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The association between perceived health symptoms and academic stress in Spanish Higher Education students

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University life can be associated to mental and emotional pressure. The aim of this research was to explore if the perception of the academic context as stressful can be associated to health symptoms (physical and mental) in higher education students enrolled in different degrees. Method. 728 students were recruited from a Spanish university. An academic stressors questionnaire (E-CEA) and response to the stress questionnaire (R-CEA) were used to assess academic stress and health symptoms. We conducted a t-test, Pearson correlation test and hierarchical multiple regression analysis. Results. Academic stress is moderate correlated to health symptoms ($r \geq .40$ in all cases). Specifically, academic stress reported by students is positively associated to physical exhaustion ($r=.533$; $p<.001$), sleeping disorders ($r=.429$; $p<.001$), irascibility ($r=.467$; $p<.001$), negative thoughts ($r=.558$; $p<.001$) and feeling nervous ($r=.474$; $p<.001$). Significant differences in E-CEA and R-CEA were found for age and major ($p \leq .001$). We observed a model which accounted for 40.3% of the variance of health symptoms reported by students, being academic stress the strongest predictive variable. Conclusions. The results from this study support the assumption that academic stress has a negative impact on college students' health.

Key words: Academic stress, community health, student development, higher education and educational policies.

Asociación entre la salud percibida y el estrés académico en estudiantes universitarios españoles. El propósito de este estudio es analizar si la percepción del ámbito universitario como estresante puede asociarse con la salud percibida en estudiantes universitarios. Método. 728 alumnos de una universidad española participan en el estudio. Como herramienta de medida se utiliza el Cuestionario de Estrés Académico (CEA), concretamente las subescalas de estresores académicos (E-CEA) y respuestas al estrés (R-CEA). Se lleva a cabo una comparación de medias (T-test), un análisis de correlaciones estadísticas y un análisis de regresión múltiple. Resultados. Se observa una correlación estadística moderada entre todos los estresores y síntomas de estrés ($r \geq .40$). Concretamente, el estrés académico percibido se correlaciona de forma positiva con los síntomas de cansancio físico ($r=.533$; $p<.001$), dificultades con el sueño ($r=.429$; $p<.001$), irascibilidad ($r=.467$; $p<.001$), pensamientos negativos ($r=.558$; $p<.001$) y nerviosismo ($r=.474$; $p<.001$). Se ha observado diferencias significativas entre los grupos de distinta edad y grado universitario ($p \leq .001$). Se expone un modelo estadístico que explica el 40.3% de la varianza de los síntomas físicos y psicológicos. Conclusiones. La percepción de estrés académico en el ámbito universitario repercute negativamente en el bienestar físico y mental de los estudiantes universitarios.

Palabras clave: Estrés académico, salud comunitaria, Universidad y políticas educativas.

University life has often been recognized as a stressful period in one's life (Bhandari, 2012) associated to mental and emotional pressure (Lin & Huang, 2013). Tertiary education students usually have to cope with a variety of academic, social and personal challenges during their university life (Lin & Huang, 2013). Among the main sources of stress which have been reported by college students, those related to academic assessment can be highlighted (Conley & Lehman, 2012; Ekpenyong, Nyebuk, & Aribio, 2013) but there are also situations concerning day-to-day topics such as transport, academic overload or unpleasant behaviour by the staff (Evans & Nelly, 2004; Feldman, Goncalves, Chacón-Puignau, Zaragoza, & Pablo, 2008; Ryan, 2009). Conflicts and pressures have been also identified among the mayor causes of academic stress (Poon, Lee, & Ong, 2012).

In the last decade, research concerning academic stressors, variables related to stress perception and academic implications has become an interesting topic of research in Spain. These previous research suggest that public interventions, exams, methodological teachers' deficiencies and students overload seem to be the main issues perceived as academic stressors by Sapanish Higher Education students (Bailles-Lazaro, 2009; Cabanach, Souto, Freire, & Ferradás, 2014; Casuso-Holgado, 2011; Franco-Taboada, 2015; González-Cabanach, Fernández-Cervantes, González-Doniz, & Freire-Rodríguez, 2010; González-Doniz, 2008; Pacheco-Castillo, 2017; Romero-Marin, 2009; Souto-Gestal, 2014).

Furthermore, self-esteem, sense of personal effectiveness and high emotional clarity have been highlighted as protective variables in the perception of academic stress in Spanish college students (Cabanach, Valle, Rodríguez, Piñeiro & González, 2010; Cabanach et al., 2014; González-Cabanach, Souto-Gestal, González-Doniz, & Souto-Camba, 2016; González-Cabanach, Souto-Gestal & Fernández-Cervantes, 2017) differences in the relationships between orientation to academic goals and stressors perception, stress response and copy strategies have been also observed in this population (González-Cabanach, Franco-Taboada, Souto-Gestal, & González-Doniz, 2017; González Cabanach, Rodríguez-Martínez, Valle-Arias, Piñeiro-Aguín, & Millán, 2008).

In his theoretical research about academic stress, Putwain (2007) suggested that there was considerable future research about stress in the educational context, particularly focusing on its potential role in detrimental health, educational and emotional outcomes. Since then, most of the research on this topic has focused on health sciences university students, that is, in care professions. In this way, the possibility of experiencing considerable amounts of stress affecting college students' physical and mental functioning have been mainly reported in medical (Eva et al., 2015; Gupta, Choudhury, Das, Mondol, & Pradhan, 2015; Punita, Saranya, Chandrasekar, & Kumar, 2016; Saxena, Shrivastava, & Singhi, 2014), nursing (Xu et al., 2014) or

dentistry students (Nafarzadeh, Hajiahmadi, Moudi, & Mosaferi, 2014; Ravishankar, Ain, & Gowhar, 2014). Nowadays, there is still a lack of research concerning academic stress and its impact in students' well-being of other areas of knowledge as engineering degrees.

The purpose of this research was to explore and compare whether the perception of the academic context as stressful can be associated to health symptoms (physical and mental) in Spanish higher education students enrolled in different majors. As we know, this is the first research aiming to determine a predictive health symptoms model.

METHOD

Design

Cross-sectional self-administered questionnaire survey.

Participants

We used a convenience sample and tried to recruit all participants ($n=1705$) by approaching them in class and asking them to complete the online survey. The response rate was 46.74% ($n=797$). A total of 8.65% of the surveys were removed from the sample due to missing data, so the final sample was composed of 728 participants.

The inclusion criteria were: college students enrolled in health sciences or engineering studies at the University of Malaga (Spain). Participation was voluntary. Written informed consent was obtained from the students in accordance with the Helsinki Declaration (2000 modification). This study had ethical approval from the Research Ethics Committee of the two centres where it was conducted.

Measures

General sociodemographic characteristics. General demographic information was obtained using a questionnaire designed by the researcher.

Academic stress

An academic stressors questionnaire (E-CEA) was used to assess the perceived academic stressors. E-CEA consists of 54 items marked on a Likert scale of 1 to 5 for each item (never, almost never, sometimes, very often and always, respectively). This scale explores nine different stressful situations: a teacher's methodological deficiencies, academic overload, speaking in public, bad relationships, feeling lack of control over one's own performance, uninteresting subjects, low academic self-esteem, exams, impossibility of taking part in academic decisions.

The total scores range from 9 to 45, with higher scores indicating an academic context perceived as more stressful (Cabanach, Souto-Gestal, & Franco, 2016; Cabanach, Valle, Rodriguez, & Piñeiro, 2008).

Health symptoms

Response to the stress questionnaire (R-CEA) was used to assess physical and mental symptoms related to stress. R-CEA consists of 22 items marked on a Likert scale as explained above. It attempts to register five different symptoms experienced in the last weeks: physical exhaustion, sleeping disorders, irascibility, negative thoughts and feeling nervous. The total scores range from 5 to 25, with higher scores indicating a lack of physical and mental well-being (Cabanach et al., 2008; Cabanach et al., 2016).

Data collection

In April 2015, researchers came up to the different classrooms and explained to the students the aims and procedure of the investigation. They also explained that participation in it was voluntary. In May 2015 an e-mail containing written consent was sent to each student. In cases where they accepted, another e-mail containing sociodemographic variables and E-CEA and R-CEA scales was sent, so it was possible to complete this information during the whole month of May. After this time, the dataset was anonymized further by the encryption of students' civil registration numbers, using new unique identification numbers. The researchers complied fully with established ethical rules.

Data analysis

Statistical analysis was conducted using the SPSS programme (v. 18.0). General characteristics of the sample and the academic stress and physical and mental symptoms scores were analysed using descriptive statistics. E-CEA and R-CEA scores were also compared attending to sociodemographic variables using a t-test. Associations between academic stress and symptoms reported was calculated with Pearson's correlation test. Finally, we conducted hierarchical multiple regression analysis to find possible determinant variables affecting students' physical and mental well-being. The level of significance was set at $p \leq 0.05$; 95% CI.

RESULTS

Firstly, we tested the validity and reliability of E-CEA and R-CEA. We observed Cronbach's alpha to be .96 and .94, respectively, so it can be considered that academic stress and health symptoms were measured using valid and reliable

instruments. General sociodemographic characteristics of the sample can be observed in table 1.

Table 1. General sociodemographic characteristics (n=728)

Variable	n	%
Age 18-30 >30	708 20	97.20 2.80
Gender Male Female	417 311	57.30 42.70
Major Engineering Health Sciences	493 235	67.70 32.30
Course 1° 2°	483 245	66.30 33.70
Accommodation Live with family Others	446 282	61.30 38.70
Financial support Study and work Only study	127 601	17.40 82.60

The mean scores for E-CEA and R-CEA were 24.06 ± 5.53 and 11.74 ± 3.86 respectively. The highest stressful situation value was reported for a teacher's methodological deficiencies and the lowest for bad relationships; in the same way, the highest symptom value reported was physical exhaustion and the lowest sleeping disorders. Comparison of academic stress and health symptoms was made on certain sociodemographic characteristics, namely age, gender, major, course, accommodation and financial support. Significant differences in E-CEA and R-CEA were found for age and major ($p \leq 0.001$). These results can be observed in table 2.

Table 2. Comparison of perceived stress and health-related symptoms based on sociodemographic characterist

Variables	N (%)	Perceived stress			Health-related symptoms		
		Mean \pm SD	t	p	Mean \pm SD	t	p
Age 18-30 >30	708(97.2) 20(2.8)	24.18 \pm 5.44 19.34 \pm 6.94	-3.59	0.000	11.81 \pm 3.84 8.46 \pm 3.70	-3.35	0.001
Gender							
Male Female	417(57.3) 311(42.7)	23.65 \pm 5.48 24.62 \pm 5.56	2.26	0.024	11.81 \pm 3.97 11.63 \pm 3.69	-.611	0.542
Major Engineering Health Sciences	493(67.7) 235(32.3)	24.95 \pm 5.20 21.98 \pm 5.72	-6.45	0.000	12.62 \pm 3.68 9.62 \pm 3.42	-0.26	0.000
Course							
1° 2°	483(66.3) 245(33.7)	24.16 \pm 5.47 23.85 \pm 5.64	0.704	0.482	11.90 \pm 3.83 11.41 \pm 3.89	1.55	0.121
Accommodation							
Live with family Others	446(61.3) 282(38.7)	23.76 \pm 5.58 24.51 \pm 5.42	1.77	0.079	11.52 \pm 3.84 12.08 \pm 3.85	1.86	0.063
Financial support Study and work Only study	127(17.4) 601(82.6)	23.49 \pm 5.70 24.17 \pm 5.49	1.20	0.230	1.77 \pm 3.82 1.73 \pm 3.87	-.107	0.915

Academic stress appears strongly correlated to health symptoms ($r \geq .40$ in all cases). Specifically, academic stress reported by students is positively associated to physical exhaustion ($r = .533$; $p < .001$), sleeping disorders ($r = .429$; $p < .001$), irascibility ($r = .467$; $p < .001$), negative thoughts ($r = .558$; $p < .001$) and feeling nervous ($r = .474$; $p < .001$). The correlation matrix is shown in table 3.

Table 3. Correlations between academic stress and health related symptoms

	1	2	3	4	5	6
1 Physical exhaustion						
2 Sleeping disorders	0.558**					
3 Irrascibility	0.533**	0.627**				
4 Negative thoughts	0.605**	0.636**	0.695**			
5 Feeling nervous	0.612**	0.778**	0.771**	0.711**		
6 Academic stress	0.533**	0.429**	0.467**	0.558**	0.474**	

Note. ** $p < 0.001$

Finally, we conducted hierarchical multiple regression analysis to identify predictor variables of health symptoms. The predictor variables used for the model were put into four blocks (models); first block: biological variables (age and gender); second block: academic variables (course and major); third block: social variables (accommodation and support) and finally fourth block: academic perceived stress.

With the R-CEA as outcome variable, the first model accounted only for 1.5% of the variance.

The addition of the variables major and course in the second model caused an increase of 14.8% in the variance ($p < .001$). Type of accommodation and financial support were added in the third model, but it could not be said that any additional variance was explained by these two variables. Finally, academic perceived stress was added in the fourth block, which accounted for an additional 23.9% of the variance in the R-CEA ($p < .001$). The final model accounted for 40.3% of the variance of health symptoms reported by students.

The result of the hierarchical regression analysis is displayed in table 4.

Table 4a. Hierarchical regression analysis for variables predicting health symptoms

Variables	MODEL 1			MODEL 2		
	B	SE	β	B	SE	β
		B			B	
Age	-0.163	0.051	-0.122**	-0.021	0.049	-0.015
Gender	0.074	0.298	0.009	-1.51	0.312	-0.193**
Major				3.82	0.35	0.452**
Course				-0.737	0.289	-0.09*
Accommodation						
Financial support						
Academic stress						
R ²	0.015			0.163		
F for change in R ² (df)	5.29 (3.83)*			60.59 (3.54)**		

Note. * $p < .05$ ** $p < .001$

Table 4b. Hierarchical regression analysis for variables predicting health symptoms

Variables	MODEL 3			MODEL 4		
	B	SE	β	B	SE	β
Age	-0.034	0.051	-0.025	-0.009	0.043	-0.006
Gender	-1.520	0.313	0.194**	-0.450	0.272	-0.058
Major	3.785	0.354	0.448**	2.207	0.314	0.261**
Course	-0.730	0.291	-0.089*	-0.548	0.246	-0.067*
Accommodation	-0.175	0.283	-0.022	-0.001	0.240	0.000
Financial support	0.287	0.373	0.028	0.388	0.315	0.038
Academic stress				0.363	0.022	0.520**
R ²	0.164			0.403		
F for change in R ² (df)	0.545 (3.54)			272.47 (2.99)**		

Note. * $p < .05$ ** $p < .001$

DISCUSSION

Attending to the descriptive data, the E-CEA and R-CEA scores allow us to affirm that the sample of higher education students analysed perceives the academic context as moderately stressful, and in the same way they report moderate health symptoms. Some methodological considerations need to be taken into consideration when we compare our results with previous findings. As Putwain (2007) concluded in his research, there is a lack of precision in terminology used and terms such as academic stress, anxiety or worry are used synonymously by researchers; in the same way, there are plenty of instruments trying to quantify this phenomenon. For these reasons, comparisons with previous findings are more relevant when compare with previous research based on E-CEA and R-CEA tools. Similar perception of academic stressors was reported in Health Sciences students (Casuso-Holgado, 2011; Cuartero-Monteagudo, 2017; González-Cabanach et al., 2010; González-Doniz, 2008; Pacheco-Castillo, 2017). As in our case, physical exhaustion was the highest symptom value reported in Physiotherapy (Souto-Gestal, 2014), Health Sciences (Casuso-Holgado, 2011), Nursing (Pacheco-Castillo, 2017) and Social Sciences students (Franco-Taboada, 2015).

However, when compare with other stress measurements a similar medium-high level of academic stress was observed by Pozos et al. (2014) in a sample of 527 students of physical education and sports majors. Moderate-high levels of stress were also observed in medical students (Saxena et al., 2014). No previous research testing engineering students' academic stress has been found.

Differences pertaining to descriptive variables were tested, grounded in the psychosocial stress model proposed by Lazarus and Folkman (1984), thanks to which we know that stress arises when individuals perceive that they cannot adequately cope with demands. In this way, individual characteristics all contribute to how we respond to a

stressor. Related to academic stress, the freshman condition has been positively associated in the literature with higher levels of stress (Michie, Glachan, & Bray, 2001; Struthers, Perry, & Menec, 2000). Our results are in contrast to these studies because no significant differences were found between students in the first and second year. In a longitudinal five years study, Bailles-Lazaro (2009) concluded that there were no differences in the perception of academic stressors along different courses of Biology, although physical and psychological response to stress were modulated over the years. Maybe, it would be necessary to test students in the final year to report solid conclusions, but, in order to compare results between majors in our study, only students in the first and second year were selected (higher courses didn't exist for engineering at that time). When we explored the influence of the major, significant differences were found. Engineering students reported higher academic stress and health symptom values ($p < .001$).

Among biological variables, gender has been deeply studied. In the present study, differences in the E-CEA and R-CEA scores between male and female participants were not statistically significant. These results are in contrast to some study findings where female gender appeared significantly associated to higher levels of academic stress (Bhandari, 2012; Cabanach et al., 2008; Pozos-Radillo et al., 2014; Saxena et al., 2014), but in agreement to others where no significant association was observed (Huan, Yeo, Ang, & Chong, 2006; Matheny, Roque-Tovar, & Curlette, 2008). Differences in coping strategies between genders have been also reported by the literature. Men use to apply positive reassessment and planning as ways for coping academic stress; by contrast, women tend to use search for support strategy (Cabanach et al., 2013; González-Cabanach, Millán, & Rodríguez, 2009). Different coping strategies could explain different academic stressors perception.

Attending to age, we observed significant differences between groups. Younger students (age < 30 years) reported higher levels of stress and more symptoms in comparison with the older ones. This finding is in concordance with some studies (Pozos-Radillo et al., 2014; Singh & Upadhyay, 2010) but in contrast to the research conducted by Chen et al. (2015), who observed that senior students under the highest level of academic stress had the worst mental and emotional fatigue scores. However, they reported that academic pressure rather than age was the most important factor. Boujut et al. (2009) conducted a longitudinal study in freshman university students trying to analyse variables related to academic stress and concluded that, although the first year in college can be considered as a critical moment for experiencing academic stress, this experience is mainly related to individual and environmental conditions such as personality, family context or coping strategies.

In this sense, links between academic stress and individual variables such as personality hardiness, self-esteem or optimism have been observed (Cabanach,

Souto-Gestal, Freire-Rodríguez, & Ferradás-Canedo, 2014; Huan et al., 2006; Hystad, Eid, Laberg, Johnsen, & Bartone, 2009; Michie et al., 2001; Ni et al., 2010).

As was mentioned previously, the main purpose of this research was to explore whether the perception of the academic context as stressful could be associated to health symptoms in higher education students. Attending to the correlation matrix obtained (table 3), it is possible to say that the perception of the academic context as stressful has a negative influence on a student's health. These findings support previous research such as that conducted by Hystad et al. (2009) who observed that academic stress was positively associated with the reported health complaints of undergraduate students, but it is necessary to highlight that the correlation index was weaker ($r=.27$, $p<.001$) than those observed in our study. Bhandari (2012) also observed that perceived stress reported by Nepalese students had a negative impact on the physical ($r=-0.189$; $p=0.05$) and the mental ($r=-0.642$; $p=0.01$) component summary of the HRQOL. As can be observed in her study, perceived stress is mainly correlated with mental symptoms, in agreement to our findings, which report a stronger correlation between academic stress and negative thoughts. Rogers et al. (2012) found that academic stress was correlated with the well-being of medical students ($r=-.45$; $p<.001$). Conley and Lehman (2012) in a study with 99 undergraduate students observed that everyday academic stressors are linked with temporary increases in blood pressure. In their opinion, cardiovascular responses to everyday stress may contribute to health problems later in life.

Sleep disorders and bad quality of sleep were strongly associated with academic stress by Lund et al. (2010) in a sample of 1.125 students.

However, in our study it is precisely the health symptom which is weakly correlated with academic stress levels. A possible explanation to this fact could be in the contribution of Dang-Vu et al. (2015) whose results indicate that individual differences in sleep spindle activity, particularly during the first non-rapid eye movement sleep period (NREM), contribute to the differential vulnerability to sleep disturbances in the face of academic stressors.

Academic stress has also been associated by the literature with poor dental health (Jain, 2014; Ravishankar et al., 2014) musculoskeletal disorders (Ekpenyong et al., 2013) and with high risk of depression (Xu et al., 2014). Taking into consideration not healthy habits, alcohol consumption was associated with academic stress in the research conducted by González et al. (2013) with a higher proportion found among women, among those students aged 21–30 years, and among those with a low or moderate household income. Furthermore, it has also been observed, in the case of the female population, that those students who experienced academic stress had about two times the chance of having menstrual disorders ($p<.05$) (Ekpenyong, Davis, Akpan, & Daniel, 2011).

Having observed moderate associations between academic stress and health symptoms, hierarchical multiple regression analysis was conducted trying to identify predictor variables. Results showed a final model accounting for 40.3% of the variance, in which academic stress explains around a quarter of the health symptoms reported by the students (23.9%). The variables course and major seemed to explain 14.8% of R-CEA scores and, on the other hand, biological variables (age, gender) and social variables (accommodation and support) explained only 1.6% of the symptoms. Only three other models have been observed trying to find predictors of students' health. In the model of Xu et al. (2014) academic stress explained 19.6% of the variance of depression in nursing students, academic stress and career prospects being the strongest predictors; Lund et al. (2010) observed that tension and stress accounted for 24% of the variance in the quality of sleep, but in this study the concept of stress pertained to a general sense, not specifically to academic stressors.

Finally, Rogers et al. (2012) also conducted a hierarchical multiple regression analysis to test the relationship between personal and environmental predictors and the outcome variable of well-being in a sample of 755 medical students. All variables accounted for 28.5% of the variance in the final model; academic stress was the strongest predictor, explaining 12.7% of the variance together with the variables debt concern and barriers. After analysis in previous research, if we take into consideration other predictor models reported by the literature, it could be said that our results contribute substantially to understanding the negative effects of academic stress on health.

However, in spite of this contribution, the present study has some limitations that need to be explained. First, the measurement tools use data in the form of self-report questionnaires to quantify students' experience of stress in the academic context and health symptoms suffered in the last weeks. A qualitative approach could have allowed a deeper knowledge of the matter. Second, the cross-sectional, correlational design limits the capacity to identify causality in relation to health symptoms, although the causal direction we proposed is consistent with stress theory (Lazarus & Folkman, 1984). And third, researchers also might consider a longitudinal approach to identify solid causality, and it would be interesting to assess students' coping strategies too.

Finally, we consider that our results should have direct implications for the university agents. It is clear that academic stress is associated with poorer student health, so preventive policies need to be considered. In this sense, the promotion of regular sports practice (Décamps, Boujut & Brisset, 2012), resilience training (Steinhardt & Dolbier, 2008) or literature courses (Fan, Kosik, Su, Tsai, & Syu, 2010) have been successfully developed in other countries. Furthermore, counseling and mental health services should be considered as part of the educational policies.

CONCLUSIONS

The results from this study support the assumption that academic stress has a negative impact on college students' health. We identified that younger students and those enrolled in the engineering major perceive the academic context as significantly more stressful, reporting significantly more health symptoms than their partners. Our study provides an advance in the literature on college students' well-being. The findings indicated that perceived academic stress explains 23.9% of the R-CEA. A global model explaining 40.3% of this variance is reported. As we know, this is the first research reporting a predictive stress health symptoms model. Based on these findings it is recommended that stress prevention campaigns are promoted by university agents.

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