbated by educational models that emphasize competition and pay limited attention to socioemotional aspects and motivation. The World Health Organization (WHO) urges institutions to strengthen mental health promotion and prevention as part of comprehensive wellbeing (2).

The emotional uncertainty following the pandemic increased young people's psycho-emotional vulnerability (3), demanding robust policies for well-being and understanding of stressors, protective factors, and coping mechanisms. In this context, teaching soft skills and socio-emotional competencies is key to promoting empathy, resilience, and emotional self-regulation, which are skills that reduce stress, depression, and anxiety (4,5). Goleman highlights the importance of emotional intelligence as a complement to cognitive intelligence (6). Therefore, the humanisation of education seeks to protect both educational quality and mental health.

In Latin America, up to 50 % of students have mental health problems (7). In Colombia, reports from DANE (Departamento Administrativo Nacional de Estadística) and Minsalud show an increase in depression, anxiety, and suicidal ideation, especially in contexts with low psychological care provision (8). Despite the protection framework of Law 1616 of 2013, many Higher Education Institutions (HEIs) still lack systematic programmes aimed at psycho-emotional care.

In the Colombian Caribbean, 21.7 % of young people report mental health difficulties, and 10.6 % report a risk of emotional and social disorders (9). Socioeconomic factors, poor access to health services, and a traditional education system based on punitive assessment affect emotional coping. In response, initiatives such as the Human Flourishing programme at the University of Sinú offer a framework for articulating psycho-socio-emotional skills and comprehensive well-being.

University students face a high cognitive and emotional burden, which exposes them to academic stress, defined as a physiological response to demands perceived as exceeding their capabilities, with effects on professional identity and performance (10). Accurate measurement requires instruments such as the SISCO SV-21, which assesses stressors, symptoms, and coping (11) and whose cultural validation is necessary (12). Factor analysis applied to students at the University of Sinú confirmed its relevance and reliability.

The results indicate that academic stress is multidimensional, with a strong association between stressors and physiological responses, including anxiety, fatigue, and sadness (13). Gender differences were identified, with women being more affected, while coping strategies remain constant throughout the semesters, evidencing adaptive rigidity. This reinforces the need to integrate soft skills and a gender perspective into welfare policies and pedagogical practices, as suggested by international studies (14) and authors such as Goleman (6) and Ward et al. (15).

Educational humanisation must be a structural principle of the curriculum, guided by empathy, emotional co-responsibility, and ongoing care for overall well-being. This involves reviewing academic workload, assessment methods and pedagogical communication (16,17). The validation of the SISCO SV-21 in Montería provides evidence to strengthen institutional well-being policies and to address academic stress as a differential risk factor by gender and coping strategies.

Reforming higher education from a humanising perspective entails adopting wellbeing as a quality criterion and consolidating spaces in which academic stress can be harnessed as an opportunity for development. The integration of soft skills into higher education will enable the development of professionals who meet high-quality regional, national, and international standards, thereby ensuring that university education fulfils its essential purpose: to promote and protect the mental health and well-being of those involved in education. In line with the scenario described and the need to base institutional decisions on evidence, the following

research question arises: What is the relationship between academic stress levels and mental health indicators among university students in Montería (Colombia), considering differential patterns by gender, academic semester, and risk profiles? To answer this question, the objective was established to analyse the relationship between academic stress levels and mental health indicators, incorporating differential variables that allow for an understanding of the heterogeneity of the study population, based on the application of the SISCO SV-21 inventory, which makes it possible to identify associations, variations by subgroups, and risk patterns. This approach offers the rigour necessary to interpret the complexity of academic stress in the university context, providing relevant inputs to guide curricular decisions, welfare policies, and educational humanisation strategies.

## Research Background

A review of international and national studies sheds light on the relationship between soft skills and mental health in the university context. Globally, Sheldon et al. (18) show that student mental health faces a global crisis, with a prevalence of depression of 25 % and suicide-related outcomes of 14 % in this student population. This research emphasises social support and self-acceptance in coping with psychological distress.

Complementarily, Ochnik et al. (19) identify female gender as a significant predictor of higher stress levels, which guides the design of gender-differentiated interventions. In the same vein, Cassaretto et al. (20) and Villarrubia et al. (21) document the persistence of physical and psychological symptoms even in students who perceive their health as positive, underscoring the need for comprehensive institutional strategies that prioritise well-being and mental health as structural components of higher education. The theoretical value is supported by Jugănar and Moraru (22), who conclude that such cross-cutting skills (developed even in extracurricular settings) are fundamental to students' comprehensive training and socio-emotional adaptation.

At the national level, the mental health situation is critical: 66.3 % of Colombians

report some type of psychological distress, with a particularly marked deterioration among young people in the Caribbean region (23,24). Research conducted in Colombian university contexts, such as Pérez-Díaz (25) and Alemán et al. (26), demonstrates the high prevalence and applicability of active listening, influence, and motivation, highlighting that women use these constructs to a greater extent than men.

Furthermore, Morozova et al. (27) and Vargas et al. (28) point out that training in social-emotional skills promotes mental well-being and academic performance by combining cognitive, emotional, and social elements. The literature recognises the importance of soft skills for university mental health, but there remains an empirical gap regarding their impact in particular contexts, such as Montería. This gap supports the need to develop psychological and pedagogical support programmes to strengthen these skills.

### Legal Elements Consulted

The research complies with ethical, legal, and bioethical frameworks that protect participants and ensure scientific validity. It adheres to the World Medical Association Declaration of Helsinki (29), which guarantees respect for, confidentiality of, and informed consent. At the national level, it complies with Resolution 8430 of 1993 of the Ministry of Health (30), which defines the research as minimal risk, and Law 1090 of 2006 (31), the Psychologist's Code of Ethics and Bioethics, regarding professional responsibility and information management. It also incorporates Law 1616 of 2013 (32), which recognises mental health as a right and guides its promotion and prevention. Together, these standards create an ethical framework for research in mental health and higher education.

### Synthesis of theoretical approaches

The related indicators define the individual's psychological state, a factor in academic performance. They are grouped into two dimensions: internal self-regulation processes and execution and coping processes, which explain the

mechanisms by which academic stress influences adaptation and psychological well-being.

### Internal self-regulation processes.

**Emotional regulation:** Anchico and Menjura (33) define it as a process involving the control, evaluation, and modification of internal and external emotional responses. De los Santos (34) defines it as a dynamic process that involves managing emotions positively and achieving emotional balance. In this sense, emotional intelligence is associated with the capacity for regulation and is a determinant of well-being and success at work (6).

**Cognitive Flexibility:** Defined by Demirtaş (35) as one of the three central executive functions (along with working memory and self-control), cognitive flexibility is the ability to switch between tasks or mental rules. This ability is essential for adapting behaviour to changing situations, controlling inappropriate responses, and finding alternative ways of looking at things in new situations (36,37).

**Adaptability:** Loyola Salas (38) conceptualises it from a Piagetian stance of assimilation and accommodation, as a process of the individual's permanent adjustment to the demands of the environment. Velarde (39) reinforces this by defining adaptability as the dialectical interaction of the individual with their environment to resolve existential conflicts through cognitive and emotional reorganisation. It involves continuously adapting strategies and actions to changing conditions.

### Execution and coping

**Problem-solving:** Is the ability to combine knowledge, skills, and learned attitudes to resolve new or particular situations. Ceballos (40) defines it as a complex cognitive and behavioural process that requires systematic, planned action, in which metacognition plays a crucial role in decision-making.

**Coping/Stress Management Index:** According to Harvey and Alabama (41), coping is the process of controlling stress and its

effects. It is a process of thoughts and actions aimed at maintaining one's well-being, guided by psychological, social, and environmental resources. According to Cox and Alabama (42), stress management involves three aspects: prevention (reducing exposure to stressors), reaction/solution (adaptive response to the event), and rehabilitation (recovery and subsequent psychological support).

**Resilience:** Tello and Céspedes (43) define it as the ability of a system or person to adapt favourably to adversities that threaten its stability or survival, to maintain functionality, and to promote long-term development. This concept integrates emotional, cognitive, and social dimensions that not only enable individuals to resist adversity but also to transform it into an opportunity for growth.

In this sense, the theoretical framework enables us to move beyond the description of academic stress and examine coping processes, thereby justifying a more conscious, reflective university education aimed at strengthening socio-emotional and self-regulation skills.

### Indicators of well-being and mental health

**Mental health:** The definition used is that of the World Health Organisation (WHO), which defines mental health as a state of well-being in which individuals can cope with the normal stresses of life, work productively, and contribute to their community (44). In line with this, Law 1616 of 2013 in Colombia recognises it as a dynamic process that manifests itself in behaviour and interaction with the environment (32).

**Well-being Index:** This definition from Viteri et al. (45) refers to a person's self-assessment of their life, encompassing both affective and cognitive components. From another perspective, Losada-Puente et al. (46) distinguish hedonic well-being (the maximisation of positive emotions) from eudaimonic well-being (the achievement of goals and self-realisation), both of which are necessary for psychological balance.

**Self-acceptance:** Calvo (47) considers it an element of psychological well-being, involving accurate self-assessment, awareness,

and acceptance of strengths and weaknesses. It benefits emotional stability and stress management, reducing maladaptive self-criticism and promoting a positive, coherent identity.

**Social relationships:** These are relationships between people, governed by social norms, that underpin life in society. According to Tonon and Alabama (48), social relationships can be conceived in two ways: as systems of interactional rules and as the structural basis of society. Their importance lies in their provision of emotional support, a sense of belonging, and stress buffering.

Thus, the constructs proposed (self-regulation and well-being) form a theoretical framework that explains an individual's psychological balance and its direct impact on academic performance. Integration reinforces the notion that higher education needs to integrate the development of emotional skills, adaptability, and the strengthening of social networks as components of a humanised and resilient education.

## METHOD

A quantitative, observational, analytical, cross-sectional study was conducted, with psychometric validation of the SISCO SV-21 and correlational analysis using cluster segmentation, to determine the association between academic stress and mental health among university students in Montería, Córdoba (Colombia). This manuscript adheres to the STROBE guidelines for the presentation of observational studies and presents patterns and associations among variables without experimental manipulation (49). The sample comprised students from the University of Sinú – Elías Bechara Zainúm, which has approximately 13 000 students and adequately represents the regional academic context. The sample size was determined using a statistical calculation with 95 % confidence and a 5 % margin of error, yielding 209 participants selected via stratified random sampling.

The sample's demographic composition showed a gender imbalance: 147 women (70.3 %) and 62 men (29.7 %). By academic level, priority was given to students in their seventh to tenth semesters, with the highest concentration

in the ninth (30.1 %), followed by the tenth (24.9 %), eighth (24.4 %), and seventh (20.6 %) semesters. This selection was based on their academic maturity and educational experience, which allows them to reflect more deeply on the phenomena analysed. The sample was predominantly young, with ages ranging from 20 to 22 years; the majority (87 participants) were 21 years old.

The data collection instrument used was the Cognitive Systemic Inventory (SISCO SV-21) of Academic Stress, developed by Barraza (11), comprising 31 items distributed across three main dimensions: academic stressors, physiological symptoms or reactions, and coping strategies. This instrument has demonstrated theoretical and psychometric validity, as widely reported in Latin American university contexts. It was administered digitally via electronic forms under conditions of anonymity and confidentiality.

#### Data analysis by a systematic process in phases:

**Psychometric validation:** The relevance of the factor analysis was evaluated using Bartlett's Test of Sphericity and the overall Kaiser-Meyer-Olkin (KMO) Index, ensuring the adequacy of the correlation matrix for exploratory factor analysis.

**Internal consistency:** The reliability of the scales was verified using Cronbach's alpha ( $\alpha$ ) and McDonald's omega ( $\omega$ ) coefficients, robust indicators of internal homogeneity and metric stability of the constructs (50).

**Descriptive and Inferential Analysis:** Welch's t-tests were performed to compare differences by gender, and a one-factor ANOVA was performed to contrast variations by academic semester. Pearson correlations were also calculated to determine the strength and direction of the associations between the variables.

**Profile Segmentation:** K-means cluster analysis was applied to identify distinct profiles of academic stress and coping, segmenting students based on similar response patterns and psychosocial characteristics.

**Data collection:** Google Forms was used to ensure data integrity, as the platform required responses to all items.

This methodological approach enabled not only the quantification of stress levels and their associations with mental health, but also the classification of risk and coping profiles, providing a solid empirical basis for future interventions in university mental health.

#### Ethical considerations

The article is derived from the applied research project entitled: *Psycho-integra: influence of soft skills on the perception of happiness among higher education students*, approved by the Research Committee of the Faculty of Health Sciences CIFCS of the University of Sinú – Elías Bechara Zainúm, through Act No. 003 of 2025, dated 25 March 2025. The study did not employ invasive techniques, involved only low-sensitivity content, was conducted with participants without vulnerability characteristics, ensured the confidentiality of information, and demonstrated a largely favourable risk-benefit ratio; it is therefore classified as minimal risk in accordance with the Declaration of Helsinki. The participating subjects signed the respective informed consent form, thereby ensuring the confidentiality of their information and compliance with the principles established in the CIOMS International Ethical Guidelines for Research Involving Human Subjects. Participants provided their informed consent electronically after receiving information about the study's objectives, the voluntary nature of their participation, the right to withdraw at any time, and guarantees of anonymity and confidentiality. Consent was obtained electronically before access to the questionnaire, and students confirmed their participation after reading the explanation of the nature of the study, the minimal risks, potential benefits, data management, and ethical guarantees. No identifiable information was collected, including names, email addresses, or other institutional identifiers.

#### RESULTS

The overall sample adequacy index KMO = 0.908 shows that the data matrix is highly appropriate for factor analysis, confirming the existence of consistent relationships between

items and a well-defined common structure. The individual values of the MSA showed satisfactory results in all items, with items such as “Reluctance to do schoolwork” (0.950), “Chronic fatigue” (0.945) and “The personality and character of teachers” (0.924) contributing significantly to the common variance. The lowest values, although acceptable, were observed for “Conflicts or tendency to argue” (0.845) and “Feelings of aggression or increased irritability” (0.863), without compromising the model’s consistency. The principal axis extraction method with Promax oblique rotation was used, which is appropriate for educational contexts in which correlations among factors are assumed. This approach provided a clear and theoretically consistent representation of the latent dimensions. Overall, the KMO and MSA values support the exploratory factor analysis results and enable

confirmatory factor analysis (CFA) to confirm the instrument’s structure.

Bartlett’s Test of Sphericity rejects the null hypothesis that the variables are not significantly correlated (Table 1). The study yields  $X^2 = 3929$  ( $df = 210$ ), indicating that the correlation matrix differs from the identity matrix and that there is sufficient covariation among the variables to justify factorial analysis. The results indicate that factor analysis is appropriate, meaning that the variables share common variance and are therefore amenable to latent factor extraction. The evidence is highly important for identifying significant associations that serve as prerequisites for latent factors or structures. The use of dimensionality-reduction techniques is justified because they enable the extraction of relevant information and the condensation of variation into fewer factors.

Table 1  
Bartlett's Sphericity Test

| $X^2$ | df  |
|-------|-----|
| 3929  | 210 |

Note: Factor analysis. Own elaboration (2025).

Table 2  
Reliability Statistics with 95% Confidence Intervals

| Reliability                        | Cronbach $\alpha$ | CI 95 % - $\alpha$ | McDonald's $\omega$ | CI 95 % - $\omega$ |
|------------------------------------|-------------------|--------------------|---------------------|--------------------|
| Academic Stressors                 | 0.887             | [0.86, 0.91]       | 0.891               | [0.87, 0.92]       |
| Physiological Reactions (Symptoms) | 0.920             | [0.90, 0.94]       | 0.921               | [0.90, 0.94]       |
| Coping Strategies                  | 0.904             | [0.88, 0.92]       | 0.905               | [0.88, 0.92]       |

Note. The table shows the internal consistency indices. CI 95 % = 95 % confidence interval. Own elaboration (2025).

The internal consistency analyses of the scales analysed showed excellent reliability (Table 2). The Academic Stressors scale yielded a Cronbach’s Alpha of 0.887 and a McDonald’s Omega of 0.891, indicating high internal consistency and supporting the construct. For the Symptoms scale, the coefficients were even higher, with an  $\alpha$  of 0.920 and an  $\omega$  of 0.921, showing not only very high internal consistency but also a well-defined and robust factorial structure. The Coping Strategies scale yielded

similar values ( $\alpha = 0.904$ ;  $\omega = 0.905$ ), indicating consistency and accuracy in measuring coping with stress. The reliability indices achieved ( $\alpha$  and  $\omega > 0.88$ ) confirm the psychometric robustness of the instrument, ensuring that the measurements reflect true differences between participants and that there is no measurement error. These results confirm the internal validity of the study and reinforce the scales as reliable instruments for measuring academic stress, its symptoms, and the strategies students use to cope with it.

## ACADEMIC STRESS

Table 3  
Relationships between Factors

| Factors | Type of correlation | Coefficient | Interpretation                     |
|---------|---------------------|-------------|------------------------------------|
| AS ↔ PR | Strong              | 0.536       | Considerable positive relationship |
| AS ↔ CS | Moderate            | 0.321       | Moderate positive association      |
| PR ↔ CS | Moderate            | 0.322       | Moderate positive correlation      |

Note. AS = Academic Stressors; PR = Physiological Reactions; CS = Coping Strategies. Own elaboration (2025).

The correlation analysis in the study shows significant positive associations among the dimensions of academic stress. The correlations between Academic Stressors and Coping Strategies and between Physiological Reactions and Coping Strategies were moderate. Specifically, a significant, moderate-to-strong association was found between Academic Stressors and students' Physiological Reactions, indicating that students with higher levels of academic stress tend to exhibit greater physiological stress responses. This suggests that although academic stress is associated with greater physiological responses, students' coping strategies modulate the severity of these negative reactions.

This is where coping mechanisms are not only a means of reacting to stress but also a means of adapting emotionally. The strength of the correlations reaffirms the interrelationship among the dimensions analysed, but discriminant validity is maintained, as the indices do not reach the threshold for conceptual overlap ( $r > 0.85$ ). Consequently, the results support the three-dimensional theoretical structure of the model and justify the use of an oblique rotation (Promax), consistent with the premise that the components of academic stress interact in an integrated manner in the student experience

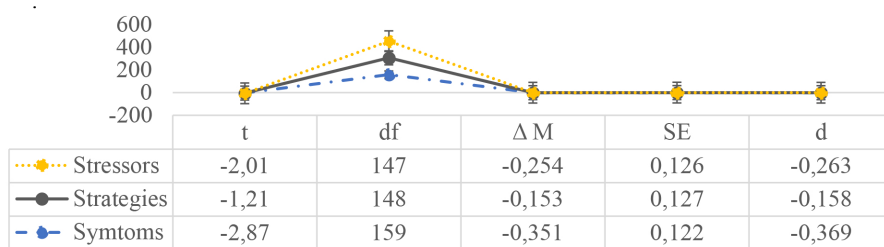


Figure 1. t-test for independent samples (gender variable)

Note: *t*: Welch's *t*; *ΔM*: difference in means; *SE*: standard error; *d*: Cohen's *d*; *df*: degrees of freedom. Means between two groups (by gender) are compared for Symptoms, Strategies, and Stressors. Own elaboration (2025).

When examining symptom-related outcomes, a difference was observed between males and females. In the symptom's variable, the difference in means was -0.351 (95 % CI [-0.593, -0.109]), and in stressors it was -0.254 (95 % CI [-0.503, -0.005]) (Figure 1). Given that none of the

confidence intervals contain zero, it is confirmed that men report lower levels in both variables, indicating better management of psychological distress. In contrast, there were no differences in coping strategies, suggesting that both groups use similar resources when faced with stress.

Overall, the results show that gender differences focus on the perception of distress and stressors rather than on the strategies used, highlighting

the need for differentiated interventions that consider the context, personal resources, and specific conditions of each group.

Table 4  
Descriptive Statistics by Group

| Variable   | Grupo | N   | M       | Md     | SD    | SE     |
|------------|-------|-----|---------|--------|-------|--------|
| Symptoms   | 1     | 92  | 0.249   | -3.64  | 0.945 | 0.102  |
|            | 2     | 117 | 0.10266 | 0.0634 | 0.958 | 0.0667 |
| Strategies | 1     | 92  | -0.108  | -0.209 | 1.002 | 0.109  |
|            | 2     | 117 | 0.0447  | 0.0261 | 0.937 | 0.0653 |
| Stressors  | 1     | 92  | -0.18   | -0.270 | 0.999 | 0.108  |
|            | 2     | 117 | 0.0742  | 0.0848 | 0.932 | 0.0649 |

Note: M: mean; Md: median; SD: standard deviation; SE: standard error. Group 1 = men; Group 2 = women. Comparison of group 1 (men) and group 2 (women) in three aspects: symptoms, strategies, and stressors. Own elaboration (2025)

The results show sustained quantitative differences between men and women in the variables evaluated. In terms of symptoms, men ( $M=0.249$ ;  $SD=0.945$ ) have higher mean values than women ( $M=0.10266$ ;  $SD=0.958$ ), while a similar pattern occurs in stressors, with higher means in the male group ( $M=-0.18$ ;  $SD=0.999$ ) compared to the female group ( $M=0.0742$ ;  $SD=0.932$ ). However, inferential analysis indicates that, despite these descriptive differences, men report lower overall levels of symptoms and stressors, consistent with the significant t-test results. This finding suggests a lower perception of stress and greater emotional regulation in the

male group. In terms of coping strategies, the descriptive difference ( $-0.108$  in men versus  $0.0447$  in women) is not statistically significant, indicating that both groups use similar resources in response to stressful situations. Overall, the patterns observed are consistent and coherent: although there are variations in the perception of stress and its manifestations, coping mechanisms remain relatively stable between groups. These results underscore the importance of designing differentiated interventions that not only reduce symptoms but also modify perceptions of stress and strengthen population-specific protective factors.

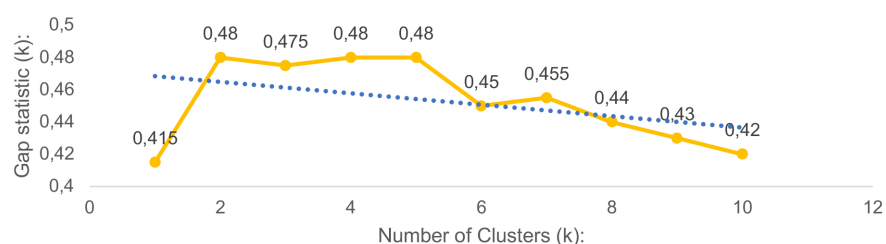


Figure 2. Optimal number of clusters

Note. Suggests the ideal number of clusters for organising patterns in student responses. Own elaboration (2025).

Figure 2 shows the gap statistic for different cluster sizes ( $k$ ). The gap statistic is a metric that helps determine the optimal number of clusters. A higher gap statistic value indicates better clustering. The graph shows a clear peak at  $k=2$ , and then the statistic decreases. Although there

is a small rise at  $k=4$ , the most pronounced peak is at  $k=2$ . This suggests that  $k=2$  is the optimal number of clusters, consistent with the solution presented. The vertical dotted line indicates the best option.

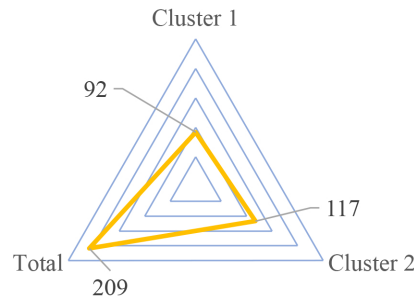


Figure 3. Cluster Vector.

Note. The table presents the cluster vector derived from cluster analysis of the student perception data. Own elaboration (2025).

Figure 3 decomposes the total variability in the data into three main components, which are essential for evaluating the effectiveness of the grouping performed.

The cluster analysis showed high within-group homogeneity and clear differentiation between groups. Cluster 1 ( $n = 92$ ) had a low internal sum of squares, indicating high cohesion and homogeneity in symptom levels, strategies, and stressors. Cluster 2 ( $n = 117$ ) showed greater internal dispersion, reflecting the heterogeneity of the variables studied. The sum of squares between clusters was 209, showing adequate separation between groups and supporting the choice of  $k=2$

as the optimal number of segments. The total sum of squares for the analysis was 870, suggesting that the segmentation consistently accounts for variability in the data and that the groups are well defined and correctly differentiated.

#### Analysis of Cluster Centroid

A description of the centroids of the identified clusters is provided for the variables “Symptoms,” “Strategies,” and “Stressors.” The centroid values represent the mean values for each group across these variables, providing an overview of the psychological and coping profiles of individuals in each cluster (Table 5).

Table 5  
Cluster Centroid

| Cluster | Symptoms | Strategies | Stressors |
|---------|----------|------------|-----------|
| 1       | -0.826   | -0.564     | -0.796    |
| 2       | 0.667    | 0.456      | 0.642     |

Note. Shows the cluster centroids, highlighting a clear differentiation between the groups. Own elaboration (2025)

The k-means analysis identified two clusters with contrasting profiles. Cluster 1 scored negatively on stressors, symptoms, and coping strategies, indicating emotional distress, decreased exposure to stress, and increased resilience. Its members exhibit a balanced and protective personality, which is appropriate for taking preventive measures or maintaining well-being. On the other hand, Cluster 2 showed positive scores on all three variables,

demonstrating intensive use of coping strategies, high exposure to stressful situations, and greater psychological distress. This points to emotional vulnerability and the need for interventions focused on stress management and strengthening adaptive resources. Overall, the results confirm two distinct groups with respect to emotional health and coping, with direct implications for the design of differentiated support strategies.

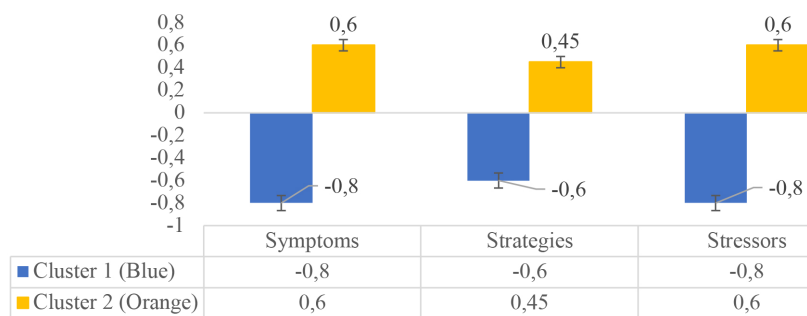


Figure 4. Averages between Clusters.

Note. Shows the clusters: one group with low symptoms and stress (Cluster 1) and another with moderate to high levels of symptoms, strategies, and stressors (Cluster 2). Own elaboration (2025).

Figure 4 of averages between clusters confirms the existence of two clearly differentiated profiles. Cluster 1 (blue) remains below average in all variables, showing low emotional distress, less exposure to stressors, and moderate use of coping strategies, traits associated with greater resilience. In contrast, Cluster 2 (yellow) has values above 0 in all three dimensions, indicating

high levels of symptoms, stress, and intensive coping, reflecting greater emotional vulnerability and risk of mental health deterioration. This visual and statistical distinction supports the need for differentiated interventions: preventive and wellness maintenance for Cluster 1, and programmes focused on stress management and strengthening adaptive coping for Cluster 2.

Table 6  
T-test for Independent Samples

| Variable   | t     | df  | $\Delta M$ | SE     | CI 95 % for $\Delta M$ | d     |
|------------|-------|-----|------------|--------|------------------------|-------|
| Symptoms   | -19.7 | 278 | -1.441     | 0.0732 | [-1.584. -1.298]       | -2.27 |
| Strategies | -10.0 | 276 | -0.976     | 0.0974 | [-1.167. -0.785]       | -1.18 |
| Stressors  | -17.8 | 288 | -1.376     | 0.0775 | [-1.528. -1.224]       | -2.07 |

Nota. Welch's t; df = degrees of freedom;  $\Delta M$  = difference in means; SE = standard error; Cohen's d = effect size. The table presents a comparison of groups across symptoms, strategies, and stressors, showing the estimated differences and their respective confidence intervals. Own elaboration (2025).

## ACADEMIC STRESS

The independent-samples t-tests showed significant differences between the two clusters across the three variables, supporting the validity and robustness of the segmentation (Table 6). The 95 % confidence intervals for the difference in means did not cross zero in any of the variables, confirming the significance of the results. The analyses showed significant decreases in the three dimensions evaluated. Symptoms showed the greatest reduction ( $\Delta M = -1.441$ ,  $SE = 0.0732$ , 95 % CI [-1.584, -1.298]), with a very large

effect size ( $d = -2.27$ ). Strategies also decreased significantly ( $\Delta M = -0.976$ ,  $SE = 0.0974$ , 95 % CI [-1.167, -0.785]), with a large effect ( $d = -1.18$ ). Similarly, stressors showed a substantial reduction ( $\Delta M = -1.376$ ,  $SE = 0.0775$ , 95 % CI [-1.528, -1.224]), accompanied by a very large effect size ( $d = -2.07$ ). These results show consistent and robust changes across the three variables analysed, suggesting that differences between groups are pronounced and reflect distinct patterns of distress and coping.

Table 7  
One-way ANOVA

| Variable   | F     | df1 | df2   |
|------------|-------|-----|-------|
| Symptoms   | 2.654 | 3   | 102.5 |
| Strategies | 0.480 | 3   | 97.2  |
| Stressors  | 1.077 | 3   | 101.9 |

Note: F: F statistic; df1: degrees of freedom between groups; df2: degrees of freedom within groups. Own elaboration (2025).

The analysis of variance (ANOVA) comparing means by semester for the variables Symptoms, Strategies, and Stressors indicates a few substantial differences across semesters (Table 7). For Symptoms, the F-statistic was 2.654, indicating a marginal difference that is inconclusive. For Coping Strategies ( $F = 0.480$ ) and Stressors ( $F = 1.077$ ), the F-statistic values are low, suggesting

that these variables remain largely homogeneous across the students' educational process. These combined results indicate similarity among the emotional and behavioural variables measured. However, a minor fluctuation in the reported symptoms is evident, which warrants further research to examine this area in greater depth.

Table 8  
Descriptives by Semester

| Semester   |    | N   | M       | SD    | SE     |
|------------|----|-----|---------|-------|--------|
| Symptoms   | 7  | 26  | -0.3610 | 0.775 | 0.1519 |
|            | 8  | 112 | 0.0690  | 1.026 | 0.0969 |
|            | 9  | 64  | 0.1325  | 0.887 | 0.1108 |
|            | 10 | 89  | -0.0767 | 0.975 | 0.1033 |
| Strategies | 7  | 26  | -0.1389 | 0.969 | 0.1900 |
|            | 8  | 112 | -0.0280 | 1.016 | 0.0960 |
|            | 9  | 64  | -0.0176 | 0.903 | 0.1129 |
|            | 10 | 89  | 0.0884  | 0.922 | 0.0977 |
| Stressors  | 7  | 26  | -0.0321 | 0.731 | 0.1434 |
|            | 8  | 112 | -0.0397 | 0.916 | 0.0866 |
|            | 9  | 64  | 0.2011  | 1.043 | 0.1304 |
|            | 10 | 89  | -0.0853 | 0.994 | 0.1054 |

Note: N: sample size; M: mean; SD: standard deviation; SE: standard error. Own elaboration (2025).

The semester-level analysis reveals changes in symptoms, coping strategies, and stressors across students' academic lives (Table 8). Symptoms do not differ significantly across semesters, whereas strategies and stressors remain constant. The seventh semester is a period during which students report feeling less distressed, which may be due to better adaptation or a lighter academic load. The study identifies emotional variability as the primary change throughout the degree programme; therefore, qualitative or

mixed-methods studies are needed to explore the experiences and meanings of the data and to design more personalised and contextualised interventions for students.

Table 9 presents Pearson's correlation coefficients between the variables Symptoms, Strategies, Stressors, and Age. This analysis is essential for determining the magnitude and direction of the relationships between psychological and demographic variables of age, revealing how they are interrelated.

Table 9  
Correlation matrix between symptoms, strategies, stressors, and age

| Variables  |               | Symptoms       | Strategies     | Stressors      | Age             |
|------------|---------------|----------------|----------------|----------------|-----------------|
| Symptoms   | Pearson's r   | —              | 0,340          | 0,588          | -0,033          |
|            | 95 % CI for r | —              | [0.234. 0.438] | [0.509. 0.658] | [-0.148. 0.082] |
| Strategies | Pearson's r   | 0.340          | —              | 0.366          | 0.064           |
|            | 95 % CI for r | [0.234. 0.438] | —              | [0.262. 0.461] | [-0.051. 0.178] |
| Stressors  | Pearson's r   | 0.588          | 0.366          | —              | -0.039          |
|            | 95 % CI for r | [0.509. 0.658] | [0.262. 0.461] | —              | [-0.154. 0.076] |

Nota. df = 289 for all correlations. Own elaboration (2025).

**Relationships among Psychological Variables:** Positive and significant correlations were observed among the three variables studied: Symptoms, Strategies, and Stressors. The correlation between Symptoms and Strategies was low to moderate ( $r = 0.340$ , 95 % CI [0.234, 0.438]), indicating that greater emotional distress was associated with greater use of coping strategies. The association between Symptoms and Stressors was the strongest ( $r = 0.588$ , 95 % CI [0.509, 0.658]), indicating that the greater the number of stressors, the greater the symptoms. Finally, the association between Strategies and Stressors also revealed a moderate correlation ( $r = 0.366$ , 95 % CI [0.262, 0.461]). Since none of these confidence intervals contains zero, the direction and magnitude of the observed association are confirmed

**Relationship between Age and Psychological Variables:** The analysis found no evaluation between age and symptom levels, coping strategies, or stressors in students, indicating

that they experience similar emotions regardless of age. An association was found between symptoms and stressors, suggesting that greater stress leads to greater emotional distress. In addition, different coping strategies are associated with both factors, indicating that individuals adjust their coping style in response to perceived stress. These findings point to the need to develop universal interventions targeting shared emotional experiences and suggest exploring the influence of variables such as personality, social context, and school conditions on these associations in the future.

## DISCUSSION

The data from factorial and cluster analyses of the SISCO SV-21 instrument (11) reveal two distinct profiles among students: one resilient, characterized by low levels of symptoms and stressors, and another vulnerable, characterized

by high levels of emotional distress and less effective coping strategies. This empirical result is consistent with the theoretical frameworks reviewed, which point to academic stress as a multi-causal phenomenon, greatly influenced by pedagogical organisation, student relationships, and emotional self-regulation.

In line with the Ministry of Health (30), uncertainty in assessment criteria and work overload are causes of academic stress and undermine students' mental health, according to the Ministry of National Education. This research supports an association between academic stressors and emotional symptoms, with a positive and significant compensatory effect, as evidenced by a strong correlation between Stressors and Symptoms ( $r = 0.588$ , 95 % CI [0.509, 0.658]). The results suggest a significant association among high academic demands, perceived lack of teaching guidance, and indicators of psychological distress. To address this relationship, it is recommended that teaching practices be developed in which communication and transparent planning predominate, as proposed by Toala (10), who argues that explicit pedagogical dialogue favours the management of academic anxiety.

Organised cooperative work is recognised in the literature as a protective factor against stress, as it allows the cognitive and emotional load to be shared among its members (28). In a resilient cluster, students engaged in these practices exhibit low levels of distress, which may be explained by the reinforcement of perceived social support and positive interdependence. These aspects are identified in educational psychology as promoters of emotional stability and academic self-efficacy. This example illustrates how learning is not only an individual process but also a collective one, mediated by emotional and collaborative connections.

Emotional regulation (the ability to recognise, modulate, and manage affective experiences) (33) is a decisive factor in distinguishing resilient from vulnerable profiles. The results underscore the need to institutionalise emotional skills training programmes as cross-cutting components of the university curriculum. Likewise, the greater emotional vulnerability observed in women is consistent with the literature on differential sensitivity to the academic context (13,19).

Along the same lines, higher levels of cognitive flexibility in advanced students suggest a relationship between academic progression and the strengthening of self-regulatory processes (35,36). Repeated exposure to assessment contexts, academic interaction, and critical reflection helps consolidate students' adaptive capacity. The observed differences in emotional symptomatology support a more sophisticated profile of cognitive and emotional adaptation in the final semesters, positioning cognitive flexibility as an intervening factor between academic demands and functional coping.

For their part, creativity and problem-solving are closely associated with adaptive outcomes. Gardner (6) conceives creativity as an adaptive intelligence capable of transforming tension into opportunity. This is evident in the resilient cluster, whose members probably use novel and flexible strategies to cope with stress. In contrast, the vulnerable cluster exhibits a more reactive and less planned coping style, which coincides with Ceballos' (40) statements on the relationship between chronic stress, deficient coping strategies, and physical and psychological symptoms.

Subjective well-being and self-acceptance, as proposed by Viteri and Calvo (47), also find empirical support in the present study. Students in the resilient cluster, with fewer stress and symptoms, exhibit better indicators of well-being and emotional balance, whereas those in the vulnerable cluster report low self-acceptance and personal satisfaction. These results indicate that well-being is not determined by external variables (such as age or academic workload), but by a combination of perceived self-efficacy, coping strategies, and a sense of personal achievement.

The absence of an association between age and the variables studied indicates that emotional experiences and coping strategies for academic stress are not determined by chronological age but by contextual, interpersonal, and personality factors. This coincides with Tonon (48), who states that social support and assertive communication are more decisive than traditional demographic variables. Consequently, university mental health interventions should be oriented toward comprehensive support models in which

shared emotional experience prevails over age or curricular differences.

The articulation between empirical evidence and the theoretical framework indicates that mental health vulnerability to academic stress requires an approach that transcends the individual or clinical perspective. A humanising approach to teaching is required (16), one that recognises the affective dimension of learning and promotes educational environments that strengthen emotional regulation, cooperation, cognitive flexibility, and subjective well-being as pillars of a transformative and healthy education.

### Study limitations

This study had limitations that must be considered when interpreting the results. The cross-sectional design limited the analysis to observational associations among academic stressors, symptoms, and coping strategies, precluding causal inference. This was compounded by the exclusive use of self-reports, which could have introduced social desirability bias and variability in the accuracy with which participants reported their perceptions and experiences.

The monocentric nature of the research, limited to a single higher education institution, restricted the extrapolation of the findings to other educational contexts with different curricular, sociocultural, or institutional dynamics. Furthermore, the study did not incorporate relevant contextual variables, such as socioeconomic status, employment status, mental health history, or extracurricular demands, which could influence the manifestation of academic stress levels and the configuration of the identified profiles.

With respect to the methodological procedures, cluster analysis was treated as an exploratory approach, subject to the model parameters and sample composition; therefore, its results may vary under other segmentation methods or in different populations. It was also necessary to recognise a potential non-response bias, given that students with high levels of distress may have chosen not to participate, affecting the representation of the phenomenon.

### CONCLUSIONS

The methodological and structural analysis developed in this research provides robust local evidence on the dynamics of academic stress and psychological well-being in higher education in Montería. The findings confirm that the SISCO SV-21 Inventory has solid psychometric properties for this population, consolidating itself as a valid and reliable tool for evaluating the phenomenon. The structural validity and internal consistency indicators obtained demonstrate that the measurements are stable and accurate, which is essential for supporting rigorous analysis and guiding the design of institutional interventions. Taken together, these results provide empirical foundations for developing policies that promote educational processes focused on the humanisation of teaching.

The findings call into question the supposed homogeneity of the student experience in higher education, showing that academic stress is not a linear or uniform process, but rather the result of the dynamic interaction between perceived demands (stressors), manifestations of discomfort (symptoms), and student responses (coping strategies). The analysis confirms the existence of clearly differentiated psychosocial profiles (resilient and vulnerable), indicating that curricular demands exert heterogeneous influences on students' psychological and physiological experiences. The resilient profile is characterised by low levels of distress and strategic activation, which, although moderate, is functional and sufficient to maintain adaptation. In contrast, the vulnerable profile presents a pattern of high emotional and cognitive reactivity, accompanied by intense and ineffective mobilisation of coping resources, reflecting self-regulatory processes overwhelmed by chronic and acute stress. This empirical contrast calls into question the relevance of designing interventions based on the concept of an 'average student' and highlights the need to implement differentiated strategies that enable early identification of students at greater risk, thereby avoiding the application of generic models that do not account for the phenomenon's complexity.

Addressing student wellbeing requires a strategic approach geared towards humanising teaching, based on recognition of the diversity of risk profiles present in the university population. The association identified between academic stressors and emotional distress confirms the need to move beyond a strictly clinical perspective and advance towards institutional policies focused on preventing curricular stressors and promoting socio-emotional skills. This approach involves not only critically reviewing curricula and pedagogical organisation to mitigate unnecessary burdens, but also strengthening skills such as self-regulation, resilience, and social adaptability. Consequently, it favours a comprehensive professional education that combines academic excellence with the development of emotional resources that enable students to cope healthily with the demands of university life.

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Dr. Ureña's contribution included conceptualisation, methodological design, project management, supervision, and manuscript review and editing. Psychologists Alemán and Gaviria contributed to data collection, tabulation, and curation, as well as to initial drafting, while Arrieta participated in formal analysis and in the validation of compliance with academic and scientific standards. For his part, Dr. Flores Mejía contributed by critically reviewing the manuscript's final content. The authors thank

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