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ORIGINAL ARTICLE

Enhancing Resilience: Analyzing Its Impact with a Second-Order Structural Equation Model on Burnout Among Mexican University Students During COVID-19

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Abstract

This study employs a second-order structural equation model to assess the statistical impact of resilience on burnout subscales among undergraduate students from Mexican faculties during the COVID-19 pandemic. An online questionnaire was administered to a nationwide sample of 5557 students enrolled in a higher education institution. The questionnaire demonstrated high reliability, with alpha coefficients exceeding 0.70 for all subscales, and demonstrated construct validity with average variance extracted (AVE) coefficients surpassing 0.50, alongside discriminant validity values exceeding 0.70. Utilizing structural equation models with second-order latent variables through the maximum likelihood method, our study sought to test the research hypothesis. The results indicated that resilience exerted a significant and direct influence on the illusion to study (0.74), explaining approximately 55% of its variance. Additionally, psychological exhaustion (−0.36), indolence (−0.35), and guilt (−0.27) were significantly inversely related, elucidating around 13%, 12%, and 1% of their respective variances. The findings underline the significance of resilience as a pertinent psychosocial factor empowering students to confront the challenges posed by the COVID-19 pandemic. Resilience enhances students' enthusiasm to study while simultaneously mitigating psychological exhaustion, indolence, and guilt. As defined by the World Health Organization (WHO), burnout emerges as a syndrome resulting from inadequately managed chronic stress. Previous research has demonstrated that depression, psychosomatic disorders, alcohol and tobacco consumption, and obesity stem from the profound feelings of guilt linked to burnout, as outlined in Gil-Monte's burnout model. Significantly, students in academic contexts often perceive their burnout experiences as indicative of personal inadequacies, leading them to internalize guilt for their perceived underperformance. This self-criticism contributes to a pervasive sense of failure and a marked decline in self-esteem. Moreover, employing Student's *t*-tests, this study reveals noteworthy gender-based disparities across all subscales, with the exception of persistence, tenacity, and self-efficacy.

Keywords Burnout syndrome · Resilience · University students · COVID-19 · Second-order latent variable modeling · SEM

Introduction

The relationship between resilience and burnout has been of great interest for research in recent years (Romano et al., 2021; Yuan et al., 2018; Parviainen et al., 2021; Qin et al., 2023; Fiorilli et al., 2020). Previous studies have shown that resilience has been a mediating variable that reduces and controls the development of burnout in university students (Tang et al., 2021; Dong et al., 2023; Kristinsson et al., 2023; Gündoğan, 2023; Zeng et al., 2021; Salmela-Aro et al., 2022; Romano et al., 2021). Evaluating the relationship between resilience and its influence on burnout will allow for creating healthier student environments. Additionally, exploring resilience as a protective factor due to its implications for student burnout is paramount

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for academic performance and well-being. Moreover, possible strategies for fostering resilience and preventing burnout should be examined. However, despite numerous studies on the relationship between these variables, it is currently unknown whether the behavior of this relationship was the same during the COVID-19 pandemic. This study aims to determine to what extent the resilience of a sample of Mexican university students with n=5537 influences the reduction of burnout syndrome during the Coronavirus Pandemic. The CD-RISK-25 Resilience scale and Gil-Monte's CESQT-P were administered to this group of students. They were also asked about their sociodemographic profile and field of study. The analyses were performed using techniques based on second-order structural equation modeling (PLS-SEM).

The COVID-19 pandemic has significantly impacted worldwide, and university students have not been an exception. The abrupt shift to online education, social isolation, and widespread uncertainty has increased student stress and burnout (Anand et al., 2020; Urzúa et al., 2020). The crisis generated by the pandemic demanded immediate responses, which profoundly impacted university students facing severe economic, social, and family challenges. UNESCO mentions that over 290 million university students worldwide were put under quarantine due to the Coronavirus (UNESCO, 2020). Many of them in Latin American countries lacked computer equipment and internet access to continue their online courses; others faced the loss of immediate family members due to the pandemic, fear of infection, and the economic impact that left a large number of them unemployed due to business closures, among many other hardships. Previous studies mention that the most affected groups are young people aged 15 to 24 (Crawford et al., 2020). Additionally, healthcare systems collapsed, causing more human losses in many parts of the world (Esteves, 2020) and increased stress, depression, and anxiety among students (Tang et al., 2021).

The context of COVID-19 has had a significant impact on higher education worldwide, including Mexico. The pandemic brought about the need to implement social distancing measures and restrictions on in-person activities (UNESCO, 2020). In the case of Mexican university students, COVID-19 generated significant changes in their educational experience (García-Rivera et al., 2021). Universities had to adapt their plans and study programs to offer online alternatives that ensured the continuity of education. This context forced the use of virtual platforms like Blackboard, among others, using connectivity networks, which resulted in many students being unable to socialize and receive support from their friends, classmates, or professors (Esteves, 2020). Additionally, they had to face concerns related to potential health problems or economic and employment difficulties. The sudden sense of disconnection negatively affected the emotional and mental well-being of the students (Tang et al., 2021).

Brief Bibliographic Review

Resilience plays a fundamental role in mitigating the effects caused by burnout syndrome in university students (Jew et al., 1999; Russo et al., 2019; Ungar, 2019). Various studies have demonstrated a negative and significant relationship between these two variables (Hossain et al., 2018; Yamashita, 2021; Kebede et al., 2019). San Román-Mata et al. defined the concept of resilience as the intrinsic ability of human beings to overcome stressful and adverse situations to achieve their goals. Resilience also refers to a person's capacity to adapt, recover, and grow in adverse situations, changes, or traumas, resisting and recovering positively after facing difficult circumstances.

When contextualizing the academic environment during the peak of COVID-19 in 2020 for university students, research shows that those students who successfully continued their university studies exhibited high levels of self-efficacy, planning, stress control, persistence, and other dimensions that have been identified as indicators of resilience (Qin et al., 2023; Walburg, 2014). Studies on the topic have demonstrated the importance of resilience and its effects on emotional exhaustion generated by Burnout. For example, in a study conducted in Hungary, Travis et al., (2021) found that specific emotional competencies such as self-awareness, awareness of others, and self-management correlated with performance and reduced Burnout.

Among the psychosocial risks associated with this issue observed in students, problems such as Burnout were identified, with psychosomatic, psychological, and physiological manifestations including depression, psychological distress, stress, anxiety, insomnia, emotional exhaustion, lack of energy, disinterest, cognitive fatigue, physical and psychological exhaustion, as well as fear of death, losing family and friends, and high levels of uncertainty (Leontopoulou, 2023; Li et al., 2021).

In the case of Mexico, it was observed that prior to the pandemic, 75% of the Mexican population experienced symptoms of fatigue and Burnout associated with work-related stress, which was higher in Mexico compared to countries like the USA and China (Stroud and Gutman et al., 2021; Quintiliani et al., 2022; Mexican et al. Institute, n.d.). Ayala and Manzano, (2018) mentions that 60% of Mexican workers suffer from high-stress levels, impacting their health and work motivation. In the case of students, differences show, according to the fields of study, higher rates among students in health sciences, engineering, and sciences. Sun et al., (2021) asserts in their research that 63% of Mexicans have experienced stress and burnout in the past two years; furthermore, 46% stated that their stress levels increased due to the

pandemic. In this regard, a study conducted by Alonzi et al., (2020) identified the following indicators as the leading causes of stress and burnout during the first peak of COVID-19: lack of control, excessive or insufficient workload (46%); inappropriate schedule, as many teachers adjusted their schedules based on their availability for distance learning, resulting in excessively long study and class hours according to official schedules (35%); little or no communication (29%); lack of balance between personal and academic life (26%); and limited space to carry out academic activities, lack of physical resources for online classes, among other factors that contributed to increased stress and burnout. Additionally, research shows that the number of students who dropped out of university was higher due to these conditions, and the failure rate and learning and evaluation averages decreased (Gaceta UNAM, 2022; Browning et al., 2021).

Problem Statement

The impact of burnout on the health and well-being of university students has been a growing concern, especially during the first wave of COVID-19. Burnout, resulting from prolonged exposure to chronic academic stress due to the multiple academic, social, and personal demands experienced by university students, must be analyzed, given the urgent need for coping strategies during pandemics like COVID-19. However, resilience plays a crucial role in preventing and mitigating burnout. Resilience as a protective factor enabled some students to effectively cope with academic pressures, maintaining emotional balance, a positive attitude, and an optimistic outlook in the face of challenging situations brought about by the pandemic. Despite numerous previous studies on the effects of resilience and burnout, there is a research gap specifically regarding these two variables in the context of COVID-19 in Mexico. Determining how these factors interrelate in an educational environment affected by the pandemic is paramount. Therefore, the research question arises: Did the resilience of higher education students in Mexico significantly influence the subscales of burnout during the COVID-19 pandemic? Identifying and understanding the influence syndrome of resilience on burnout will enable the development of effective intervention and resilience promotion strategies to prevent and address burnout among Mexican students, ensuring academic success, reducing dropout rates, and improving their mental health in times of crisis.

Objective

The main objective of our research was to determine the statistical influence of resilience on subscales of Burnout Syndrome in undergraduate students in Mexico during the COVID-19 pandemic using a second-order latent variable structural equation modeling.

Research Hypothesis

H1: "Resilience as a psychosocial variable enabled the sampled students to cope with Burnout during the COVID-19 pandemic, leading to increased Enthusiasm to Study and reduced Psychological Exhaustion, Indolence, and Guilt."

A second-order latent variable structural equation model (SEM) considering the research hypothesis is proposed, as shown in Fig. 1.

The aforementioned SEM model proposes the following specific hypotheses as presented in Table 1.

As observed in Table 1, four hypotheses are proposed. This document presents the following structure: introduction, literature review, conceptual model, methodology, results, discussion, limitations, future studies, and conclusion. This article explores the relationship between resilience and burnout in university students during the COVID-19 pandemic.

Materials and Methods

Methods

Study Design

This study can be classified as an ex post facto, non-experimental, cross-sectional research. Our approach was somewhat explanatory by using structural equation modeling with second-order latent variables using the maximum likelihood method (Hair, 2021).

Unit of Analysis

The participants in this research were undergraduate students of a University in Northern Mexico, with a total sample size of $n = 5557$. The socio-demographic characteristics of the participants were as follows: 63.9% ($f = 3551$) were women, while 36.1% ($f = 2006$) were men; 90.6% ($f = 5036$) reported being single, 4.7% ($f = 259$) were in a fact union, 3.7% ($f = 210$) were married, and 1% ($f = 52$) selected "other" as their marital status. In terms of education level, 93.6% ($f = 5201$) had a bachelor's degree, 3.7% ($f = 203$) had a specialization, 1.7% ($f = 105$) had a master's degree, and 1% ($f = 48$) chose "other" as their educational qualification. The age distribution was as follows: 71% ($f = 3970$) were aged 17 to 22, 21% ($f = 1173$) were between 23 and 27 years, and 8% ($f = 414$) were 28 years or older.

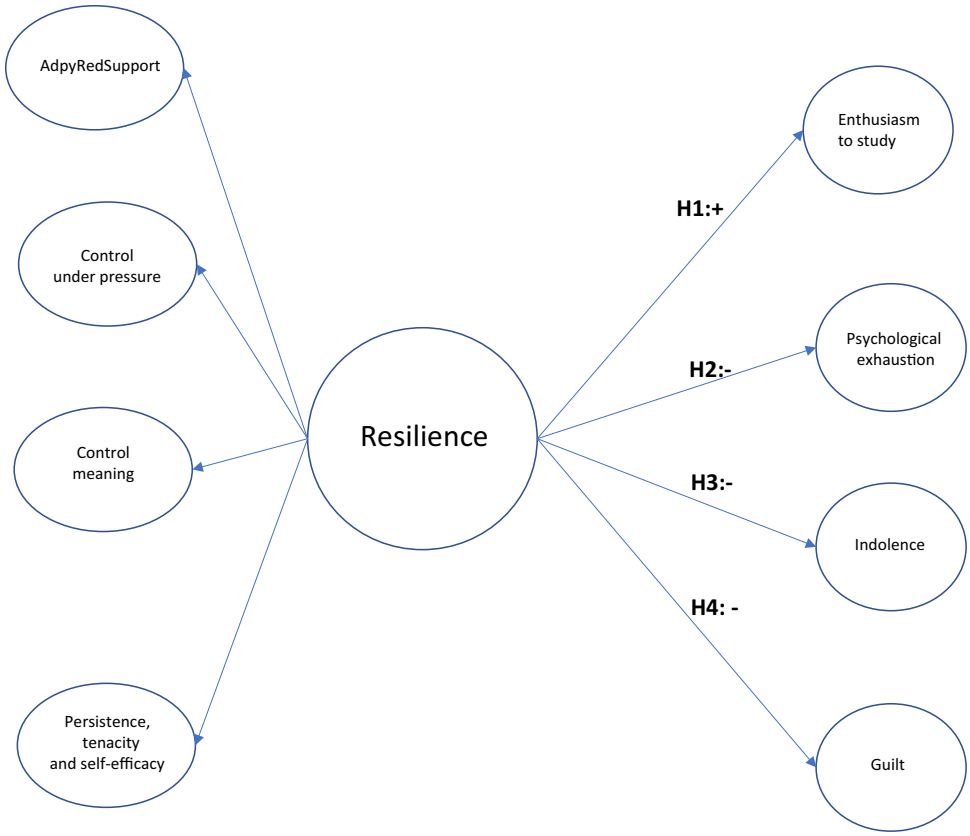

Fig. 1 Structural equation model proposed. Source: self-elaboration

Table 1 Specific research hypotheses

Exogenous or independent variable	Specific hypotheses derived in the SEM	Endogenous or dependent variables
Resilience (understood as a second-order latent variable) integrating subscales such as: AdpyRedSupport, control under pressure, meaningful control and persistence, tenacity and self-efficacy	H1: "Resilience has a significant direct influence on the enthusiasm to study".	Enthusiasm to study (Gil Monte, year)
	H2: "Resilience has a significant inverse influence on psychological exhaustion."	Psychological exhaustion (Gil Monte, year)
	H3: "Resilience has a significant inverse influence on indolence."	Indolence (Gil Monte, year)
	H4: "Resilience has a significant inverse influence on guilt."	Guilt (Gil Monte, year)

Source: self-elaboration

The questionnaires were administered electronically to all the sampled students, resulting in a response rate of approximately 60% of the student population. The completed questionnaires were collected and uploaded into a database, which was then edited and analyzed using the Statistical Package for the Social Sciences (IBM SPSS) version 23 for Windows, as well as the Smart PLS version 3.

Questionnaires

The data collection questionnaires used in this study encompassed a range of socio-demographic variables, including gender, marital status, age, scholarity level, seniority, and if employed, employment shift and type. Furthermore, the instrument consisted of the following questionnaires:

The Resilience Scale CD-RISC25 (Connor & Davidson, 2003) This questionnaire aimed to assess resilience, which refers to an individual's ability to adapt and overcome challenging circumstances. Resilience was measured as a multidimensional construct through the respondents' positive response to risk situations. The scale comprises 25 items that participants rated on a 5-point Likert scale ranging from 1 to 5. It encompasses five dimensions: Persistence/Tenacity/Self-efficacy (items 1012, 16, 17, and 2325), control under pressure (items 6, 7, 14, 15, 18, 19, and 20), adaptability and support

networks (items 1, 2, 4, 5, and 8), control and meaning (items 13, 21, and 22), and spirituality (items 3 and 9); however, spirituality was not significant; thus, it was eliminated from the model. As mentioned, spirituality does not appear to play a meaningful role in explaining or predicting the outcome variable within the specific context of the study. We believe that the measurement tool used to assess spirituality might not have been sensitive enough to capture the nuances of the participants' spiritual beliefs and practices, leading to a lack of significance. This may be due to the fact that the instrument was designed for English-speaking countries with different context.

The Spanish Burnout Inventory Questionnaire, Validated by Gil-Monte et al. (2011) The questionnaire consists of 20 items integrated in four dimensions in a random way: enthusiasm to study, integrated by five items (1, 5, 10, 15, and 19); psychological exhaustion, integrated by four items (8, 12, 17, and 18); indolence, integrated by six items (2, 3, 6, 7, 11, and 14); and guilt, integrated by five items (4, 9, 13, 16, and 20).

Independent or Exogenous Variable

Resilience is a second-order exogenous variable integrating subscales: (1) adaptability and support networks, (2) control under pressure, (3) control and meaning, and (4) persistence/tenacity/self-efficacy.

Dependent or Endogenous Variables

These variables are the subscales of the burnout syndrome, analyzed separately as (1) enthusiasm to study, (2) psychological exhaustion, (3) indolence, and (4) guilt.

Statistical Tests

A structural equation model with second-order latent variables, using the maximum likelihood method, tested the research hypotheses.

Results

Statistical Analysis and Hypothesis Testing

Model Fit Indices

Overall Model Fit The score of 3.99 for the overall model fit, calculated as the chi-square divided by the degrees of freedom (χ^2/df), confirms an adequate model fit.

Absolute Fit Measures The Goodness of Fit Index (GFI) showed a score of 0.87, which is considered acceptable due to its proximity to 1. The Root Mean Square Error of Approximation (RMSEA) of 0.02 is also accepted within the 0.95 interval.

Incremental Fit Measures An Adjusted Goodness of Fit Index (AGFI) of 0.89 was shown, indicating a moderate fit. The Tucker-Lewis Fit Index (TLI) of 0.99, close to 1, was considered adequate. The Normed Fit Index (NFI) of 0.882 was moderate. The Relative Fit Index (RFI) of 0.99 was considered adequate. The Incremental Fit Index (IFI) of 0.99 was considered adequate. The Comparative Fit Index (CFI) of 0.99 was considered adequate.

Parsimony Fit Measures The Normed Parsimony Fit Index (PNFI) of 0.77 was considered moderate, while the Parsimony Goodness-of-Fit Index (PGFI) of 0.77 was also considered moderate.

The details of the described parsimony fit indexes above can be seen in Tables 5 and 6.

Confirmatory Factor Analysis A confirmatory factor analysis (CFA) of the structural equation model was conducted, revealing coherence between the theoretical items and the scores for each standardized regression coefficient of each dimension or construct. The weights of these coefficients ranged from 0.53 to 0.94. This information can be observed in Tables 5 and 6.

Descriptive Statistics, Reliability, and Validity of the Model

Descriptive Statistics

Descriptive statistics displays the mean scores, standard deviations, and confidence intervals. It is worth noting that the lowest average score among the model's subscales was guilt, with $\bar{X} = 1.52$ ($s = 0.85$), while persistence had the highest score with $\bar{X} = 3.83$ ($s = 0.83$).

Bivariate Correlations between Subscales Significant bivariate correlations are observed, which are important to highlight as they support the expected theoretical coherence with empirical evidence in the present study. These are as follows: the burnout syndrome subscales, such as psychological exhaustion, indolence, and guilt, exhibit significant inverse correlations with all subscales of resilience, namely, adaptive support, control, significance control, and persistence. On the other hand, enthusiasm to study showed positive correlations with resilience subscales, while exhibiting significant inverse correlations with all subscales of the burnout syndrome.

Table 2 presents the descriptive statistics, reliability, and validity indices, as well as the Pearson Moment-Product bivariate correlations between the subscales.

All of the above can be seen in detail in Tables 2, 4, and 5.

As we can see, Table 2 shows descriptive statistics about the different subscales. On the other hand, Table 3 shows the results of the hypothesis tests.

As noticed in Table 3, all the hypotheses' tests show that the hypothesis proposals were accepted. Furthermore, in Fig. 2, we can see the restructured model;

Table 3 and Fig. 2 show the results of the structural equation model where the 4 hypotheses were verified and accepted, as follows:

Hypothesis 1 test results show a significant direct influence of resilience towards enthusiasm to study with a standardized regression coefficient of 0.74, explaining approximately 55% of its variance from its square R. Therefore, this hypothesis was accepted.

Hypothesis 2 test results show a significant inverse influence of resilience towards psychological exhaustion with a standardized regression coefficient of −0.36, explaining approximately 13% of its variance from its square *R*. Therefore, this hypothesis was accepted.

Hypothesis 3 test results show a significant inverse influence of resilience towards indolence with a standardized regression coefficient of −0.35, explaining approximately 12% of its variance from its square *R*. Therefore, this hypothesis was accepted.

Hypothesis 4 tests results show a significant inverse influence of resilience towards guilt with a standardized regression coefficient of −0.27, explaining approximately 0.07% of its variance from its square *R*. Therefore, this hypothesis was accepted.

In the guilt subscale, males had a mean score of 1.59 while females showed a mean score of 1.47, observing significant differences with a *T* score of −4.82 when equal variances are assumed, while a *T* of −4.67 when they are not assumed, corresponding to significant scores in both indicators of 0.00.

Following, Table 4 shows the indexes of global fit

As noted in Table 4, all the absolute measurements of fit are moderate and proper fit.

Following, in Table 5, items and subscales of SEM statistics are shown.

As seen in Table 5, significant differences of the subscales of resilience and burnout syndrome to analyze the possible significant differences in the subscales of the sampled students by gender; we used Student's *t*-tests.

The results of Student's *t*-tests are presented in Table 6.

Table 2 Descriptive statistics, convergent, and discriminant validity

Subscales		Mean	Standard deviation	Confidence interval		Number of items	Alpha	Omega	AVE	E1	E2	E3	E4	E5	E6	E7	E8
				Lower	Upper												
E1	AdpyRedSupport	3.48	1.00	3.45	3.51	2	0.78	0.79	0.66	**0.81**							
E2	Control	3.33	0.91	3.30	3.35	4	0.79	0.8	0.5	0.773	**0.71**						
E3	Control meaning	3.44	0.99	3.41	3.46	3	0.76	0.77	0.52	0.824	0.844	**0.72**					
E4	Persistence	3.83	0.83	3.81	3.85	6	0.86	0.86	0.5	0.867	0.815	0.898	**0.71**				
E5	Enthusiasm to study	3.80	0.89	3.77	3.82	5	0.87	0.88	0.59	0.474	0.392	0.437	0.594	**0.77**			
E6	Psychological exhaustion	3.51	1.15	3.48	3.54	4	0.91	0.91	0.71	-0.285	-0.261	-0.325	-0.234	-0.127	**0.84**		
E7	Indolence	2.42	1.06	2.39	2.44	4	0.8	0.81	0.53	-0.204	-0.136	-0.253	-0.216	-0.184	0.552	**0.73**	
E8	Guilt	1.52	0.85	1.49	1.54	5	0.91	0.91	0.68	-0.167	-0.136	-0.205	-0.187	-0.09	0.197	0.3	**0.82**

Significance at 0.95. Source: self-elaboration.

AVE average explained variance, *Discriminant* principal diagonal

Values in bold indicate high correlations

Table 3 Results of hypothesis testing

Exogenous or independent variable	Specific hypotheses derived in the SEM	Weights of the standardized regression coefficients	Endogenous or dependent variables	*R* squared	Decision
Resilience (understood as a second-order latent variable) integrating subscales such as AdpyRedSupport, control under pressure, meaningful control and persistence, and tenacity and self-efficacy	H1: "Resilience has a significant direct influence on the enthusiasm to study".	0.74	Enthusiasm to study(Gil Monte, year)	0.55	Accepted
	H2: "Resilience has a significant inverse influence on psychological exhaustion."	−0.36	Psychological exhaustion (Gil Monte, year)	0.13	Accepted
	H3: "Resilience has a significant inverse influence on indolence."	−0.35	Indolence (Gil Monte, year)	0.12	Accepted
	H4: "Resilience has a significant inverse influence on guilt."	−0.27	Guilt (Gil Monte, year)	0.07	Accepted

Source: self-elaboration

As seen in Table 6, the results of Student's *t*-tests by gender for all of the subscales are shown.

In the AdpyRedSupport subscale, males had a mean score of 3.54 while females had a score of 3.44, showing significant differences with a *T* score of −4.39 when equal variances were assumed, while a *T* of −4.36 when they were not assumed, corresponding to significant scores in both indicators of 0.00.

The control under pressure subscale showed that males had a mean score of 3.46 while females showed a mean score of 3.25, observing significant differences with a *T* score of −8.02 when equal variances were assumed, while a *T* of −7.98 when they were not assumed, corresponding to significant scores in both indicators of 0.00.

The control meaning subscale showed that males had a mean score of 3.50 while females showed a score of 3.40, observing significant differences with a *T* score of −3.82 when equal variances were assumed, while a *T* of −3.80 when they were not assumed, corresponding to significant scores in both indicators of 0.00.

The persistence, tenacity and self-efficacy subscale showed that males had a mean score of 3.82 while females had a score of 3.83, not observing significant differences with a *T* score of 0.54 when equal variances were assumed, while a *T* of 0.54 when they were not assumed, corresponding to non-significant scores of 0.586 and 0.591, respectively, being greater than 0.05.

The enthusiasm to study subscale showed that males had a mean score of 3.67 while females showed a score of 3.87, observing significant differences with a *T* score of 7.87 when equal variances were assumed, while a *T* of 7.71 when they were not assumed, corresponding to significant scores in both indicators of 0.00.

The psychological exhaustion subscale showed that males had a mean score of 3.35 and females 3.59, observing significant differences with a *T* score of 7.42 when equal variances were assumed, while a *T* of 7.40 when they were not assumed, corresponding to significant scores in both indicators of 0.00.

The indolence subscale showed that males had an average score of 2.55 and females 2.34, observing significant differences with a *T* score of −6.92 when equal variances were assumed, while a *T* of −6.81 when they were not assumed, corresponding to significant scores in both indicators of 0.00.

Discussion

The main objective of the study was accomplished, analyzing the influence of resilience as a second-order construct in a structural equation model to explain each one of the

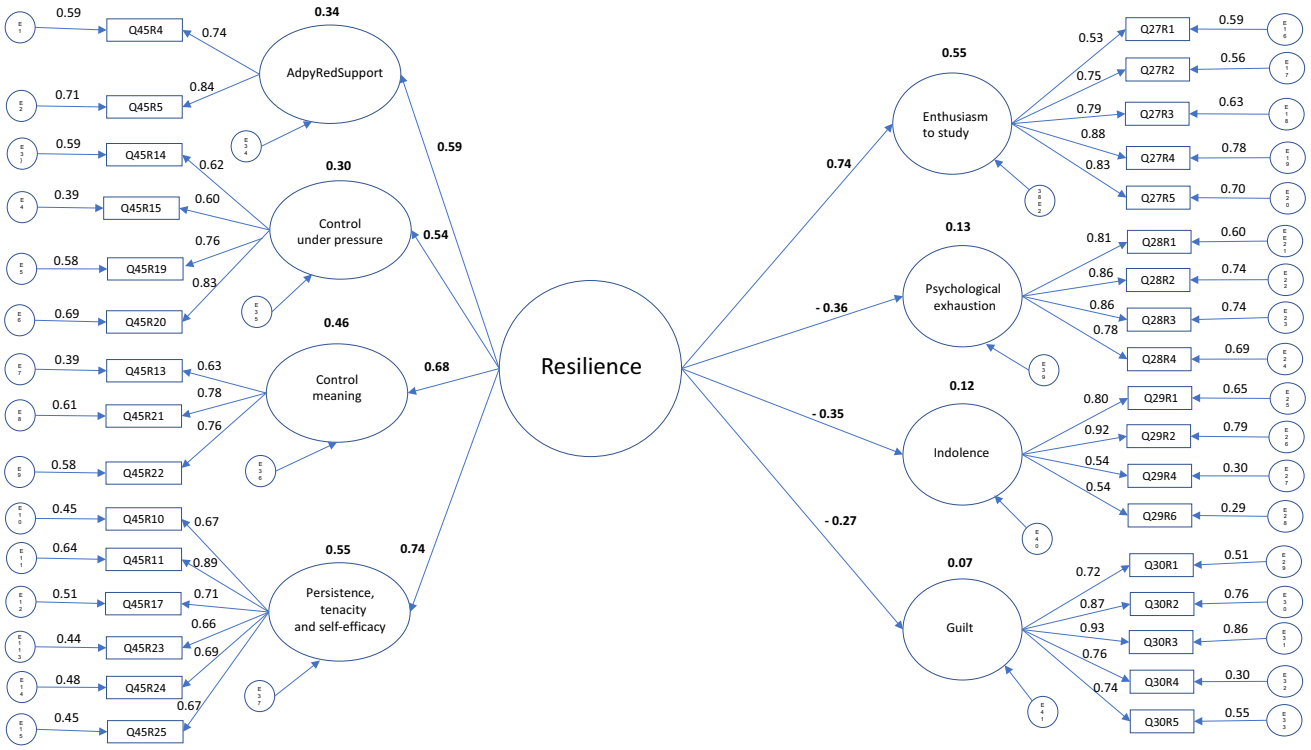

Fig. 2 Restructured model of second-order latent variable structural equations. Source: self-elaboration

Table 4 Indexes

Measure	Index	Value	Classification
Global fit of the model	Chi square/degrees of freedom	3.99	Proper fit
Absolute Measurements of fit	"Goodness of Fit Index" (GFI)	0.87	Moderate fit
	"Root Mean Square Error of Approximation" (RMSEA)	0.02	Proper fit
Absolute measurements of fit	"Adjusted Goodness of Fit Index" (AGFI)	0.89	Moderate fit
	"Tucker-Lewis Fit Index" (TLI ó Rho2)	0.99	Proper fit
	"Normed Fit Index" (NFI ó Delta)	0.99	Proper fit
	"Relative Fit Index" (RFI ó Rho 1)	0.98	Proper fit
	"Incremental Fit Index" (IFI ó Delta 2)	0.99	Proper fit
	"Normed Parsimony Fit Index" (CFI)	0.99	Proper fit
Parsimony adjustment measures	"Normed Parsimony Fit Index" (PNFI)	0.77	Moderate fit
	"Parsimony Goodness-of-Fit Index" (PGFI)	0.77	Moderate fit

Source: self-elaboration

subscales of the burnout syndrome in students that participated in the study (enthusiasm to study, psychological exhaustion, indolence, and guilt).

The main findings from the specific SEM hypotheses were as follows.

The study determined a significant direct influence of resilience as a second-order construct on enthusiasm to study, with a regression coefficient of 0.74, explaining approximately 55 % of its variance. This fact is an important finding because, during the COVID-19 pandemic, resilience was a psychological factor that increased young people's enthusiasm to study, even in difficult times for humanity.

Resilience as a second-order variable had an inverse influence on psychological exhaustion, with a regression coefficient of −0.36, being able to explain approximately 13% of its variance. This decrease, although small, was significant at a difficult time in each student's personal life from her individual and personal perspective.

Resilience as a second-order variable had an inverse influence on indolence, with a regression coefficient of −0.35,

Table 5 Items and subscales of SEM statistics

Subscales and items	Weights of the standardized regression coefficients	Total item correlation corrected	Cronbach's alpha if the item has been deleted	Alpha	Omega	AVE	Discriminant
AdpyRedApoy				0.78	0.79	0.66	0.81
Q45R4-I can deal with any problem that comes up.	0.74	0.65					
Q45R5-Past success gives me confidence for new challenges.	0.84	0.65					
Control				0.79	0.80	0.50	0.71
Q45R14-Under pressure, I can focus and think clearly.	0.62	0.59	0.75				
Q45R15-I prefer to take the lead to solve a problem.	0.60	0.54	0.78				
Q45R19-I can handle unpleasant feelings.	0.76	0.61	0.74				
Q45R20-I can act in a hurry.	0.83	0.70	0.70				
Control meaning				0.76	0.77	0.52	0.72
Q45R13-I know where to go for help.	0.63	0.53	0.77				
Q45R21-I have a strong sense of life.	0.78	0.63	0.64				
Q45R22-I have my life under control	0.76	0.64	0.65				
Persistence				0.86	0.86	0.50	0.71
Q45R10-I do my best no matter what.	0.67	0.63	0.84				
Q45R11-I can achieve my goals.	0.89	0.74	0.82				
Q45R17-I think I am a strong person.	0.71	0.62	0.84				
Q45R23-I like challenges.	0.66	0.61	0.84				
Q45R24-I study to achieve my goals.	0.69	0.67	0.83				
Q45R25 - I am proud of my academic achievements.	0.67	0.65	0.84				
Enthusiasm to study				0.87	0.88	0.59	0.77
Q27R1-Studying is a stimulating challenge for me.	0.53	0.53	0.89				
Q27R2-I see the study as a source of personal fulfillment.	0.75	0.76	0.83				
Q27R3-I think that studying gives me positive things.	0.79	0.76	0.83				
Q27R4-Studying is a stimulating challenge for me.	0.88	0.78	0.82				
Q27R5-I see the study as a source of personal fulfillment.	0.83	0.72	0.84				
Psychological exhaustion				0.91	0.91	0.71	0.84
Q28R1-I think that studying gives me positive things.	0.81	0.78	0.89				
Q28R2-Studying is rewarding for me.	0.86	0.85	0.87				
Q28R3-I feel physically tired when I study.	0.86	0.80	0.88				
Q28R4-I feel emotionally worn out.	0.78	0.76	0.90				
Indolence				0.80	0.81	0.53	0.73

Table 5 (continued)

Subscales and items	Weights of the standardized regression coefficients	Total item correlation corrected	Cronbach's alpha if the item has been deleted	Alpha	Omega	AVE	Discriminant
Q29R1-I don't feel like dealing with some teachers.	0.80	0.66	0.73				
Q29R2-I think many teachers are unbearable.	0.92	0.72	0.70				
Q29R3-I think that some relatives of my classmates are annoying.	0.54	0.55	0.78				
Q29R6-I label or classify teachers according to their behavior.	0.54	0.54	0.78				
Guilt				0.91	0.91	0.68	0.82
Q30R1-I am concerned about the treatment that I have given to some people in my group.	0.72	0.71	0.90				
Q30R2-I feel guilty for some of my attitudes in the group.	0.87	0.84	0.87				
Q30R3-I have regrets for some of my behaviors in the group.	0.93	0.84	0.87				
Q30R4-I think I should apologize to someone for my behavior.	0.76	0.75	0.89				
Q30R5-I feel bad about some things that I have said in the classroom.	0.74	0.73	0.90				

Source: Self-elaboration

Table 6 Subscales significant differences analyzed by students' gender

Subscales	Sex	*N*	Mean	Standard Dev	
AdpyRedSupport	Female	3551	3.44	0.99	
	Male	2006	3.56	1.00	***
Control under pressure	Female	3551	3.25	0.90	
	Male	2006	3.46	0.92	***
Control meaning	Female	3551	3.40	0.98	
	Male	2006	3.50	0.99	***
Persistence, tenacity and self-efficacy	Female	3551	3.83	0.82	
	Male	2006	3.82	0.86	
Enthusiasm to study	Female	3551	3.87	0.86	***
	Male	2006	3.67	0.92	
Psychological exhaustion	Female	3551	3.59	1.13	***
	Male	2006	3.35	1.15	
Indolence	Female	3551	2.34	1.04	
	Male	2006	2.55	1.10	***
Guilt	Female	3551	1.47	0.81	
	Male	2006	1.59	0.91	***

Source: self-elaboration

*** highly significant

explaining approximately 12 % of its variance. This decrease, although small, was also relevant due to the conditions of student's personal life from their psychosocial perspective.

Resilience as a second-order variable had an inverse influence on guilt, with a regression coefficient of −0.27, explaining approximately 0.07 % of its variance. This decrease, although small, was significant from a psychosocial perspective. However, from a statistical perspective, it should disappear from the SEM model because it has an explanation of its variance of less than 10%.

Resilience as a second-order psychological variable, integrating subscales such as AdyRedSupport, control, self-control, and persistence, could help students to face life problems experienced during the pandemic of the COVID-19. Through resilience, they increased enthusiasm to study and decreased psychological exhaustion, indolence, and even guilt. In the analysis of the statistically significant differences between males and females, the following was found.

Men reported a higher average score compared to women on the AdyReSupport subscale. Also, men reported a higher average score compared to women in the control subscale. In the significance control subscale, men reported a higher average score than women. We found no significant differences when comparing persistence, tenacity, and self-efficacy between men and women. In the enthusiasm to study, women reported a significantly higher average score than men. In psychological exhaustion, women reported a significantly higher mean score than men. For the indolence subscale, women reported a significantly higher mean score compared to men.

Limitations to This Research

Surprising results were shown when numerous students were answering so quickly the questionnaire. They were asking for help, as well, since they felt scared and alone copying with the pandemic's uncertainty. Unfortunately, we were unable to offer intervention in this first stage of the study. Recommendations were made to the faculties to pay special attention to students asking for help during this period. One limitation was to have transversal research in one moment of time only, not being able to compare the evolution of burnout and resilience at different moments of this pandemic.

Implications and Opportunities for Further Research

The current context of the COVID-19 pandemic opens several areas of research focused on adaptative mechanisms that students are learning. It is important to compare the resilience that students have developed as part of their adaptation and how these variable impact in their copying mechanisms and their general response to this pandemic. Also, a second application of the instrument is recommended to compare the evolution of the variables thru time. In regard to the spirituality lack of significance in this research, it is important to note that it does not necessarily negate the importance of that subscale in the context of study, spirituality should be a relevant and significant factor in Mexico; however, its significance might not have been observed within the specific parameters of the CD-RISK model; thus, we recommend to add an additional instrument in future studies to assess the spirituality.

Conclusions

The attainment of our study's objective in evaluating the impact of resilience subscales on burnout syndrome subscales has led to several significant conclusions. These findings underscore the critical need for targeted interventions aimed at different student groups, particularly those considered vulnerable, to cultivate effective coping mechanisms and bolster higher levels of resilience.

The identified vulnerable student groups should be a priority for institutions to provide tailored support, equipping them with the necessary tools to navigate the challenges posed by the pandemic and its associated uncertainties. By focusing on enhancing resilience, these interventions can empower students to develop a robust ability to adapt and overcome the adversities brought about by the pandemic, thus promoting their overall well-being.

Moreover, faculties play a pivotal role in recognizing and assisting students grappling with elevated levels of burnout syndrome. Initiatives should be implemented to identify these students individually, helping them harness their enthusiasm to study while mitigating the adverse effects of psychological exhaustion. It is paramount that faculty members are not only attuned to these challenges but are also equipped with resources to provide empathetic support and guidance to foster a conducive learning environment.

In this context, professors are well-positioned to offer essential social support and guidance to students who exhibit lower levels of resilience and higher degrees of burnout. By nurturing a sense of belonging and facilitating open discussions, educators can contribute significantly to alleviating stress and promoting a more positive and resilient mindset.

In conclusion, our study highlights the importance of multifaceted interventions tailored to different student profiles, emphasizing resilience-building strategies and targeted support for those facing elevated burnout levels. This approach acknowledges the diverse needs of students in the face of uncertainty and acknowledges the pivotal role that educational institutions and faculty members play in fostering an environment conducive to growth, well-being, and academic success.

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Data Availability The data presented in this study are available upon request

Declarations

Ethics Approval The study was conducted according to the guidelines of the Declaration of Helsinki. The final questionnaire was presented to the Ethics and Bioethics Commission of the Universidad Autonoma de Baja California for its evaluation and authorization.

Consent to Participate Informed consent was obtained from all subjects involved in the study.

Conflicts of Interest The authors declare no competing interests.

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