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Scientific articles

Comparative study of academic stress in Business Management engineering students during the Covid-19 pandemic

Estudio comparativo del estrés académico en estudiantes de ingeniería en Gestión Empresarial durante la pandemia covid-19

Estudo comparativo do estresse acadêmico em estudantes de engenharia em Gestão Empresarial durante a pandemia de covid-19

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Abstract

The Covid-19 pandemic represented a radical change in the educational modality, consequently, it had repercussions in different aspects for the students, generating as a consequence stress, which for the present work is studied from the congoscitivist approach. The objective was to identify the level of academic stress during the Covid-19 pandemic in Business Management Engineering students in the state of Hidalgo in order to make a comparative study. By means of an empirical, quantitative, descriptive, cross-sectional, non-experimental and explanatory study, the survey was used as a method of data collection, adapting the SISCO SV Academic Stress Inventory questionnaire adapted to the context of Covid-19, which was applied to a sample of 344 Business Management Engineering students from Hidalgo, Mexico. The results indicate that in both institutions more than 71% of the student body presented a high level of academic stress, also, it is identified that the greatest stressor is the overload of tasks and work, as well as the performance of written evaluations, practices, application work, projects, while the stress symptoms manifested by the students are anxiety, anguish, despair and sleep disorder. As for coping strategies, to a greater extent they deal with academic stress by concentrating on resolving the situation that worries them. Finally, by means of the Mann-Whitney U non-parametric test for independent samples, the hypothesis establishing the existence of differences in the levels of academic stress of both study groups was tested; this difference is not significant.

Keywords: stressors, coping strategies, symptoms, Covid-19.

Resumen

La pandemia de covid-19 representó un cambio radical en la educación, lo que tuvo diversos efectos en los estudiantes. Por ello, y desde un enfoque congoscitivista, en el presente trabajo se procuró identificar el nivel de estrés académico generado durante la pandemia por covid-19 en estudiantes de ingeniería en Gestión Empresarial del estado de Hidalgo. Mediante un estudio empírico, de tipo cuantitativo, de alcance descriptivo, transversal, no experimental y explicativo, se utilizó la encuesta como método de recolección de datos, para lo cual se adaptó el cuestionario Inventario de Estrés Académico SISCO SV al contexto de covid-19, el cual se aplicó a una muestra de 344 estudiantes de la referida carrera. Los resultados indican que más del 71 % del estudiantado presentó un nivel de estrés académico fuerte. Asimismo, se identificó que el mayor estresor fue la sobrecarga de tareas y trabajos, así como la realización de evaluaciones escritas, prácticas, trabajos de aplicación y proyectos. Además, los síntomas de estrés que manifestaron los estudiantes fueron

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ansiedad, angustia, desesperación y trastorno del sueño. En cuanto a las estrategias de afrontamiento, en mayor medida los alumnos enfrentan el estrés académico concentrándose en resolver la situación que les preocupa. Finalmente, mediante la prueba no paramétrica para muestras independientes U de Mann-Whitney, se comprobó la existencia de diferencias no significativas en los niveles de estrés académico en los grupos de estudio.

Palabras clave: estresores, estrategias de afrontamiento, síntomas, covid-19.

Resumo

A pandemia de covid-19 representou uma mudança radical na educação, que teve vários efeitos nos estudantes. Por este motivo, e a partir de uma abordagem congoscitivista, neste trabalho procuramos identificar o nível de estresse acadêmico gerado durante a pandemia de covid-19 em estudantes de engenharia em Gestão Empresarial no estado de Hidalgo. Através de um estudo empírico, de tipo quantitativo, de âmbito descritivo, transversal, não experimental e explicativo, utilizou-se como método de recolha de dados o inquérito, para o qual foi adaptado o questionário SISCO SV Academic Stress Inventory ao contexto da covid-19 , que foi aplicado a uma amostra de 344 estudantes da referida carreira. Os resultados indicam que mais de 71% dos estudantes apresentaram um forte nível de estresse acadêmico. Da mesma forma, identificou-se que o maior estressor foi a sobrecarga de tarefas e de trabalho, bem como a realização de avaliações escritas, práticas, trabalhos de aplicação e projetos. Além disso, os sintomas de estresse que os estudantes manifestaram foram ansiedade, angústia, desespero e distúrbio do sono. Em relação às estratégias de enfrentamento, em maior medida os alunos enfrentam o estresse acadêmico por se concentrarem na resolução da situação que os preocupa. Por fim, utilizando o teste não paramétrico para amostras independentes Mann-Whitney U, verificou-se a existência de diferenças não significativas nos níveis de estresse acadêmico nos grupos de estudo.

Palavras-chave: estressores, estratégias de enfrentamento, sintomas, covid-19.

Fecha Recepción: Mayo 2023 **Fecha Aceptación:** Enero 2024

Introduction

When the World Health Organization (WHO) declared the spread of the covid-19 virus a pandemic, different countries implemented strategies to mitigate infections, which focused mainly on the suspension of non-essential activities in order to promote distancing. social. In the case of the educational sector, specifically at the higher level, the pandemic and subsequent changes in the teaching-learning process had physical, emotional and psychological repercussions on students (Silva *et al.* , 2020).

According to the Economic Commission for Latin America and the Caribbean (ECLAC) (2020) and the United Nations Educational, Scientific and Cultural Organization (UNESCO) (2020), the health contingency interrupted the learning of more than billion students in at least 129 countries. This forced institutions to move teaching-learning activities to remote mode, which represented a significant change in traditional education.

For example, higher education institutions (HEIs) faced great challenges in the process of adapting to a new work dynamic, such as the lack of technological and economic resources, resistance to change, lack of adaptation, personal problems and relatives. These factors generated fear, anxiety, uncertainty and, consequently, stress, so it can be stated that specifically academic stress related to the covid-19 pandemic is a topic of recent interest. In fact, most research has been conducted in China and some Western countries, with emphasis on the general population, healthcare workers, and medical students (Sundarasen *et al*, 2020).

A study carried out in Spain shows that university students in that country reported symptoms of mental disorder and only one out of eigtht received care. This is an alarming situation, since if they are not provided with the necessary support, it can affect their mental health, their academic performance and, consequently, their future (Ballester *et al.* , 2020).

For their part, Yang *et al.* (2021) indicate that there is little understanding of how academic workload, separation from school, and fears of contagion affect student health, a problem that is also relevant in Mexico and the state of Hidalgo. In fact, the educational institutions analyzed in this work have not carried out diagnoses on the situation of the students and, therefore, have not established a care program that allows them to provide the necessary follow-up and care for the affected students.

Consequently, this work arises from the concern of engineering academic bodies in Business Management to identify the effects of the covid-19 pandemic on technological higher education students of the same specialty, belonging to the National Technology of Mexico,

specifically to the Institutes of the East and West of Hidalgo. The objective is to identify the level of academic stress during the pandemic in these students in order to make a comparison.

The research question was the following: is there a difference in academic stress between engineering students in Business Management at the Instituto Tecnológico Superior del Oriente del Estado de Hidalgo (ITESA) and the Instituto Tecnológico Superior del Oeste del Estado de Hidalgo (ITSOEH)? The hypothesis proposed was the following: there is a difference in the level of academic stress between ITESA and ITSOEH students.

Carrying out this research in the context of Hidalgo represents an opportunity to generate information that allows us to know stress levels and identify differences or similarities. This will contribute to the existing literature in Mexico with empirical data that allows us to understand the response to academic stress of students. This information will also be useful to establish proposals for improvement that promote the mental health of students in this context and that allow them to respond to the consequences that will be reflected in their personal and academic spheres. Likewise, it will allow us to distinguish the stressors that had a greater effect, the coping strategies used, the symptoms generated and whether there are differences or similarities between both institutions.

The structure of the document includes this introduction, followed by the review of the literature and the state of the art, then the objective, the materials and methods, the results, the discussion and, finally, the conclusions.

Literature Review

Academic stress has been studied from various perspectives, since it can affect the academic performance of students, so it is important to know some related concepts. According to Mingote and Pérez (2003), stress is a complex dynamic process triggered by the perception of "threat to the integrity of an individual and to the quality of their significant relationships that aims to recover the lost homeostatic balance, enable the development of individual competence and improve the quality of adaptation to the environment" (p. 15) , which can have consequences in the academic, personal, family and social spheres.

On the other hand, Barraza (2006) defines academic stress as the systemic imbalance in the relationship between the person and their environment. According to this perspective, stress occurs when, according to the person's own assessment, the demands or demands of the environment exceed their own resources.

Gutiérrez and Amador (2016) point out that " academic stress represents a mental health problem that affects higher education students due to the academic demands of the university and can generate various pathologies" (p. 28), therefore it represents a risk condition for students. Another perspective considers that "stress is generated when people perceive situational demands that exceed the resources for coping" (Malinauskas , 2010, p. 747), while García and González (2022) consider that " academic stress is a discomfort that is raised by academic activities and events" (p. 1).

From this review of concepts, it can be stated that stress occurs when students perceive that the demands or demands of the environment exceed their resources. Therefore, Jafari *et al.* (2021) express that the majority of higher educational institutions faced great challenges, among which the attention and monitoring of students infected by covid-19 and mental health care stand out. In addition, students' own problems must be considered, such as limited income levels, infected family members, and the lack of a safe place to shelter during quarantine, factors that can undoubtedly also influence the level of stress.

Given the need to work in the virtual modality, it is important to consider that when the educational service is offered in this scheme, there are different factors that will determine success or failure, since both students and teachers must have confidence in the functionality of the digital tools, feeling immersed and assuming commitment (Hughes *et al.* , 2002).

Importance of the study of academic stress

The study of academic stress is of great importance for HEIs. According to Wang *et al.* (2020), lockdown due to the Covid-19 pandemic, which resulted in prolonged suspension of in-person academic activities and distance learning, was positively associated with perceived stress and negatively associated with physical and psychological health. Factors such as academic load, psychological separation from school, fear of contagion, frustration, boredom, and the proliferation of news and information of statistics and "fake news" contributed to the emergence of this problem.

Consequently, the HEIs faced great challenges and radical changes, both for teachers and students, which led to rethinking the teaching-learning processes and influenced academic stress. Barraza (2020) indicates that measures to counteract infections—such as confinement, social distancing, the proliferation of information, and facing a new situation of uncertainty—generated high levels of stress due to the change in the environment.

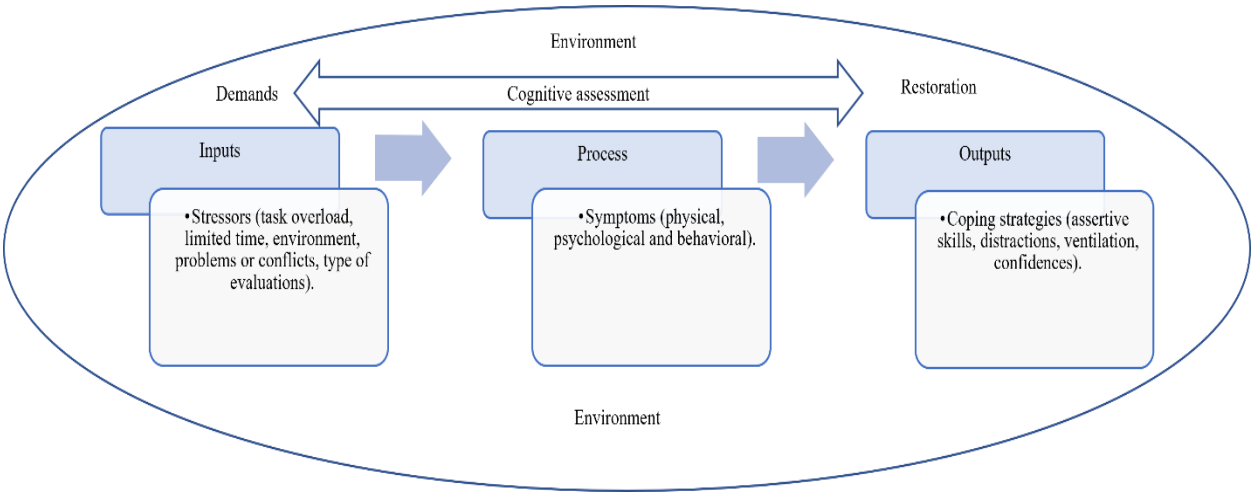
Now, academic stress is taken up again as an object of study based on general systems theory from the congoscitivist approach (figure 1). This assumes that every reality has a systemic

constitution, so the study of academic stress involves considering the phenomenon in its entirety, identifying its components and studying their relationships. Being part of an open system, a relationship with the environment is generated, which gives rise to the flow of inputs (*input*) of stressful stimuli, symptoms or indicators of imbalance (process) and coping strategies (*output*) (Barraza , 2006; Colle, 2002).

From the above, it is established that some of the academic stressors include task overload, limited time to complete work, types of work, evaluations, and conflicts with classmates or teachers. Symptoms are identified at three levels: physical (such as headaches, insomnia and digestive problems), psychological (such as lack of concentration, memory problems and anxiety) and behavioral (such as reluctance to activities, absenteeism and isolation).

Strategies to manage academic stress consider assertive ability, seeking information about the situation, professional assistance, and a task execution plan. From the perspective of the open system, this implies a series of evaluative processes in the face of stressful stimuli in the environment, which seek to achieve a systemic balance in the person-environment relationship (Barraza, 2020; Colle, 2002).

Figure 1. Systemic cognitive model of academic stress



Source: self made

The above serves to understand, from a comprehensive perspective, the cognitive systemic model to address the improvement of academic stress, which is considered an indicator of student well-being. In this model, an individual faces demands related to his or her academic experience

and the adaptive resources available (Wilks , 2008). In the case of the covid-19 pandemic, in addition to causing the closure of educational institutions, it had an impact on the living conditions of students, the methodology of academic work and expectations and projects (Ruiz-Robledillo et al., 2022).

Therefore, it is imperative for HEIs to know the levels of academic stress in order to make a diagnosis and provide support to students, since the lack of attention and monitoring can have a negative impact on the present and future of students.

State of the matter

Internationally, Malinauskas and Saulius (2022) conducted research in Lithuania on perceived academic stress and social support among university students during the Covid-19 pandemic. The study focused on investigating differences in perceived academic stress and social support perceived and received at university by undergraduate students during the two waves of the Covid-19 pandemic. This research, quantitative and longitudinal in nature, revealed that the level of social support among university students improved significantly during the second wave of the Covid-19 pandemic compared to the level during the first wave.

On the other hand, Jafari *et al.* (2021) conducted research with 593 students from two campuses of the University of California. The objective was to understand the mental health of students, the tools they use to cope with stress, and their perceptions about the care they receive from their academic institutions during the covid-19 pandemic. 87% of students expressed that their mental health has been negatively affected by the pandemic, especially those who already had decreased levels of mental health. Additionally, they expressed the need for institutions to include them in the decision-making processes that would contribute to their health.

In Mexico, González-Velázquez (2020) developed a study on academic stress associated with the covid-19 pandemic. To do this, they applied the Cabanach Academic Stress Coping Scale (A-CEA) and the Academic Stress Perception Questionnaire in University Students associated with covid-19. Through quantitative and descriptive research, the main results indicate the presence of low academic stress that increased during exam periods or presentations in front of classmates. Likewise, students expressed that they have the skills to self-regulate their behavior.

Aim

Identify the level of academic stress during the covid-19 pandemic in engineering students in Business Management in the state of Hidalgo in order to make a comparison.

Materials and methods

The present study was empirical, quantitative, descriptive, cross-sectional, non-experimental and explanatory. To compare the level of academic stress, the higher technological education students who are studying Business Management engineering at the Higher Technological Institute of the East of the State of Hidalgo (ITESA) and the Higher Technological Institute of the West were selected as the unit of analysis. of the State of Hidalgo (ITSOEH). Both institutes are part of the National Technology of Mexico and are located in the state of Hidalgo.

The information collection was carried out during the pandemic, in the semester from January to June 2022. To do this, the sample size was calculated for finite samples (table 1).

Table 1. Population and sample

Institution	Population	Sample
Higher Technological Institute of the East of the State of Hidalgo (ITESA)	326	178
Higher Technological Institute of the West of the State of Hidalgo (ITSOEH)	288	166
Total	614	344

Source: self made

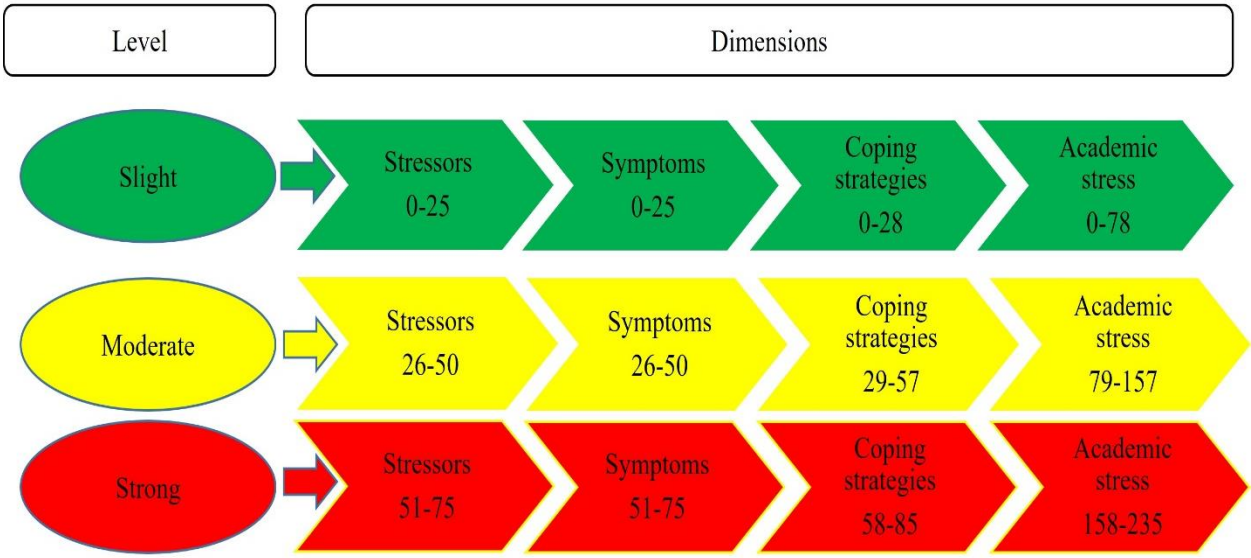
As a data collection method, a survey was used based on the adaptation of the questionnaire titled SISCO SV Academic Stress Inventory, adapted to the context of covid-19 (Alania *et al.*, 2021).

For the data collection process, a form was created in Google Forms that was emailed to the students. In addition, the invitation was reinforced and awareness was raised about the importance of participation through WhatsApp messages sent by the group tutors, with periodic reminders.

The questionnaire consisted of two sections. The first included sociodemographic variables such as gender, age, marital status, institution, semester, shift, and academic status. The second part consisted of 47 items distributed in three dimensions that measured stressors (15 items), symptoms (15 items) and coping strategies (17 items). These items were measured using a Likert scale from 1 to 6, according to the following: 1 = never, 2 = almost never, 3 = rarely, 4 = sometimes, 5 = almost always, 6 = always.

Regarding the determination of the level of academic stress, three levels were considered: mild, moderate and strong, which result from adding the items in each dimension, as indicated in Figure 2.

Figure 2. Academic stress level



Source: self made

To validate the reliability of the questionnaire, Cronbach's alpha was calculated, whose value was 0.921. The hypothesis testing was carried out by applying the non-parametric test for independent samples Mann-Whitney U, which allows identifying the difference in means between the two groups considered in the unit of analysis of this study engineering student in Business Management from ITESA and ITSOEH . The information was processed in the SPSS program *(Statistical Package for the Social Sciences).*

Results

The results of the sociodemographic variables, presented in Table 2, show that in both educational institutions—Instituto Tecnológico Superior del Oriente del Estado de Hidalgo (ITESA) and Instituto Tecnológico Superior del Oeste del Estado de Hidalgo (ITSOEH)—there is greater participation of women (more than 60%). In ITESA, the predominant age is 18 to 20 years old, while in ITSOEH it is 21 to 23 years old.

Regarding marital status, singles prevail in both institutions. Furthermore, the data indicate that in ITESA, the semester with the greatest representation was the fourth, while in ITSOEH it was the sixth semester.

Finally, in both institutions, the majority of students are in the morning shift and are in a regular academic situation.

Table 2. Sociodemographic variables

Variable	Description	Higher Technological Institute of the East of the State of Hidalgo (ITESA)		Higher Technological Institute of the West of the State of Hidalgo (ITSOEH)		Total	
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Gender	Male	66	37.08%	51	30.72%	117	34.01%
	Female	112	62.92%	115	69.28%	227	65.99%
	Total	178	100.00%	166	100.00%	344	100.00%
Age	18 to 20 years	96	53.93%	67	40.36%	163	47.38%
	21 to 23 years	67	37.64%	70	42.17%	137	39.83%
	24 to 26 years	eleven	6.18%	10	6.02%	21	6.10%
	27 years or older	4	2.25%	19	11.45%	23	6.69%
	Total	178	100.00%	166	100.00%	344	100.00%
Civil status	Single	167	93.82%	150	90.36%	317	92.15%
	Married	7	3.93%	4	2.41%	11	3.20%
	Free Union	4	2.25%	12	7.23%	16	4.65%
	Total	178	100.00%	166	100.00%	344	100.00%

Semester	Second	48	26.97%	49	29.52%	97	28.20%
	Room	61	34.27%	26	15.66%	87	25.29%
	Sixth	32	17.98%	51	30.72%	83	24.13%
	Seventh	eleven	6.18%	2	1.20%	13	3.78%
	Eighth	26	14.61%	38	22.89%	64	18.60%
	Total	178	100.00%	166	100.00%	344	100.00%
Shift	Morning	108	60.67%	115	69.28%	223	64.83%
	Evening	46	25.84%	24	14.46%	70	20.35%
	Mixed	24	13.48%	27	16.27%	51	14.83%
	Total	178	100.00%	166	100.00%	344	100.00%
Academic status	Regular	160	89.89%	155	93.37%	315	91.57%
	Irregular	18	10.11%	eleven	6.63%	29	8.43%
	Total	178	100.00%	166	100.00%	344	100.00%

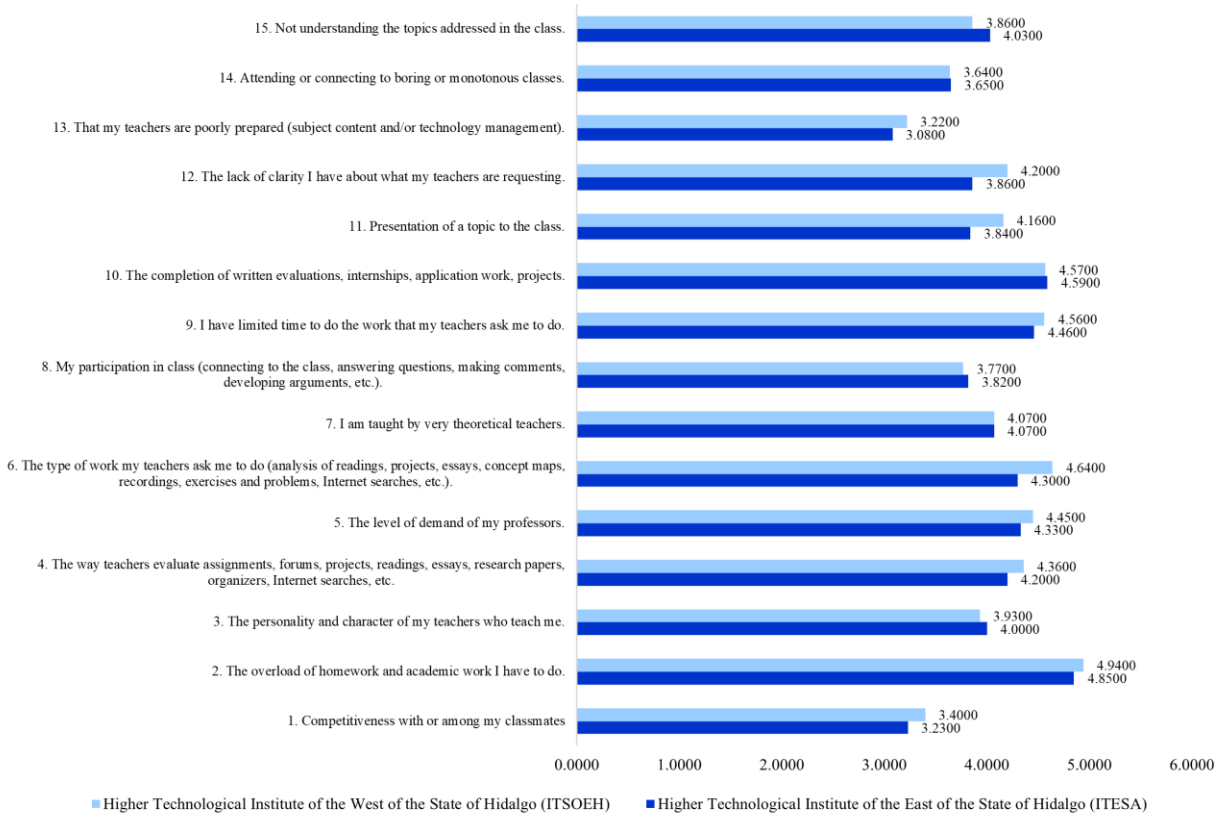
Source: self made

In relation to descriptive statistics, three dimensions are considered: stressors, symptoms generated and coping strategies. The results, reflected in Figure 3, indicate that in the dimension of stressors, the three aspects that generate the greatest academic stress in both institutions (ITESA and ITSOEH) are the overload of tasks and work. Furthermore, they agree in perceiving the completion of written evaluations, practices, application work and projects as a stressor.

However, they differ in that the ITSOEH students identify as a stressor the type of work requested by the teaching staff (analysis of readings, projects, essays, concept maps, recordings, exercises and problems, Internet searches, etc.), while the ITESA students perceive having limited time to do the work assigned by the teaching staff as a stressor.

In both institutions, students state that the least stressor is the perception that teachers are poorly prepared, either in the content of the subject or in the management of technology.

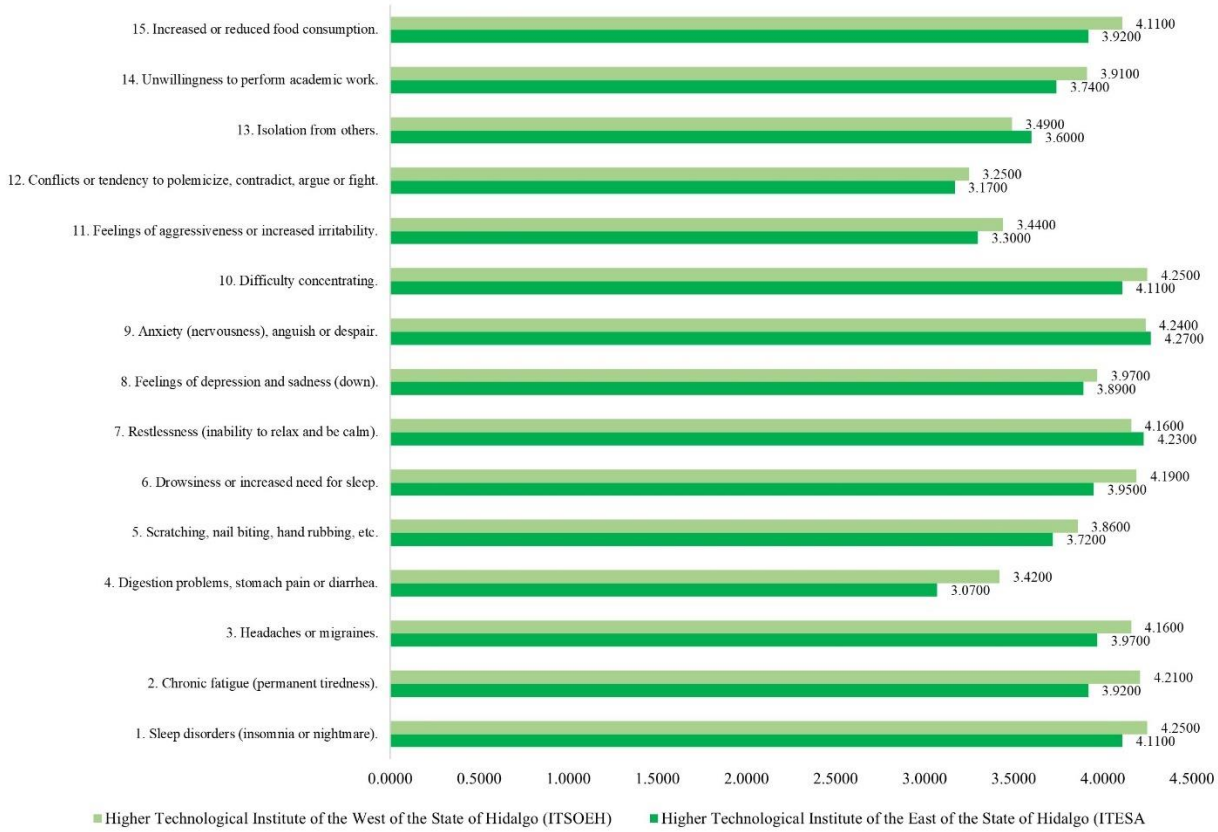
Figure 3. Comparison of academic stressors



Source: self made

In relation to the symptoms generated, the data presented in Figure 4 indicate that ITESA students mainly experienced anxiety, anguish and despair, followed by restlessness and sleep disorders. On the other hand, for the ITSOEH educational community, sleep disorder was ranked first, followed by difficulty concentrating, as well as anxiety, anguish or despair. That is, of the three effects most perceived by respondents in both institutions, they coincide with anxiety, anguish, despair and sleep disorder. This reflects that, regardless of the context of the students and the institution in which they carry out their academic activities, similar effects are observed due to the virtual activities carried out during the covid-19 pandemic.

Figure 4. Comparison of symptoms



Source: self made

On the other hand, the results of the students' perception of the coping strategies they used to face the virtual education modality due to the covid-19 pandemic are presented in figure 5. In both institutions, the students indicate that the The main strategy for responding to academic stress is to focus on resolving the situation that worries them. This is followed by listening to music and finally surfing the internet. The coping strategy they used the least was playing video games.

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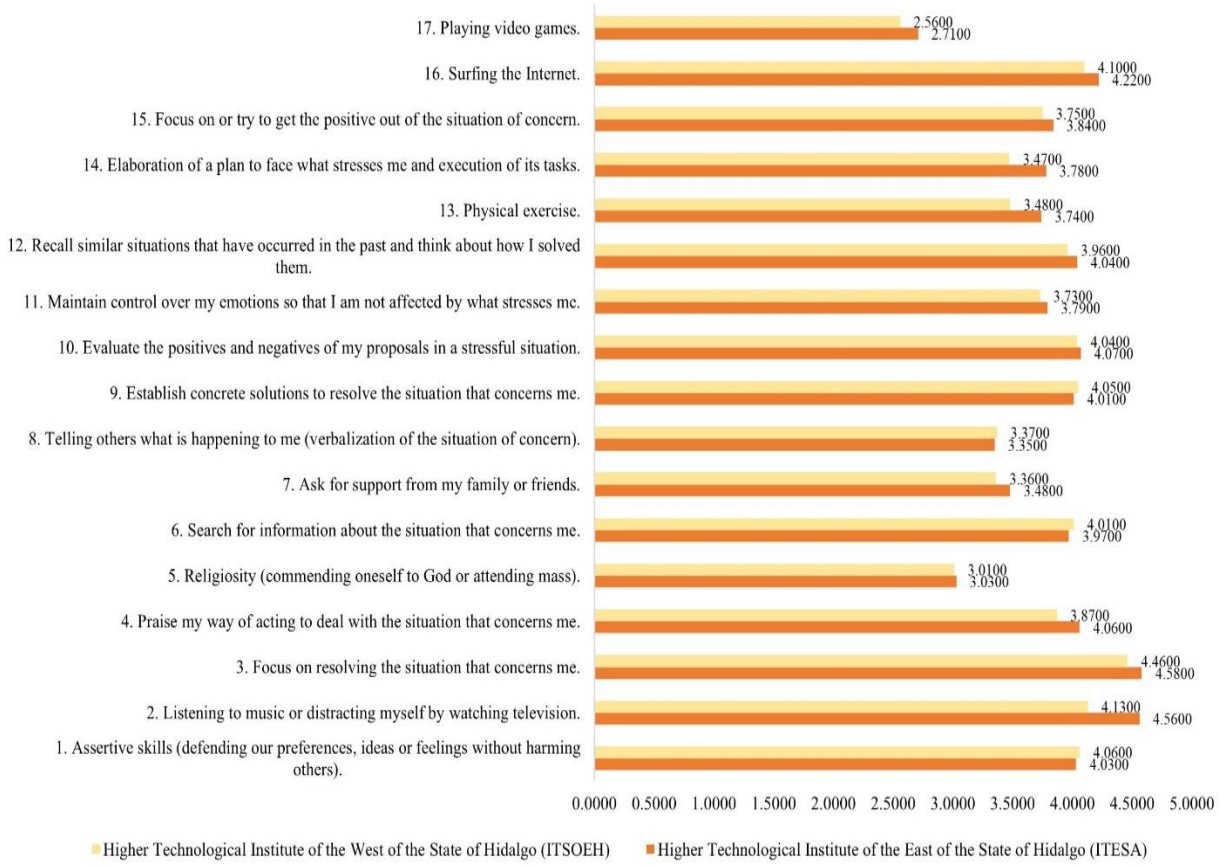
Figure 5. Comparison of coping strategies



Source: self made

Table 3 and Figure 6 show the results of the descriptive statistics of the study dimensions. Regarding stressors, the data indicate differences of 1.4800* between ITESA and ITSOEH students, with the level of stressors being higher in the second group.

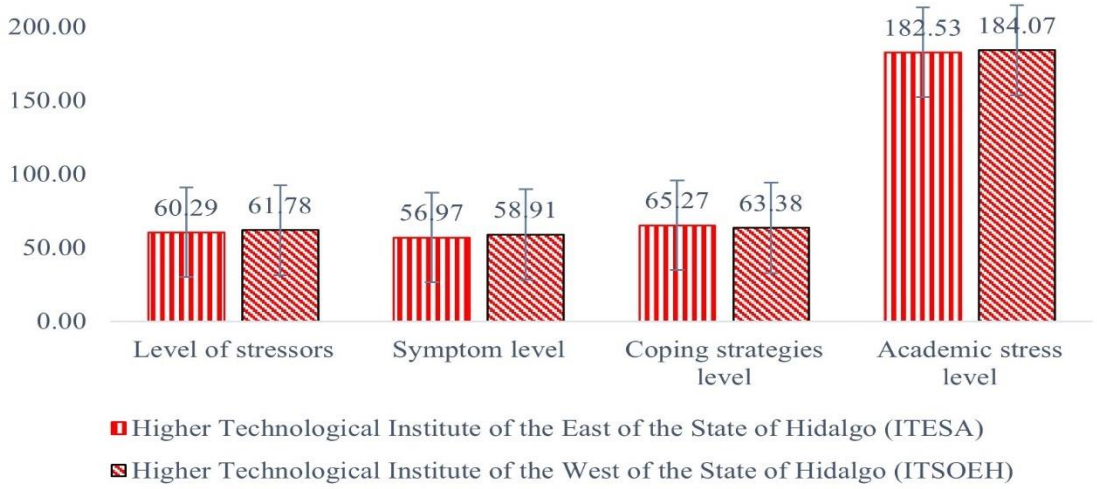
In relation to the symptom dimension, a higher average score is observed in the ITSOEH students with a value of 1.9433*, higher than the group of ITESA respondents. Regarding coping strategies, the average score is higher in ITESA students compared to ITSOEH students, with a difference of 1.8902*. Finally, in terms of academic stress, the level is higher in the group of ITSOEH students with a value of 1.5382*, being higher in ITSOEH compared to ITESA.

Table 3. Average academic stress scores

Dimension	Institution	N	Half	Desv . Deviation	Desv . Average error
Stressor level	Higher Technological Institute of the East of the State of Hidalgo (ITESA)	178	60.2921	12.4289	0.9315
	Higher Technological Institute of the West of the State of Hidalgo (ITSOEH)	166	61.7771	13.7238	1.0651
Symptom level	Higher Technological Institute of the East of the State of Hidalgo (ITESA)	178	56.9663	17.9943	1.3487
	Higher Technological Institute of the West of the State of Hidalgo (ITSOEH)	166	58.9096	20.0489	1.5561
Level of coping strategies	Higher Technological Institute of the East of the State of Hidalgo (ITESA)	178	65.2697	13.1478	0.9854
	Higher Technological Institute of the West of the State of Hidalgo (ITSOEH)	166	63.3795	13.7354	1.0660
Academic Stress Level	Higher Technological Institute of the East of the State of Hidalgo (ITESA)	178	182.5281	30.7183	2.3024
	Higher Technological Institute of the West of the State of Hidalgo (ITSOEH)	166	184.0663	34.9085	2.7094

Source: self made

Figure 6. Average academic stress scores



Source: self made

The data presented allow us to identify that in both institutions the levels of stressors, symptoms, coping strategies and academic stress are at the strong level. With results above 60 in the level of stressors and coping strategies, and a level above 56 in symptoms, a similar trend is observed in both study groups. Regarding academic stress, the results are higher than 128, which is the lower limit to classify the level as strong in both institutions. Next, the proposed working hypotheses are contrasted.

H0: There is no difference in the level of academic stress in ITESA and ITSOEH students.

H1: There is a difference in the level of academic stress in ITESA and ITSOEH students.

To test the hypotheses, the non-parametric Mann-Whitney U test for independent samples was used. This choice is based on the assumptions that the independent variable—which refers to the institution (ITESA and ITSOEH)—is dichotomous, while the dependent variable—stress level—is continuous. Furthermore, the sample size exceeds 30 cases and the data do not follow a normal distribution.

The value of the Mann-Whitney U statistic and Wilcoxon's W depends on the linearly ordered observations of both groups. In this case, the value of U corresponds to the number of times that a value of the ITESA students precedes that of the ITSOEH students.

On the other hand, the Wilcoxon W statistic (Wm) is the sum of the ranks associated with the observations that make up the smaller sample (ITSOEH students). This derives from the fact

that, if the ITSOEH population is smaller than that of ITESA, smaller ranges will tend to be associated with ITESA values.

From these analyses, it is determined that ITSOEH students present a higher level of academic stress than ITESA students, although the difference is not significant. This is because the Mann-Whitney U value was 14214.500 and the p value (Sig. two-sided asymptotic) is 0.544, which leads to accepting the null hypothesis. Therefore, it is concluded that the level of academic stress is at a strong level for ITESA and ITSOEH students.

Although there is a difference of 6.5113 in the average ranges, it is not significant. Therefore, regardless of the educational institution to which the students belong, being part of the Tecnológico Nacional de México and the engineering educational program in Business Management, they present similarities in the perception of stressors, symptoms, and coping strategies. and, consequently, in the level of academic stress, which is mostly classified as strong.

Table 5. Mann-Whitney U test

Ranks				
Variable	Institution	N	Average range	Sum of ranks
Academic Stress	Higher Technological Institute of the East of the State of Hidalgo (ITESA)	178	169.36	30145.50
	Higher Technological Institute of the West of the State of Hidalgo (ITSOEH)	166	175.87	29194.50
	Total	344		

Test statistics –	
	Academic Stress
Mann-Whitney U	14214,500
Wilcoxon W	30145,500
Z	-0.607
asymptotic sig. (bilateral)	0.544
to. Grouping variable: Institution	

Source: self made

Finally, table 6 is presented, which shows the frequency distribution of the academic stress levels of the students, in both ITESA and ITSOEH institutions more than 71% present a strong level of stress, secondly, the moderate level is presented and in a lower percentage the mild level.

Table 6. Level of academic stress

Academic stress level	Higher Technological Institute of the East of the State of Hidalgo (ITESA)		Higher Technological Institute of the West of the State of Hidalgo (ITSOEH)		Total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Mild	8	4.49%	12	7.23%	twenty	5.81%
Moderate	43	24.16%	33	19.88%	76	22.09%
Strong	127	71.35%	121	72.89%	248	72.09%
Total	178	100.00%	166	100.00%	344	100.00%

Source: self made

Discussion

The decision to pursue a higher education career, particularly engineering, can carry the possibility of developing a certain level of stress, which in turn can trigger emotional and physical problems. This situation can worsen when there is a drastic change in the teaching-learning process, such as the transition from traditional face-to-face education to virtual education driven by the covid-19 pandemic.

In relation to the results of the stressors dimension, it is identified that students from both institutions indicate that the overload of tasks and the completion of written evaluations, projects, etc., were the factors that generated greater stress. These results are similar to those of Moawad (2020), who conducted research at a university in Saudi Arabia and concluded that exams and types of exams, dates and amount of assignments, as well as time management are the topics that They generate greater stress and uncertainty in university students.

Similarly, the results coincide with those obtained by González-Velázquez (2020), who in the Mexican context points out that the covid-19 pandemic generated an increase in anxiety. Furthermore, it indicates that, in the educational field, the impact is large and, therefore, difficult to quantify, which suggests the need to reconsider the possibility of reconstructing education with a model appropriate to the dynamics of change and uncertainty.

Likewise, it agrees with the conclusions presented by Moreno-Montero *et al.* , (2022) who indicate that, in Ecuadorian university students, the most frequent stressor was task overload. The symptoms generated included concentration problems, as identified in ITSOEH students. The most used coping strategy was listening to music, which is also one of the most considered in the context of Hidalgo, Mexico.

The results are also similar to those presented by García and González (2022), who mention that academic stress affects both academic performance and extracurricular activities. According to their systematic review of the literature, the overload of work and school tasks, as well as the limited time for their development, are the main factors that generate stress in students.

However, the results do not agree with the conclusions of the study by Talavera-Salas *et al.* (2021), who affirm that Peruvian higher education students studying public management present a moderate level of stressors, symptoms, and coping strategies. However, they do agree that the overload of tasks and jobs is one of the stressors they perceive the most, and that among the symptoms are anxiety or despair and sleep disorders. Regarding coping strategies, focusing on the situation and listening to music stand out.

Regarding the fact that the majority of students (more than 70%) present a strong level of stress, the results are similar to those obtained by Hoyt *et al.* (2021), who, in their study conducted with American college students, found that all students, on average, suffered from stress.

In general, the results coincide with what was stated by Puente *et al.* (2022), who point out that confinement due to the covid-19 pandemic had a negative impact on students. Furthermore, they indicate that students learn less in virtual education and that stress is the negative emotion they present the most.

On the other hand, the need to implement prevention and monitoring programs for the psychological effects generated by confinement during pandemics is highlighted to guarantee the well-being and mental health of university students, since with the return to in-person presence they have been generated again. radical changes in work dynamics that can affect students (González- Jaimes *et al.* , 2020).

Conclusions

The Covid-19 pandemic has caused changes in the dynamics of teaching and learning, as well as in the mental health of students, which has exacerbated already existing problems. In this sense, the results of this work indicate that the majority of Business Management engineering students from both institutions (ITESA and ITSOEH) present a high level of stressors, symptoms, coping strategies and academic stress, which can have repercussions in the personal and academic sphere.

In both institutions, respondents indicate that the greatest stressors are the overload of tasks and work, as well as the completion of written evaluations, practices, application work and projects. In contrast, the lowest stressor perceived by students is the perception that teachers are poorly prepared (in terms of subject content and/or management of technology). Regarding the symptoms generated by academic stress, the results show that both study groups presented anxiety, anguish, despair and sleep disorders.

Finally, in terms of coping strategies, students respond that to a greater extent they deal with academic stress by concentrating on solving the situation that worries them, followed by listening to music and, finally, surfing the Internet.

In short, it can be assured that this analysis can help identify which stressors affect university students in the teaching and learning process to establish functional coping and support strategies. In this way, HEIs can contribute to reducing the negative effects that may arise on health, academics and, consequently, general well-being. Likewise, it is a priority that the Government and the directors of the HEIs work collaboratively to generate policies aimed at diagnosing and managing the impact of the covid-19 pandemic or other contingencies that affect the mental health and well-being of students.

The main limitation of this study, however, is that it only considers engineering students in Business Management from two institutions (ITESA and ITSOEH) located in the state of Hidalgo and belonging to the Tecnológico Nacional de México. Even so, the results show certain trends in terms of stressors, symptoms, coping strategies and academic stress in technological higher education students in Hidalgo and Mexico. This generates empirical information for the reflection and implementation of programs and strategies in future situations that radically change the teaching-learning process.

Future lines of research

The identification of the level of academic stress in the different educational programs of technological higher education institutions is proposed as a future line of research. Furthermore, it is suggested to establish the association with variables such as academic performance, dropout and failure to identify the effect of academic stress on these indicators.

Likewise, it is recommended to collect data on academic stress upon returning to face-to-face activities. It is also considered important to take into account mixed education and the use of technology, elements that were promoted during the pandemic and that today are an integral part of current educational processes, in line with the trend towards education 4.0.

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