



Psicología Educativa. Revista de los
Psicólogos de la Educación

ISSN: 2174-0550

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Colegio Oficial de Psicólogos de Madrid
España

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Psicología Educativa. Revista de los Psicólogos de la Educación, vol. 20, núm. 1, 2014,
pp. 47-52

Colegio Oficial de Psicólogos de Madrid
Madrid, España

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Psicología Educativa

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Academic stress as a predictor of chronic stress in university students

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ARTICLE INFORMATION

Manuscript received: 12/11/2013

Revision received: 21/02/2014

Accepted: 26/03/2014

Keywords:

Academic stress

Chronic stress

College students

Logistic regression

ABSTRACT

The aim of this study was to examine the correlation and predictive value between the Academic Stress Inventory (ASI) and the Stress Symptom Inventory (SSI) in university students and its association with age and gender in both inventories. We evaluated a representative and random sample of 527 students at a public university in 2012. A multiple regression analysis was carried out. The results showed that IEA situations that correspond to classroom intervention, mandatory work, and doing an exam predict high-level chronic stress; being a female and 18, 23, and 25 years old were associated mostly to stress. We conclude that accurate identification of stressors could help understand stress and its harmful effects on college students.

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El estrés académico como predictor del estrés crónico en estudiantes universitarios

RESUMEN

El objetivo de este estudio fue examinar la correlación y el valor predictivo entre el Inventario de Estrés Académico (IEA) y el Inventario de Síntomas de Estrés (ISE) en estudiantes universitarios, así como su asociación con la edad y género en ambos inventarios. Se evaluó una muestra representativa y aleatoria de 527 estudiantes de una universidad pública en el año 2012. Se usó análisis de regresión múltiple. Los resultados mostraron que las situaciones del IEA que corresponden a intervención en clase, trabajos obligatorios y la realización de un examen predicen un nivel elevado de estrés crónico; el género femenino y las edades de 18, 23 y 25 años se asociaron mayormente con el estrés. Se concluye que la identificación exacta de estresores podría ayudar a entender el estrés y sus efectos dañinos en estudiantes universitarios.

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Stress is considered to be a physiological reaction of an organism where diverse defense mechanisms come into play in order to confront a situation which is perceived as threatening or of increased demand. Under the “cognitive-transactional model”, psychological stress according to Lazarus and Folkman (1986, p. 63) is defined as “a particular relationship between the individual and his surroundings which is judged by him to be threatening or to overwhelm his resources and which puts his well being at risk”. Specifically, facing the typical problems which may be present for students in their academic environment, stress may be a natural and necessary reaction for survival in these areas, where different factors are involved including academic overload, group projects,

competitiveness, lack of technological resources, lack of supervision, or insufficient organization of time which produces what is called chronic stress. (Tapia, Guajardo, & Quintanilla, 2008)

The symptoms of academic stress result in a particularly worrisome health concern. Not only adults are at risk for stress, the demands of modern life, even during grade school, have caused the appearance of this malady more and more frequently in children and teens, in which both endogenous and exogenous demands interact to negatively influence the academic performance and achievement of the students. (e.g., Caldera, Pulido, & Martínez, 2007; Segredo, Veloso, & Rodríguez, 2004). Specialized literature indicates that academic stress has been studied in diverse university circles (Aselton, 2012; Berrío & Mazo, 2011), developing different focuses and models. One study analyzed the potential explanatory-predictive effect of daily stress on somatic symptomatology of neuroticism (Santed, Sandín, Chorón, & Olmedo 2000). Another study performed in Mexico by Preciado-Serrano and Vázquez-Goñi in 2010 explores

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the relationship between the *stress profile* and *burnout* in Mexican university students, using a statistical regression model in which the existence of a significant correlation is reported. Other studies are directly related to perception, life events and school activities (e.g., Díaz, 2010; Matheny, Roque-Tovar, & Curlette, 2008; Pulido et al., 2011; Román, Ortiz, & Hernández, 2008), as well as academic strategies and school performance (e.g., Broc & Gil, 2008; Caldera, et al., 2007; Díaz, 2010; Martínez, 2010; Sohail, 2013). These studies conclude that timely evaluations favor the application of efficient interventions in order to lower the stress levels, lower the associated worrisome thoughts and prevent the deterioration of performance of the students (Caldera, et al., 2007).

Based on these conclusions, the objective of this study was to examine the correlation predictive value of the Academic Stress Inventory (ASI) over the Stress Symptoms Inventory (SSI) in university students, as well as their association with age and gender in both inventories.

It is appropriate to mention on one hand that in the bibliographic research no predictive studies reporting the relationship between ASI and SSI were discovered, and particularly studies related to university students. Therefore, this study is considered groundbreaking in the exploration of this relationship.

On the other hand, because the symptoms associated with stress are present in a high percentage of the population of Mexico, this study is important in order to support evidence for the transactional theory of stress and its negative manifestations in academic fields. We hope that in the near future models can be constructed to explain the role of the situations and components of academic stress in order to be able to predict the presence of chronic stress.

The present study has as its purpose to prove the following hypothesis: the ASI situations (test taking, oral presentations, classroom participation, seeking help from tutors, academic overload, overly large class size, lack of time, obligatory assignments, homework, group projects, and competition among students) are predictive of a high level of chronic stress (SSI) and are associated to age and gender of university students.

Method

Sample and Procedure

A cross-sectional and analytical study was performed during the 2012 school year with university students with physical education and sports majors from a public university in Guadalajara, Mexico. Total enrollment was 976 students (63% men and 37% women) from which a simple random selection with an expected prevalence of 64.5% (Marty, Lavín, Figueroa, Larraín, & Cruz, 2005), a 70% accepted minimum frequency and with 99% precision (Lwanga & Lameshow, 1991), which produced 527 individual interviews of university students.

The selection of this university population was carried out by random and proportional numbers, taking into consideration gender and scholastic cycles. The list of students registered for the 2012 school year was used to select those who would voluntarily answer the surveys under an informed consent status. The investigative protocol and informed consent form were reviewed and approved with reference number IISO/CI/11/2012-2013 in adherence to the Helsinki Declaration of 2008 in terms of the ethics of investigation of human beings.

Measures

The *Academic Stress Inventory* was used (ASI; Polo, Hernández, & Pozo, 1999) validated by the Spanish Society of Anxiety and Stress. This is a questionnaire with eleven situations which were considered potential stress generators in students in the academic arena. Each

one of the situations offers a scaled answer of 5 points (1 no stress, 5 high stress) where each participant gives a value according to his or her perception of whether or not it produces stress.

The eleven situations considered to be potential stress generators are: test taking (EA1), oral presentations (EA2), class participation (EA3), seeking help from tutors (EA4), academic overload (EA5), overly large class size (EA6), lack of time (EA7), obligatory assignment (EA8), homework (EA9), group projects (EA10), and competition among classmates (EA11). The reliability in terms of internal consistency corresponds to an alpha coefficient by Cronbach of .90, which is considered satisfactory. In order to establish association, the score is converted from ordinal values into a cardinal level of academic stress in the following way: if the value was 1–2 it was considered low level; a value of 3, moderate level; and between 4–5, high level.

The *Stress Symptom Inventory* (SSI), a questionnaire which was developed and approved by Lipp and Guevara (1994), contains a list of 42 psycho-physiological symptoms characteristic of chronic stress which is based on a three phase model developed by Selye (alarm, resistance, and exhaustion). In 1988, Dominguez adapted it for use in Mexico by means of a content validation and reported an alpha internal consistency rating by Cronbach of .94, which indicates an acceptable degree of reliability. The classification of high, moderate, and low levels of chronic stress was carried out by mean and standard deviation (SD). Furthermore, high level is considered two and three SD above mean, medium level ± 1 SD and low level stress 2 and 3 SD below mean (Pozos-Radillo, Torres, Aguilera, Acosta, & González, 2008). Variables gender and age (in five year increments) are also presented.

Data Analysis

Pearson's analysis of correlation was used to pinpoint the information about the predictive value and, in order to determine the validity of the measurements obtained, we carried out an analysis of regression *by steps* for the ASI and SSI by simultaneously introducing the equation of measurement to the level of significance ($p < .05$). In these analyses, the variables appear in order in the equation according to the percentage of the explained variance.

Afterwards, a hierarchical analysis of multiple regression was applied to determine the predictive value of the situations of the ASI in which the *Introduce* method was used with the ASI situations. With this procedure, an incremental value of prediction of the variable included in third place (ASI) was obtained, once the effect of the second and the first was controlled.

In order to explore the statistically significant difference of gender and age in chronic stress (SSI), as it relates to academic stress situations (ASI), the bi-variant associations were tracked through an analysis of the contingency charts. In these contingency charts the categories of the ASI and SSI (high, moderate and low) were evaluated and were transformed into dichotomies, with values of "0" or "1"; a high level rating was considered as risk. In order to carry out the association of risk calculation the Odds Ratio (OR) was estimated with a CI of 95% and a level of significance of $p < .05$. The data was tabulated and processed using SPSS (Statistical Package for Social Sciences), Version 15 for Windows XP, with university license.

Results

Descriptive Statistics and Correlations

In order to carry out this study, 527 students from a public university were interviewed, of whom 311 (59%) were women and 216 (41%) men; the age range was 18–33 years with an average age of 21.07 (± 1.80) years. The descriptive analysis of the SSI, according to the levels present, showed that 35.3% (186) of the students showed a

high level of chronic stress, 44.8% (236) moderate levels, and 19.9% (105) low levels. After the analysis of the situations of the ASI, 32.8% (173) showed high levels of stress when taking a test; 25.4% (134) from competitiveness among classmates; 18.6% (98) from lack of time; 18% (95) from oral presentations; 17.8% (94) from overly large class size; 17.5% (82) from seeking help from tutors; 17.1% (90) from homework; 16.7% (88) from obligatory assignments; 15.9% (84) from group projects; and 15.5% (82) from class participation, academic overload or both. The breakdown and description of this data, according to gender, is shown in Table 1; the age distribution is shown in Table 2.

Predictive Value of the ASI as it relates to the SSI

Table 3 indicates the correlations between the SSI scores and the ASI situations. The analysis reveals that the positive correlations, which indicated a moderate strength, were situation EA3 ($r = .63$, $p < .01$), followed by EA8 ($r = .49$, $p < .01$); the situation EA1 showed a weak correlation ($r = .21$, $p < .01$). Other situations presented a non-significant correlation with r less than .20: $r = .12$ for EA2, $r = .13$ for EA4, $r = .16$ for EA5, $r = .14$ for EA6, $r = .11$ for EA7, $r = .10$ for EA9, $r = .16$ for EA10. Situation EA11 yielded $r = .01$, which was considered a very low correlation and was therefore not included.

The correlation coefficient obtained by analysis of chronic stress through regression by steps, initially revealed that the situations of classroom participation (EA3), obligatory homework (EA8), and test taking (EA1) met the predictive criteria with a significant value ($R^2 = .26$, $F = 13.3$, $p < .05$). The EA3 situation presented a stronger correlation according to the adjusted R^2 ; in the first model, the last situation had a 21% SSI prediction, with an $F = 25.2$ and a $p < .05$. Nevertheless, when EA8 and EA1 situations were introduced the prediction only increased by 5%. The rest of the situations were excluded because they had either an insignificant or a negative correlation. The results showed a significant increase in the explanation of the ASI and SSI, as appraised by the university students. When the EA3 equation was introduced the additional predictive value related to the situations EA8 ($p < .01$) and EA1 ($p < .05$), as reported in Table 4.

Analysis of Association for the ASI and SSI with Age and Gender

In the exploration to determine the association between high levels of the SSI and the ASI situations, with the variable of gender and age (Table 5) it was found that the high level of chronic stress (SSI) was related by means of the OR with the feminine gender variables ($OR = 1.47$) and with the age of 25 years ($OR = 6.3$) The

Table 1

Distribution of chronic stress levels according to the levels of academic stress situations and gender of college students at a public university, Guadalajara, Mexico, 2012

		Chronic stress levels					
		High		Medium		Low	
		Gender		Gender		Gender	
Academic stress situations	Levels	Fem	Mal	Fem	Mal	Fem	Mal
		Fx	Fx	Fx	Fx	Fx	Fx
(EA1) Realization test	High	46	26	47	24	20	10
	Medium	50	19	40	35	21	16
	Low	25	20	42	48	20	18
(EA2) Exhibition jobs	High	32	10	32	10	5	6
	Medium	51	28	49	45	31	10
	Low	38	27	48	52	25	28
(EA3) Intervention in class	High	21	19	26	11	3	2
	Medium	41	18	46	39	9	9
	Low	59	28	57	57	49	33
(EA4) Attend tutorials	High	30	8	26	21	6	1
	Medium	32	25	40	34	13	14
	Low	59	32	63	52	42	29
(EA5) Academic Overload	High	23	15	26	11	5	2
	Medium	38	21	32	31	16	12
	Low	60	29	71	65	40	30
(EA6) Overcrowding in the classroom	High	29	10	26	19	7	3
	Medium	38	28	26	30	16	13
	Low	54	27	77	58	38	28
(EA7) Lack of time	High	27	12	29	19	6	5
	Medium	37	27	40	34	21	11
	Low	57	26	60	54	34	28
(EA8) Jobs mandatory	High	33	7	22	19	6	1
	Medium	37	20	41	39	10	11
	Low	51	38	66	49	45	32
(EA9) Tasks study	High	23	14	35	9	9	0
	Medium	38	17	26	27	17	14
	Low	60	34	68	71	35	30
(EA10) Work group	High	28	18	22	7	7	2
	Medium	27	8	29	24	10	8
	Low	66	39	78	76	44	34
(EA11) Competitiveness between mates	High	26	22	40	26	13	7
	Medium	38	18	42	31	26	23
	Low	57	25	47	50	22	14

Note. Post. Questionnaire data SSI and ASI, Fem = female, Mal = male.

Table 2

Distribution of high levels of chronic stress and academic stress according to the age of college students at a public university. Guadalajara, Mexico, 2012

High level of academic stress situations	Age	High levels of chronic stress					
		Age 18 -21		Age 22 - 25		Age 26 y +	
		Fx	%	Fx	%	Fx	%
(EA1)	18 - 21	44	8.3	34	6.5	17	3.2
Realization	22 - 25	28	5.3	37	7.0	13	2.5
test	26 y +	0	0	0	0	0	0
(EA2)	18 - 21	22	4.2	23	4.4	8	1.5
Exhibition jobs	22 - 25	16	3.0	19	3.6	3	0.6
	26 y +	1	0.2	0	0	0	0
(EA3)	18 - 21	33	6.3	23	4.4	3	0.6
Intervention in class	22 - 25	7	1.3	14	2.7	2	0.4
	26 y +	0	0	0	0	0	0
(EA4)	18 - 21	27	5.1	26	4.9	5	0.9
Attend tutorials	22 - 25	11	2.1	20	3.8	2	0.4
	26 y +	0	0	1	0.2	0	0
(EA5)	18 - 21	29	5.5	22	4.2	5	0.9
Academic	22 - 25	9	1.7	15	2.8	2	0.4
overload	26 y +	0	0	0	0	0	0
(EA6)	18 - 21	25	4.7	29	5.5	7	1.3
Overcrowding in	22 - 25	14	2.6	16	3.0	3	0.6
the classroom	26 y +	0	0	0	0	0	0
(EA7)	18 - 21	28	5.3	28	5.4	9	1.7
Lack of time	22 - 25	11	2.1	19	3.6	2	0.4
	26 y +	0	0	1	0.2	0	0
(EA8)	18 - 21	28	5.3	25	4.7	5	0.9
Jobs mandatory	22 - 25	12	2.3	15	2.8	2	0.4
	26 y +	0	0	1	0.2	0	0
(EA9)	18 - 21	28	5.3	26	4.9	8	1.5
Tasks study	22 - 25	9	1.7	18	3.4	1	0.2
	26 y +	0	0	0	0	0	0
(EA10)	18 - 21	36	6.8	16	3.0	5	0.9
Work group	22 - 25	10	1.9	13	2.5	4	0.8
	26 y +	0	0	0	0	0	0
(EA11)	18 - 21	38	7.2	33	6.3	14	2.7
Competitiveness	22 - 25	10	1.9	30	5.7	5	0.9
between mates	26 y +	0	0	1	0.2	1	0.2

Note. Post. Questionnaire data SSI and ASI.

Table 3

Matrix of correlations between the scores on college students to the Stress Symptom Inventory (SSI) and the Academic Stress Inventory (ASI)

	ISE	EA1	EA2	EA3	EA4	EA5	EA6	EA7	EA8	EA9	EA10	EA11
ISE	---											
EA1	.21**	---										
EA2	.12**	.38**	---									
EA3	.63**	-.30	-.14	---								
EA4	.13**	.08*	.14**	.35**	---							
EA5	.16**	.01	.17**	.40**	.29**	---						
EA6	.14**	.02	.10**	.38**	.46**	.22**	---					
EA7	.11**	.08*	.15**	.33**	.31**	.37**	.25**	---				
EA8	.49*	.06	.09	.05	1.00**	.74**	1.00**	.74**	---			
EA9	.10**	-.00	.19**	.41**	.29**	.38**	.32**	.39**	.43**	---		
EA10	.16**	.05	.06	.33**	.29**	.29**	.34**	.26**	.34**	.43**	---	
EA11	-.01**	.11**	.08*	.14**	.08*	.19**	.10*	.10**	.18**	.16**	.20**	---

Note. SSI = chronic stress, EA1 = conducting test, EA2 = exhibition of works, EA3 = classroom intervention, EA4 = Attend tutorials, EA5 = academic overload, EA6 = overcrowding in the classroom, EA7 = lack of time, EA8 = compulsory labor, EA9 = study tasks, EA10 = workgroups, EA11 = competition among peers.

* $p < .05$, ** $p < .01$.

Table 4

Hierarchical multiple regression analysis of SSI (Stress Symptom Inventory) on each of the academic stress situations ASI (Academic Stress Inventory)

ISE	Beta	ET	(p)	R ²	F
Model 1				.21**	25.2
EA3	.21	.04	< .01		
Model 2				.24**	16.9
EA3	.18	.04	< .01		
EA8	.12	.04	< .01		
Model 3				.26*	13.3
EA3	.17	.04	< .01		
EA8	.12	.04	< .01		
EA1	.10	.03	< .05		

Note. Questionnaire Data SSI and ASI, EA3 = classroom intervention, EA8 = compulsory labor, EA1 = conducting test.

* $p < .05$, ** $p < .01$.

academic stress situations (ASI) that were found to have a significant association were EA1 with feminine gender ($OR = 1.48$) and with the age of 23 ($OR = 2.09$); for EA3 the association was established with the age of 18 ($OR = 2.89$) and for EA8 only the feminine gender was significant with an $OR = 1.70$. The other situations did not show any significance with the variables of age and gender.

Table 5

Association between high levels of chronic stress (SSI) and academic stress (ASI) in relation to age and gender of university students from a public university in Guadalajara, Mexico

Variables	High level	p	OR	CI (95%)
SSI (Chronic stress)				
Gender female	125	.03*	1.47	1.02 - 2.14
Age 25 years	8	.00**	5.06	1.32 - 19.32
ASI (Academic Stress)				
EA1				
Gender female	113	.04*	1.48	1.01 - 2.16
Age 23 years	29	.00**	2.09	1.21 - 3.61
EA3				
Age 18 years	16	.01*	2.18	1.19 - 7.01
EA8				
Gender female	61	.03*	1.70	1.04 - 2.79

Note. Questionnaire Data SSI and ASI, EA3 = classroom intervention, EA8 = compulsory labor, EA1 = conducting test. OR = Odds Ratio, CI = Confidence Interval.

* $p < .05$, ** $p < .01$.

With regard to these analyses, we have made various contrasts relative to the supposed independence, normality, and homoscedasticity. In this sense, we must review the data, which does not show multicollinearity among the predictor variables. The average of the statistical values of “tolerance” carried out for the physical, psychological, and behavioral factors was set at .79, with no value below .71. The proximity of these values and the maximum value (range 0–1) indicates the independence of the contributions of the predictor variables over the values of the eleven academic stress indicators, thereby showing that the variance of the residuals is constant, proving that the residuals were distributed normally. The average of the value ($VIF = 1.24$), with no value below 1.05, shows that there was no a collinearity problem.

Discussion

The study demonstrated that a positive correlation exists between the ASI and some situations of the SSI, including class participation, obligatory homework and test taking. The ratings show a dependency among the variables, that is, when one increases the other does as well in constant proportion. These results permit us to validate our hypothesis. To our knowledge, this is the first predictive study which identifies the existence of a relationship between the situations which make up the ASI with the level of SSI in university students. The resulting model of this investigation helps to confirm the transactional theory of *social cognitive* focus, where the interaction of the stress variables was emphasized, based on the cognitive processes which developed around a stressful situation as the internal representation of the evaluations which are peculiar to and problematic for the students and their academic environment.

Studies about stress (e.g., Arreola-Quiroz & Stucchi, 2010; Matheny et al., 2008; Silva, 2009) mention that Mexico is considered among the countries with elevated stress levels. In the United States, 70% of medical visits are for problems which are caused by stress, and a quarter of the medications which are sold in that country are antidepressants or other types of drugs which affect the central nervous system (Aselton, 2012; Cox & Mackay, 1981). Regarding academic stress, previous studies have proven that stress is present in educational environments and furthermore that it is more frequent with homework and tests, the lack of time to complete assignments, and not having understood the material (e.g., Díaz, 2010; Pulido et al., 2011; Román et al., 2008). Some factors are the cause of important differences in results such as those related to the different study plans of the educational institution the students attend and which is the objective this study, since the educational model is oriented to professional competence, where not the tests but the students' classroom participation is considered to be the best means of evaluation. Another probable cause for these differences is the variation in the study design, most importantly those who were involved in other situations which tackled the issues differently, and the tendency of the students to have poor academic achievement (e.g., Broc & Gil, 2008; Caldera et al. 2007; Celis et al., 2001; Díaz, 2010; Martínez, 2010; Navea, 2012; Sohail, 2013).

In our study we also observed a significant association according to the OR between the levels of chronic and academic stress (EA1 and EA8) in women as compared to those of men, which therefore implies that closer attention should be given to this population of students. In other studies it has been found that the feminine gender present a higher risk of stress (e.g., Costarelli & Patsai, 2012; Leiner & Jiménez, 2011; Pozos et al., 2008; Pulido et al., 2011). In terms of age, it was found that a relationship exists between a high chronic stress level and 25 years of age; furthermore, for a high level of academic stress, a significant association was found between situation EA1 and 23 years of age, and between situation EA3 and 18 years of age. Other studies differ with these results, indicating that 21-year-old students are at an increased risk for stress (e.g., Leiner & Jiménez, 2011; López & López, 2011). The difference between these authors and the work presented here stems from the fact that the association between the situations was more specific both for chronic stress as well as for the different situations of academic stress. Nevertheless, the average age in this study was 21 years. The age range which showed significant association was 18–25 years. Also, it was discovered that there is a higher frequency of moderate levels of chronic stress, with a difference of 9.5% over high levels, which should be considered an alarming situation. The instrument used (SSI) is based on symptomatic evidence, which thereby shows that if no intervention strategy to reduce stress levels from moderate to low is put into place, these rates could elevate to high levels at any moment, putting health and academic performance at risk. This could result in low scholastic achievement or desertion by the students.

This study has among its strengths the large and representative sampling of students. In this sample 54% of total enrollment for physical education and sports majors of this university were interviewed. This includes more students than other studies concerning academic stress (e.g., Díaz, 2010; Pulido et al., 2011; Román et al., 2008). It is likewise important to mention the limitations of this study, which lie principally in the existence of other factors which could have an influence on chronic and academic stress at the time the survey was taken, such as the social, economic, and cultural characteristics which were not evaluated in this study.

In conclusion, our study determined that only the following situations of the *Academic Stress Inventory* (ASI), class participation, obligatory assignments and test taking, are predictive of the *Symptoms of Stress Inventory* (chronic stress). Twenty-five-year-old women are at an increased risk to develop high levels of chronic stress; also, the 23-year-old female has a higher risk of developing high levels of academic stress during test taking and for obligatory assignments. Eighteen-year-old students are at higher risk to develop high levels of academic stress when faced with class participation in comparison to males and other ages.

With these results, our work hypothesis is accepted: a positive relationship of the ASI and the SSI has been determined. A model of predictive variables such as the association of the variables of 25 and 23 years of age, the female gender having an increased risk of developing high levels of chronic stress (SSI), and of the situations EA1, EA3, and EA8 of academic stress ASI, has been established. The exact identification of the stressors could help reduce and understand the stress, thereby eliminating the harm they cause, which negatively affects the academic performance of the students. Therefore the implementation of educational programs oriented towards the prevention of stress and its negative effects is recommended in order to further the capacity of the students to withstand stressful situations.

Conflict of interest

The authors of this article declare no conflict of interest.

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