



ELSEVIER

Contents lists available at ScienceDirect

Psychiatry Research

journal homepage: www.elsevier.com/locate/psychres

Psychological effects of the COVID-19 outbreak and lockdown among students and workers of a Spanish university



Paula Odriozola-González^{a,1,*}, Álvaro Planchuelo-Gómez^{b,1}, María Jesús Irurtia^{a,1}, Rodrigo de Luis-García^{b,1}

^a Department of Psychology, University of Valladolid, Paseo de Belén 1, 47011 Valladolid, Spain

^b Image Processing Laboratory, University of Valladolid, Valladolid, Spain

ARTICLE INFO

Keywords:

University students
Anxiety
Stress
Depression
Psychological impact

ABSTRACT

The aim of this study was to analyze the psychological impact of COVID-19 in the university community during the first weeks of confinement. A cross-sectional study was conducted. The Depression Anxiety Stress Scale (DASS-21) was employed to assess symptoms of depression, anxiety and stress. The emotional impact of the situation was analyzed using the Impact of Event Scale. An online survey was fulfilled by 2530 members of the University of Valladolid, in Spain. Moderate to extremely severe scores of anxiety, depression, and stress were reported by 21.34%, 34.19% and 28.14% of the respondents, respectively. A total of 50.43% of respondents presented moderate to severe impact of the outbreak. Students from Arts & Humanities and Social Sciences & Law showed higher scores related to anxiety, depression, stress and impact of event with respect to students from Engineering & Architecture. University staff presented lower scores in all measures compared to students, who seem to have suffered an important psychological impact during the first weeks of the COVID-19 lockdown. In order to provide timely crisis-oriented psychological services and to take preventive measures in future pandemic situations, mental health in university students should be carefully monitored.

1. Introduction

The novel coronavirus disease (COVID-19) was firstly detected in Wuhan (Hubei Province, China) in December 2019. From that moment, it began to spread first in China, and soon afterwards throughout the world. Confirmed cases and deaths grew rapidly, and on April 5th there were more than 1,200,000 confirmed cases worldwide and more than 68,000 people had died from it (Johns Hopkins University & Medicine, 2020). This situation has produced a notable emotional impact on medical workers and the general population, with important symptoms of anxiety, stress and depression (Kang et al., 2020; Wang et al., 2020).

On that same date, 130,759 COVID-19 cases had been registered in Spain, making it the third country in the world with the most people affected by this pandemic. In response to this situation, between March 9th and 13th there was a progressive closure of schools and universities. On March 14th, the Spanish government declared a nationwide state of alert and population lockdown was imposed as of March 16th. For many Spaniards, this is the first experience of an emergency with an imperceptible agent, leading to great uncertainty and significant

adverse consequences for mental health (Hawryluck et al., 2004; Shigemura et al., 2020).

Although the overall impact on education and mental health of the university environment is still unknown, it is expected to be very considerable (Araújo et al., 2020; Sahu, 2020). Considering the usual high incidence of emotional disorders in university students, it can be expected that the current situation may cause a notable impact on this population (Auerbach et al., 2016; Bruffaerts et al., 2018; Hunt and Eisenberg, 2010). For instance, in a recent study focusing on Chinese medical college students, higher levels of anxiety were associated with factors strongly related to COVID-19, such as acquaintance with a COVID-19 diagnosed patient (Cao et al., 2020). Likewise, data from international students have shown an increase in concerns not only for their education, but also for the well-being of their families in case of their return home because of suspended in-person classes (Zhai and Du, 2020).

Given the expected impact of the situation on this community, it is crucial to analyze the experience of members of the university community during the COVID-19 crisis and confinement in order to develop measures and implement psychological interventions properly adjusted

* Corresponding author.

E-mail address: paula.odriozola.gonzalez@uva.es (P. Odriozola-González).

¹ All authors have reviewed and approved the final version of the manuscript.

to this situation. That may help mitigate the possible adverse effects on education, work and mental health among the university members.

The purpose of this study was to analyze the psychological symptoms on the members of University of Valladolid, in Spain, during the outbreak of the COVID-19.

2. Methods

2.1. Study population

Every member of the University of Valladolid living in Spain at the time of the study was eligible for participation in this study. An anonymous internet survey was announced through the communication channels of the University of Valladolid, a regional TV station and social media. Ethics approval was obtained from the Research Ethics Board of the University of Valladolid.

2.2. Survey instrument

A web-based survey composed of 66 multiple-choice questions was launched on March 28th, 2020, and remained open during 8 days. The survey took approximately 10 minutes to complete, and included questions referred to demographical data, personal situation during the confinement, present and/or past psychological/psychiatric treatment, present intake of psychoactive medication, perceived impact of the confinement on personal and social relationships, self-reported concern about the social and economic situation caused by the crisis and its impact on the health of oneself, partner, parents, children and other family and friends.

Moreover, questions related specifically to the University of Valladolid were included for the university students and workers. They were asked about their role at the University (student, faculty member or academic staff, or administrative staff). Students and faculty members or academic staff were asked about their area of study or expertise. These areas were Arts & Humanities (A&H), Sciences, Health Sciences (HS), Social Sciences & Law (SS&L), and Engineering & Architecture (E&A). Students were additionally asked about their program level (undergraduate, Master, PhD student or other) and about the year of the undergraduate degree if pertinent.

The emotional impact and psychological symptoms associated with confinement due to the COVID-19 crisis were evaluated using two scales: Depression Anxiety Stress Scale (DASS-21; Antony et al., 1998) and the Impact of Event Scale (IES; Horowitz et al., 1997).

The DASS-21 is a 4-point Likert-type scale (3 = *applied to me very much or most of the time*; 0 = *did not apply to me at all*) that measures the negative emotional states experienced during the last week through 21 items. We administered the Spanish version of the DASS-21 (Daza et al., 2002). It has shown a hierarchical factor structure with three first-order factors (Depression, Anxiety, and Stress) and a second-order factor that is an overall indicator of emotional symptoms (Ruiz et al., 2017). The DASS-21 has also shown good internal consistency and convergent and discriminant validity.

The IES is a 4-point Likert-type scale (0 = *not at all*, 1 = *rarely*, 3 = *sometimes*, 5 = *often*) that assesses subjective distress resulting from a traumatic life event through 15 items. It contains two subscales: Intrusion (intrusive thoughts, nightmares, intrusive feelings and imagery, dissociative-like re-experiencing) and Avoidance (numbing of responsiveness, avoidance of feelings, situations and ideas). We administered the Spanish version by Baguena et al. (2001), which has shown good psychometric properties. Slight adaptations were performed from this version (changing verbal tenses where needed) to account for the nature of the event explored. A cut-off of the IES ≥ 26 was used to reflect moderate to severe impact.

2.3. Statistical analysis

Group proportions were calculated for categorical variables, while histograms, mean, standard deviation and median values with inter-quartile range were employed for quantitative ones. To estimate the reliability of DASS-21 and IES tests, Cronbach's alpha was employed. The 95% Confidence Interval for each alpha value was estimated using 1000 bootstrap samples.

Generalized Linear Models (GLM) with a Gaussian distribution were employed to analyze the association between the DASS-21 and IES scores with each of independent variables described at the Survey instrument subsection.

GLM models were also applied to the self-reported concern about the health of different family members and friends, and about the social and economic situation. The independent variables were the same as for the previous GLM.

The final multivariate GLM was selected using the Akaike's Information Criterion (AIC) and an automatic stepwise strategy, with forward and backward steps. The model with the lowest AIC was automatically selected. Diverse multivariate models were obtained to consider the diverse variables specific to each university group.

P-values below 0.05 were considered to be statistically significant. The analysis was performed using R statistical software package, version 3.5.2.

3. Results

The survey was completed by a total of 3,707 participants, among which 2,530 belonged to the University of Valladolid and are thus the sample considered in this study. There was a 66.1% of female participants, and ages ranged between 18 and 70 years ($M = 27.9$, $SD = 12.4$). 76.8% of the participants were students, 9.8% administrative staff and 13.4% faculty members and academic staff (excluding PhD students). The qualitative characteristics of the final survey respondents are summarized in Table 1, whereas their characteristics related to their situation in the University of Valladolid are described in Table 2.

3.1. DASS-21

The Cronbach's alpha for Depression was 0.89 [0.88, 0.89]; for Anxiety was 0.82 [0.80, 0.83]; and for Stress was 0.85 [0.84, 0.86].

35.18%, 48.10% and 40.32% of the survey respondents exhibited signs of psychological symptoms according to anxiety, depression and stress scores, respectively.

Mean values and standard deviations for each of the DASS-21 subscales were 5.52 ± 4.92 for depression, 3.34 ± 3.87 for anxiety and 6.81 ± 4.72 for stress. Fig. 1 shows the distribution of DASS-21 mean scores by area of study or research area (students and faculty members or academic staff). Figs. 2-4 show the proportion of university students that fall within each of the groups that are usually considered for this instrument, considering their area of study. In the three subscales, students from the E&A area were those with the highest proportion of subclinical scores and lowest of severe and extremely severe scores. On the other hand, students from the A&H and SS&L areas were those with the lowest proportion of subclinical anxiety and depression scores, with a similar proportion to the Sciences area for stress.

Univariate GLM coefficients for the specific university characteristics are shown in Table 3. Supplementary Figures 1-2 show the distribution of DASS-21 mean scores by university group and year of study (including master and PhD students) excluding the last two years, which in the University of Valladolid only include Architecture and Medicine students. Univariate coefficients for the other characteristics are shown in Supplementary Table 1.

Significant higher depression, anxiety and stress scores were observed in students with respect to university workers. In addition, scores were significantly higher in undergraduate students compared to

Table 1
Characteristics of the survey respondents from the University of Valladolid.

Characteristics	Number (%)
Age (mean = 27.9 ± 12.4; median = 22, Interquartile range = 10)	
18-25	1750 (69.2)
26-35	247 (9.8)
36-45	173 (6.8)
46-55	223 (8.8)
56-65	120 (4.7)
66-70	17 (0.7)
Sex	
Male	858 (33.9)
Female	1672 (66.1)
Marital status	
Single	1958 (77.4)
Married or with partner	523 (20.7)
Divorced or separated	40 (1.6)
Widowed	9 (0.4)
Health worker	
Yes	173 (6.8)
No	2357 (93.2)
Live with	
Alone	146 (5.8)
1 person	451 (17.8)
2-4 people	1823 (72.1)
5 or more people	110 (4.3)
Changes in employment activity	
Yes	786 (31.1)
No	514 (20.3)
No employment activity	1230 (48.6)
Tested for COVID-19	
Yes	14 (0.6)
No	2516 (99.4)
Reported COVID-19 symptoms	
Yes	223 (8.8)
No	2307 (91.2)
Know patient with COVID-19 diagnosis	
Yes	1347 (53.2)
No symptoms	32 (2.4)
Mild	422 (31.3)
Moderate	486 (36.1)
Severe	217 (16.1)
Dead	190 (14.1)
No	1183 (46.8)
Previous psychological or psychiatric treatment	
Yes	655 (25.9)
No	1875 (74.1)
Current psychological or psychiatric treatment	
Yes	180 (7.1)
No	2350 (92.9)
Current intake of psychoactive medication	
Yes	161 (6.4)
No	2369 (93.6)
Positive effects of confinement on relationships with confined people	
Yes	1666 (65.8)
No	864 (34.2)
Negative effects of confinement on relationships with confined people	
Yes	808 (31.9)
No	1722 (68.1)
Positive effects on social relationships	
None	1291 (51.0)
Little	940 (37.2)
Some	247 (9.8)
Great	52 (2.1)
Negative effects on social relationships	
None	924 (36.5)
Little	924 (36.5)
Some	488 (19.3)
Great	194 (7.7)

Master students for depression, anxiety and stress, and also compared to PhD students for stress. For the three subscales, significant lower scores were found in E&A students compared to the students from the other

Table 2
Characteristics of the survey respondents related to the situation at the University of Valladolid.

University situation	Number (%)
Group	
Student	1944 (76.8)
Administrative staff	247 (9.8)
Faculty members and academic staff (excluding PhD students)	339 (13.4)
Student group	
Undergraduate	1752 (90.1)
Master	135 (6.9)
PhD	47 (2.4)
Other	10 (0.5)
Area of Study	
Arts & Humanities	262 (13.5)
Sciences	199 (10.2)
Health Sciences	335 (17.2)
Social Sciences and Law	720 (37.0)
Engineering and Architecture	428 (22.0)
Year (undergraduate students)	
1	395 (22.5)
2	422 (24.1)
3	344 (19.6)
4	462 (26.4)
5	79 (4.5)
6	45 (2.6)
Preferred not to say it	5 (0.3)
Area of Study (Researcher)	
Arts & Humanities	71 (20.9)
Sciences	45 (13.3)
Health Sciences	51 (15.0)
Social Sciences and Law	84 (24.8)
Engineering and Architecture	88 (26.0)

areas, except for the depression subscale in students from the HS area. Undergraduate students at the sixth year of their studies (which include only medicine students) presented significant lower depression and stress scores compared to first year students, and significant lower depression scores were also found for fourth year students with respect to first year. Faculty members and academic staff from the A&H area presented significant higher scores with respect to the E&A area for the three subscales, and workers from the HS area also showed significant higher anxiety scores compared to the E&A area.

After adjusting for multiple covariates, administrative staff showed significant lower anxiety scores compared to students, and faculty members and academic staff showed significant lower depression scores compared to students. Significant lower stress scores were found in Master compared to undergraduate students. Significant higher anxiety scores were found in A&H and SS&L with respect to E&A students, and also higher depression scores in A&H compared to E&A students. Faculty members and academic staff from the A&H area also showed significant higher depression scores compared to those in E&A.

The complete multivariate model can be seen in Supplementary Table 2.

3.2. IES

The Cronbach's alpha for Intrusion was 0.81 [0.80, 0.83]; and for Avoidance was 0.78 [0.76, 0.79].

Around 12.5% of the respondents showed scores related to severe symptoms with the IES instrument, and around 75% of the sample presented mild or moderate symptomatic levels, with relatively higher avoidance than intrusion scores.

Mean values and standard deviations were 14.71 ± 8.70 for avoidance and 10.64 ± 7.60 for intrusion. Fig. 1 also shows the distribution of IES mean scores by area of study or research area (students and faculty members or academic staff). The proportion of university

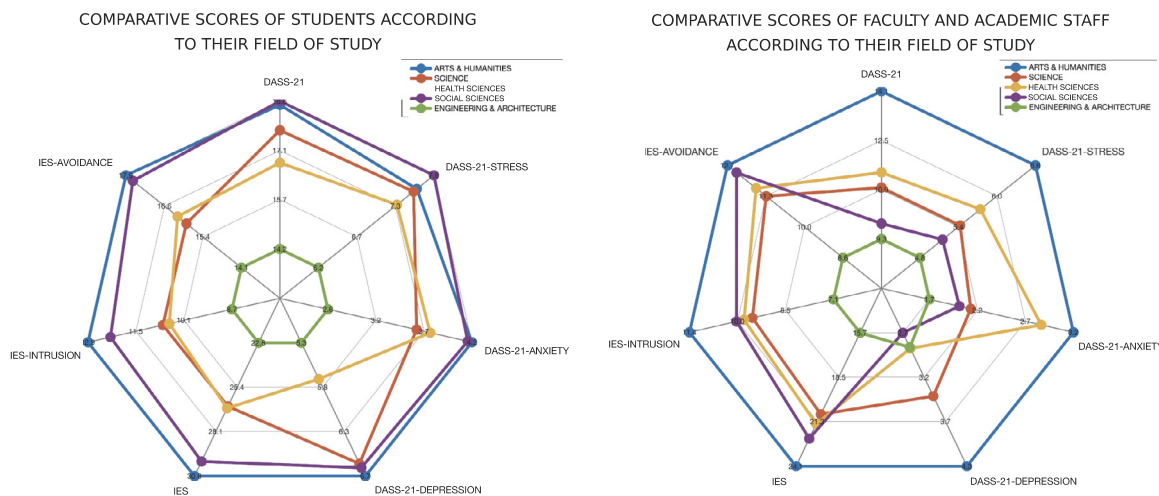


Fig. 1. Radar plot with the distribution of IES and DASS-21 mean scores in students and academic and faculty staff by field of study.

students, considering their area of study, that falls within each of the groups that are considered for the IES are shown in Fig. 5. Students from the E&A area were those with the highest proportion of subclinical scores and the lowest proportion of severe symptoms. On the other hand, students from the A&H and SS&L were those with the lowest proportion of subclinical scores and the highest proportion of severe symptoms.

Histograms for the scores of the IES avoidance and intrusion subscales are shown in Supplementary Figs. 3-4. The distribution of the intrusion scores is similar between the students from the E&A, HS and Sciences areas on the one hand, and between the SS&L and A&H areas on the other hand. The distribution of the avoidance scores was similar between all the areas, with higher proportion of the lowest scores in the E&A area.

Univariate GLM coefficients for the specific university characteristics are shown in Table 4. Univariate coefficients for the other characteristics are shown in Supplementary Table 3.

With respect to the students, significant higher intrusion and avoidance scores were observed compared to faculty members and academic staff, and only higher avoidance scores compared to administrative staff. Master students showed significant lower intrusion and avoidance scores compared to undergraduate students, and lower avoidance scores in PhD compared to undergraduate students.

Significant lower intrusion and avoidance scores were observed in E&A students in comparison with the other four areas. Sixth year undergraduate students (Medicine students only) presented significant lower avoidance scores with respect to first year students. E&A faculty members and academic staff showed significant lower intrusion and avoidance scores in comparison with the other areas, except intrusion scores compared to the Sciences area.

After adjusting for multiple covariates, administrative staff showed significant lower avoidance scores compared to students, and faculty members and academic staff showed significant lower intrusion scores compared to students. Significant higher intrusion and avoidance scores were found in A&H and SS&L with respect to E&A students. The same result was also observed in faculty members and academic staff. Within this group, workers from the Sciences field showed higher avoidance scores in comparison to those in E&A.

The complete multivariate model can be seen in Supplementary Table 4.

3.3. Concern about health, social and economic situation

The concern scores are summarized in Table 5. Univariate GLM coefficients for the specific university characteristics are shown in Tables 6-7. University workers (both faculty members or academic staff

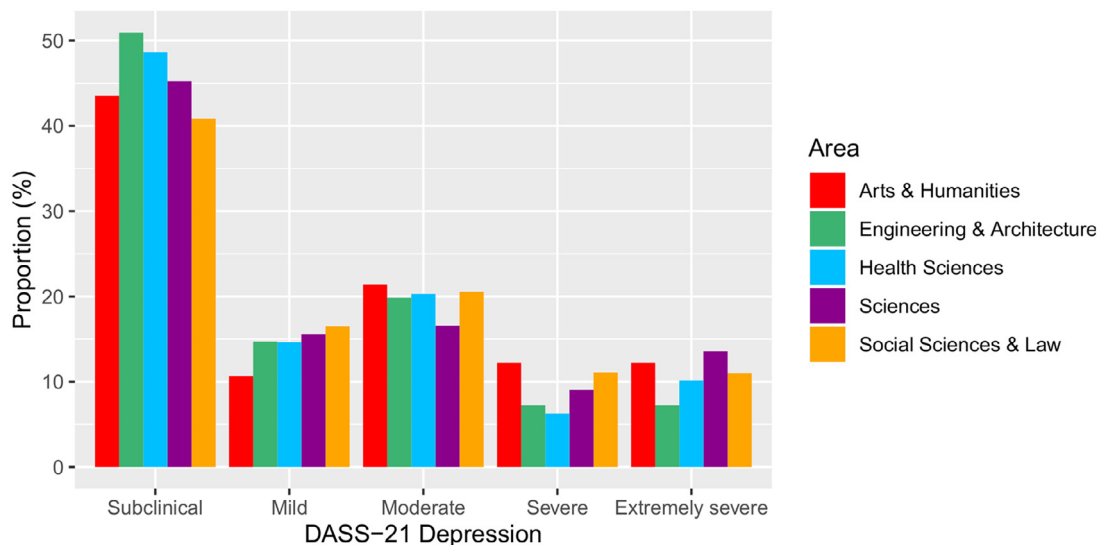


Fig. 2. Proportion of students organized by area of study that fall within each of the groups that are commonly considered for the DASS-21 depression subscale.

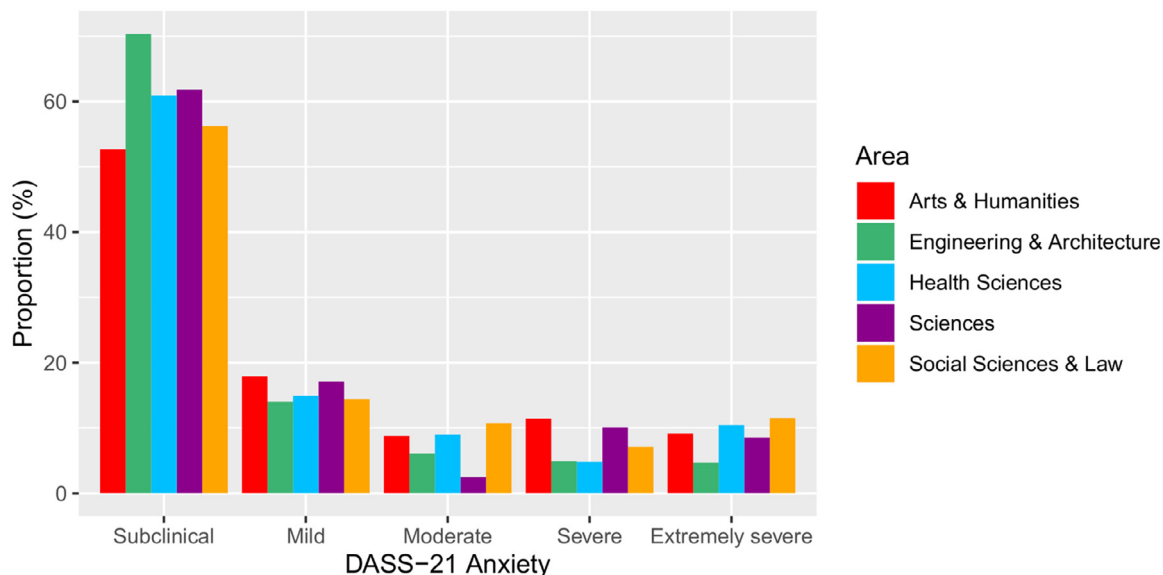


Fig. 3. Proportion of students organized by area of study that fall within each of the groups that are commonly considered for the DASS-21 anxiety subscale.

and administrative staff) presented generalized significant higher concern scores with respect to students, except for their concern about relatives' health. Generalized significant higher concern scores were found in A&H and SS&L compared to E&A students. Some concern scores were significantly lower in undergraduate students compared to studies different to PhD and Master (labelled as other studies), and in first year students compared to students from higher years. Significant higher concern score about social situation was found in A&H in comparison with E&A faculty members and academic staff. Univariate models for other characteristics are shown in Supplementary Tables 5-6.

Adjusting by multiple covariates, some of the univariate identified differences remained significant, such as the differences between students from E&A with respect to A&H and SS&L field, and the differences between workers and students. The multivariate models are shown in Supplementary Tables 7-8.

4. Discussion

The COVID-19 outbreak has prompted most countries opt for population confinement and social distancing measures as a way to control the spread of the virus. However, important psychological effects have been pointed out in previous confinement experiences (Hawryluck et al., 2004). The current pandemic has already shown significant psychological symptoms related to anxiety, stress and depression (Wang et al., 2020). The development of new guidelines for counseling, psychological interventions online or those designed for specific groups such as health workers or older adults are being identified as necessary measures in this situation (Bao et al., 2020; Xiang et al., 2020; Yang et al., 2020).

Our results show that, regarding the initial psychological responses of the members of the University of Valladolid from March 28 to April 4, 2020, two weeks after the lockdown of the Spaniard population due to the COVID-19 pandemic, 34.19% of participants reported moderate to extremely severe depression symptoms; 21.34% of participants reported moderate to extremely severe anxiety symptoms; and 28.14%

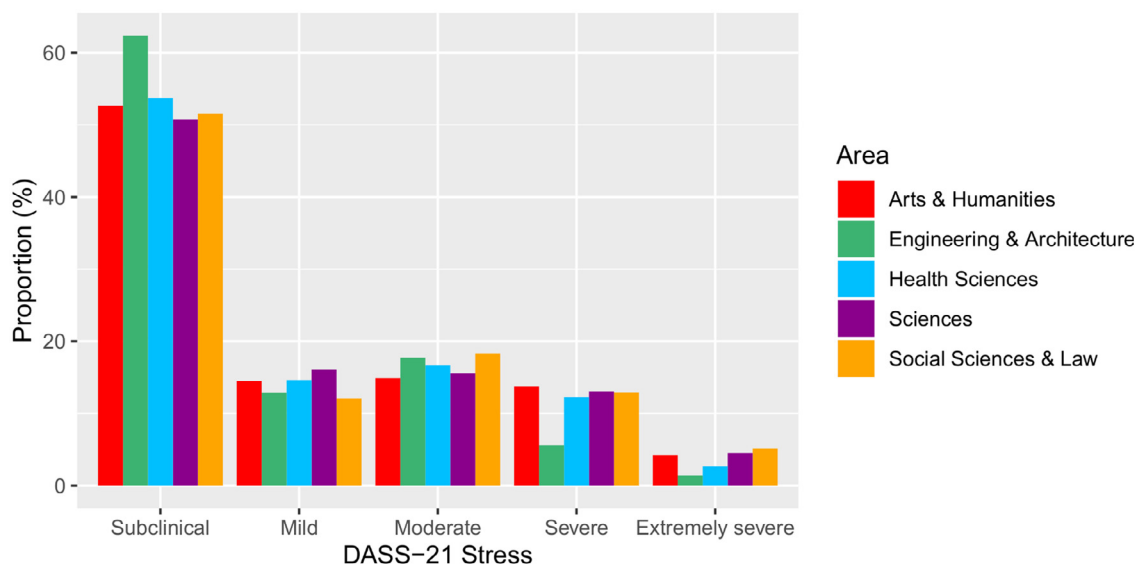


Fig. 4. Proportion of students organized by area of study that fall within each of the groups that are commonly considered for the DASS-21 stress subscale.

Table 3
Univariate GLM coefficients associating DASS-21 scores with respondents characteristics related to the situation at the University of Valladolid.

University situation	DASS-21 total	DASS-21 stress	DASS-21 anxiety	DASS-21 depression
Group				
Administrative staff vs. Student	-7.12****	-2.73****	-1.58****	-2.80****
Academic staff vs. Student	-6.22****	-1.84****	-1.34****	-3.03****
Student Group				
Master vs. Undergraduate	-4.26****	-1.82****	-0.91**	-1.53***
PhD vs. Undergraduate	-4.47*	-1.31	-0.79	-2.38**
Other vs. Undergraduate	-7.14	-2.50	-1.66	-2.98
Area of Study				
Arts vs. Engineering	4.29****	1.40***	1.51****	1.38***
Sciences vs. Engineering	3.53***	1.36***	0.93**	1.25**
Health Sciences vs. Engineering	2.57**	1.12**	1.07***	0.38
Social Sciences vs. Engineering	4.40****	1.65***	1.46****	1.29****
Year				
2 vs. 1	-0.73	-0.00	-0.10	-0.62
3 vs. 1	-0.11	0.03	0.25	-0.39
4 vs. 1	-1.74*	-0.57	-0.15	-1.03**
5 vs. 1	-0.25	0.21	0.07	-0.53
6 vs. 1	-4.75*	-1.52*	-0.84	-2.39**
Area of Study (Researcher)				
Arts vs. Engineering	4.81**	1.84**	1.53**	1.44*
Sciences vs. Engineering	1.67	0.64	0.44	0.59
Health Sciences vs. Engineering	2.16	0.96	1.19*	0.01
Social Sciences vs. Engineering	0.50	0.36	0.32	-0.17

**** $p < 0.0001$, *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

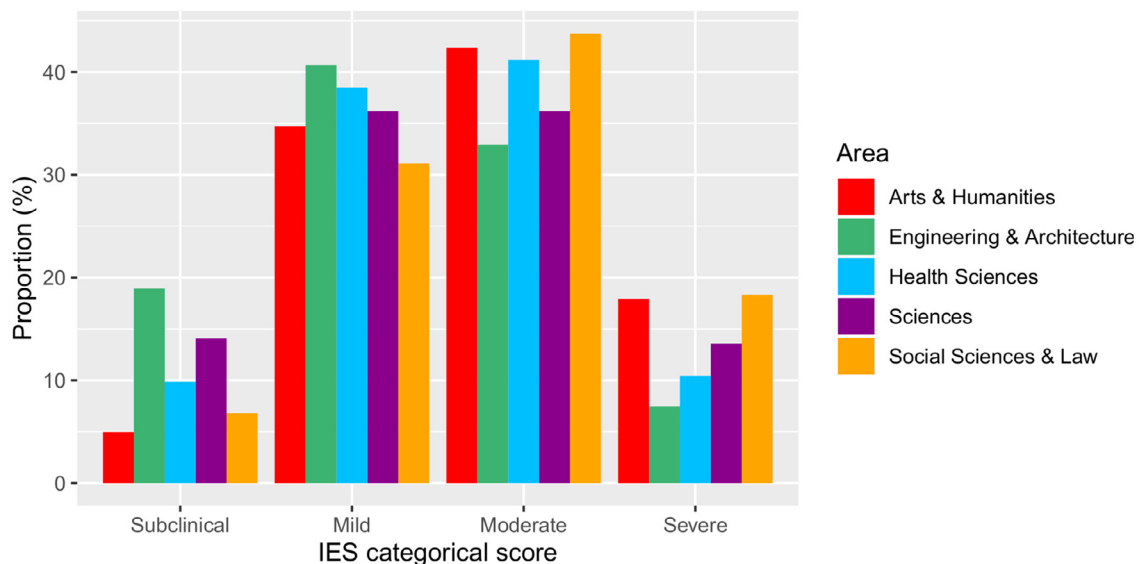


Fig. 5. Proportion of students organized by area of study that fall within each of the groups that are considered for the IES.

reported moderate to extremely severe stress symptoms. Also, 50.43% of participants obtained a score related to the psychological impact of outbreak and lockdown as moderate or severe (IES ≥ 26). A higher prevalence of high scores on psychological impact measured by IES was observed compared to the prevalence of large scores on depression, anxiety and stress measured by DASS-21. Similar results were also recently found in China by Wang et al. (2020). As these authors point out, this difference in prevalence may be due to the specific evaluation of the impact of the event by IES versus a non-specific evaluation by DASS-21.

Regarding the different groups at the university, significantly higher depression, anxiety and stress scores were observed in students compared to the different groups of employees. The high prevalence of psychological symptoms in university students has been frequently pointed out (Auerbach et al., 2016; Bayram and Bilgel, 2008;

Bruffaerts et al., 2018). While there is evidence from several studies in which students from the HS or Engineering area were found to present higher symptomatology scores than those in the Humanities area (Elias et al., 2011; Posselt and Lipson, 2016), our results show precisely the opposite. In fact, the lowest scores are shown by E&A students and workers on all three subscales. In line with our results, the study of Lipson et al. (2016) showed that A&H students have a greater tendency to develop mental illnesses compared to the other areas, such as the Engineering and Business students, who also seem to undergo treatment less frequently.

The percentage of moderate to severe scores of the subgroups of our sample in IES also showed higher prevalence in the A&H area and lower prevalence in the E&A area, not only in the students group, but also in the group of faculty members and academic staff. Specifically, 60.31% of students and 45.07% of faculty members and academic staff of A&H

Table 4
Univariate GLM coefficients associating IES scores with respondents characteristics related to the situation at the University of Valladolid.

University situation	IES total	IES intrusion	IES avoidance
Group			
Administrative staff vs. Student	-3.10**	0.00	-3.11****
Academic staff vs. Student	-6.88****	-1.61***	-5.27****
Student Group			
Master vs. Undergraduate	-4.09**	-2.20**	-1.89*
PhD vs. Undergraduate	-2.82	0.13	-2.94*
Other vs. Undergraduate	-1.50	0.49	-1.99
Area of Study			
Arts vs. Engineering	7.99****	4.16****	3.82****
Sciences vs. Engineering	3.82**	2.00**	1.82*
Health Sciences vs. Engineering	3.93***	1.81**	2.11***
Social Sciences vs. Engineering	7.11****	3.51****	3.60****
Year			
2 vs. 1	0.39	0.44	-0.05
3 vs. 1	-0.08	0.23	-0.32
4 vs. 1	-0.25	-0.24	-0.01
5 vs. 1	1.50	1.01	0.49
6 vs. 1	-4.33	-1.42	-2.92*
Area of Study (Researcher)			
Arts vs. Engineering	8.39****	4.32***	4.07**
Sciences vs. Engineering	5.14*	2.43	2.71
Health Sciences vs. Engineering	5.75*	2.68*	3.06*
Social Sciences vs. Engineering	6.67**	2.91**	3.76**

**** $p < 0.0001$, *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Table 5
Concern for health and socio-economic situation.

Concern	Mean ± SD	Median	Interquartile range
Own health (N = 2521)	5.4 ± 2.9	5	5
Partner health (N = 1624)	6.6 ± 3.0	7	5
Parents health (N = 2419)	8.2 ± 2.3	9	3
Children health (N = 613)	5.6 ± 3.8	6	9
Other family health (N = 2489)	8.3 ± 2.2	9	3
Friends health (N = 2511)	6.6 ± 2.7	7	4
Social situation (N = 2503)	8.1 ± 2.2	9	3
Economic situation (N = 2490)	8.2 ± 2.2	9	3

SD = standard deviation.

compared to 40.42% of students and 23.86% faculty members and academic staff of E&A showed moderate to severe IES scores. To our knowledge, this study is the first one that analyzes the impact of a major event such as the COVID-19 crisis in students from different fields.

A study with a large sample size performed in China obtained similar percentage of respondents with moderate or severe IES scores with respect to our study (Wang et al., 2020). Furthermore, that study also highlights the high levels of symptomatology in students, indicating that the uncertainty and the potential negative impact on academic progress may have motivated the impact on students' mental health.

However, results from another study in the general population of China, evaluated using the same instrument (IES), seem to show a much lower percentage of moderate or severe scores on the impact of the event, 7.6% (Zhang and Ma, 2020). The reasons for the difference between that study and our results may perhaps be related to the considerable age difference between the respondents of both studies, with younger respondents in our case, and a significantly smaller sample size in the study on the Chinese general population.

In our study, by contrast, university employees from all groups showed higher concern scores than students, except for concern about relatives' health. Once again, the A&H students, along with those in the SS&L areas, showed a higher level of concern than the E&A students.

Table 6
Univariate GLM coefficients associating concern with respondents characteristics related to the situation at the University of Valladolid (part 1).

University situation	Own health	Pair health	Parents health	Children health
Group				
Administrative staff vs. Student	1.07****	0.95****	0.76****	3.57****
Academic staff vs. Student	0.76****	0.62**	0.67****	3.31****
Student Group				
Master vs. Undergraduate	0.02	-0.08	-0.10	0.82
PhD vs. Undergraduate	0.40	0.44	0.40	4.23***
Other vs. Undergraduate	-0.07	2.09	1.98*	5.97***
Area of Study				
Arts vs. Engineering	0.89****	0.60	0.59**	2.24**
Sciences vs. Engineering	0.21	0.39	0.18	0.27
Health Sciences vs. Engineering	0.31	-0.02	0.22	-0.81
Engineering				
Social Sciences vs. Engineering	0.93****	0.71**	0.51***	0.65
Year				
2 vs. 1	-0.40	0.02	-0.08	-1.53*
3 vs. 1	-0.42	-0.34	0.02	-0.67
4 vs. 1	-0.37	-0.09	-0.22	-0.61
5 vs. 1	-0.37	-0.57	-0.09	-1.45
6 vs. 1	-1.09*	-1.21	-0.49	-0.11
Area of Study (Researcher)				
Arts vs. Engineering	0.37	-0.10	0.20	-0.06
Sciences vs. Engineering	-0.41	0.20	0.10	-0.26
Health Sciences vs. Engineering	0.45	0.39	0.50	0.00
Social Sciences vs. Engineering				
	0.34	0.27	-0.32	-0.18

**** $p < 0.0001$, *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Similarly, faculty members and academic staff in A&H had a higher concern score about the social situation in comparison with those in E&A. The presence of a more pragmatic attitude or different world viewpoints in the E&A group might account for the differential results found in this study, but more research would be needed to elucidate this issue.

This study has some strengths and limitations. Among the strengths, the large sample size (2530 respondents) allowed us to perform a robust analysis and extract solid tendencies and associations. Also, this is an early study that offers a unique opportunity to investigate the emotional impact of the COVID-19 pandemic in a university environment. It provides valuable information about the current situation useful to gain some insight about the situation in other universities or in possible future global crises.

Regarding the limitations, firstly, this is a cross-sectional study carried out at a Spanish university under an unprecedented situation. Longitudinal studies are needed to analyze the long-term impact of this situation on the psychological state of their members and to draw conclusions about the cause and effect relationships between the variables involved. Secondly, we adopted a convenient online survey in only one university from Spain, which may contribute to some bias in the study results. Larger scale surveys in different universities should be conducted in order to extend and generalize the findings. Thirdly, our results indicate the need of incorporating additional aspects in future studies. For example, it is important to explore why younger students are suffering a greater psychological impact, which could be related to factors such as their perception of the future, their way of consuming information media, etc.

In conclusion, university students have been specially impacted by the COVID-19 confinement. Students from the SS&L and A&H fields

Table 7
Univariate GLM coefficients associating concern with respondents characteristics related to the situation at the University of Valladolid (part 2).

University situation	Family health	Friends health	Social situation	Economic situation
Group				
Administrative staff vs. Student	-0.47**	0.70***	0.50***	0.38*
Academic staff vs. Student	-0.49***	0.26	0.48***	0.26
Student Group				
Master vs. Undergraduate	-0.25	-0.11	-0.05	0.08
PhD vs. Undergraduate	0.10	0.18	0.14	-0.18
Other vs. Undergraduate	-0.00	1.80*	1.22	1.11
Area of Study				
Arts vs. Engineering	0.08	0.94***	0.68***	0.43*
Sciences vs. Engineering	0.27	0.22	0.03	0.13
Health Sciences vs. Engineering	0.05	0.39*	0.60***	0.15
Social Sciences vs. Engineering	0.29*	0.95***	0.69***	0.62***
Year				
2 vs. 1	-0.17	-0.01	-0.25	0.04
3 vs. 1	-0.14	-0.17	-0.22	-0.23
4 vs. 1	-0.32*	-0.49**	-0.40*	-0.07
5 vs. 1	-0.31	-0.78*	-0.19	-0.29
6 vs. 1	-0.23	-1.11*	0.38	-0.32
Area of Study (Researcher)				
Arts vs. Engineering	0.43	0.73	0.67*	0.54
Sciences vs. Engineering	-0.24	-0.05	0.05	0.63
Health Sciences vs. Engineering	0.11	0.37	0.41	0.68
Social Sciences vs. Engineering	-0.35	0.20	0.18	0.59

*** $p < 0.0001$, ** $p < 0.001$, * $p < 0.01$, * $p < 0.05$

were more affected than students from other areas, particularly with respect to E&A students. This study suggests that mental health from university students and employees should be carefully monitored during this crisis, and that universities should provide psychological services oriented and adapted to these circumstances to mitigate the emotional impact on university members.

Funding

This study received no specific funding.

CRedit authorship contribution statement

Paula Odriozola-González: Conceptualization, Methodology, Investigation, Writing - original draft, Supervision. **Álvaro Planchuelo-Gómez:** Methodology, Formal analysis, Investigation, Writing - original draft. **María Jesús Iruña:** Conceptualization, Methodology, Investigation. **Rodrigo de Luis-García:** Conceptualization, Methodology, Investigation, Resources, Writing - original draft, Project administration.

Acknowledgments

Álvaro Planchuelo-Gómez was supported by Junta de Castilla y León (Spain) and the European Social Fund (ID: 376062, Base de Datos Nacional de Subvenciones).

Supplementary materials

Supplementary material associated with this article can be found, in

the online version, at [doi:10.1016/j.psychres.2020.113108](https://doi.org/10.1016/j.psychres.2020.113108).

References

Antony, M.M., Bieling, P.J., Cox, B.J., Enns, M.W., Swinson, R.P., 1998. Psychometric properties of the 42-item and 21-item versions of the Depression Anxiety Stress Scales (DASS) in clinical groups and a community sample. *Psychol. Assess.* 10, 176–181. <https://doi.org/10.1037/1040-3590.10.2.176>.

Araújo, F.J.O., de Lima, L.S.A., Cidade, P.I.M., Nobre, C.B., Neto, M.L.R., 2020. Impact of Sars-Cov-2 and its reverberation in global higher education and mental health. *Psychiatry Res.* 288, 112977. <https://doi.org/10.1016/j.psychres.2020.112977>.

Auerbach, R.P., Alonso, J., Axinn, W.G., Cuijpers, P., Ebert, D.D., Green, J.G., Hwang, I., Kessler, R.C., Liu, H., Mortier, P., Nock, M.K., Pinder-Amaker, S., Sampson, N.A., Aguilar-Gaxiola, S., Al-Hamzawi, A., Andrade, L.H., Benjet, C., Caldas-de-Almeida, J.M., Demyttenaere, K., Florescu, S., de Girolamo, G., Gureje, O., Haro, J.M., Karam, E.G., Kiejna, A., Kovess-Masfety, V., Lee, S., McGrath, J.J., O'Neill, S., Pennell, B.-E., Scott, K., Ten Have, M., Torres, Y., Zaslavsky, A.M., Zarkov, Z., Bruffaerts, R., 2016. Mental disorders among college students in the World Health Organization World Mental Health Surveys. *Psychol. Med.* 46, 2955–2970. <https://doi.org/10.1017/S003329716001665>.

Baguena, M.J., Villaroya, E., Belena, A., Díaz, A., Roldán, C., Reig, R., 2001. Psychometric properties of the Spanish version of Impact of Event Scale-Revised (IES-R). *Análisis y Modif. Conduct.* 27, 581–604.

Bao, Y., Sun, Y., Meng, S., Shi, J., Lu, L., 2020. 2019-nCoV epidemic: address mental health care to empower society. *Lancet* 395, e37–e38. [https://doi.org/10.1016/S0140-6736\(20\)30309-3](https://doi.org/10.1016/S0140-6736(20)30309-3).

Bayram, N., Bilgel, N., 2008. The prevalence and socio-demographic correlations of depression, anxiety and stress among a group of university students. *Soc. Psychiatry Psychiatr. Epidemiol.* 43, 667–672. <https://doi.org/10.1007/s00127-008-0345-x>.

Bruffaerts, R., Mortier, P., Kiekens, G., Auerbach, R.P., Cuijpers, P., Demyttenaere, K., Green, J.G., Nock, M.K., Kessler, R.C., 2018. Mental health problems in college freshmen: prevalence and academic functioning. *J. Affect. Disord.* 225, 97–103. <https://doi.org/10.1016/j.jad.2017.07.044>.

Cao, W., Fang, Z., Hou, G., Han, M., Xu, X., Dong, J., Zheng, J., 2020. The psychological impact of the COVID-19 epidemic on college students in China. *Psychiatry Res.* 287, 112934. <https://doi.org/10.1016/j.psychres.2020.112934>.

Daza, P., Novy, D.M., Stanley, M., Averill, P., 2002. The depression anxiety stress scale-21: Spanish translation and validation with a Hispanic sample. *J. Psychopathol. Behav. Assess.* 24, 195–205. <https://doi.org/10.1023/A:1016014818163>.

Elias, H., Ping, W.S., Abdullah, M.C., 2011. Stress and academic achievement among undergraduate students in Universiti Putra Malaysia. *Procedia - Soc. Behav. Sci.* 29, 646–655. <https://doi.org/10.1016/j.sbspro.2011.11.288>.

Hawryluck, L., Gold, W.L., Robinson, S., Pogorski, S., Galea, S., Styrá, R., 2004. SARS control and psychological effects of quarantine, Toronto, Canada. *Emerg. Infect. Dis.* 10, 1206–1212. <https://doi.org/10.3201/eid1007.030703>.

Horowitz, M.J., Wilner, N., Alvarez, W., 1997. Impact of event scale: a measure of subjective stress. *Psychosom. Med.* 41, 209–218. <https://doi.org/10.1097/00006842-197905000-00004>.

Hunt, J., Eisenberg, D., 2010. Mental health problems and help-seeking behavior among college students. *J. Adolesc. Heal.* 46, 3–10. <https://doi.org/10.1016/j.jadohealth.2009.08.008>.

Johns Hopkins University & Medicine, 2020. Coronavirus COVID-19 global cases by the center for systems science and engineering at Johns Hopkins [WWW Document]. URL <https://coronavirus.jhu.edu/map.html> (accessed 4.5.20).

Kang, L., Li, Y., Hu, S., Chen, M., Yang, C., Yang, B.X., Wang, Y., Hu, J., Lai, J., Ma, X., Chen, J., Guan, L., Wang, G., Ma, H., Liu, Z., 2020. The mental health of medical workers in Wuhan, China Dealing with the 2019 Novel Coronavirus 7. *The Lancet. Psychiatry*, pp. e14. [https://doi.org/10.1016/S2215-0366\(20\)30047-X](https://doi.org/10.1016/S2215-0366(20)30047-X).

Lipson, S.K., Zhou, S., Wagner, B., Beck, K., Eisenberg, D., 2016. Major differences: variations in undergraduate and graduate student mental health and treatment utilization across academic disciplines. *J. College Stud. Psychother.* 30, 23–41. <https://doi.org/10.1080/87568225.2016.1105657>.

Posselt, J.R., Lipson, S.K., 2016. Competition, anxiety, and depression in the college classroom: variations by student identity and field of study. *J. Coll. Stud. Dev.* 57, 973–989. <https://doi.org/10.1353/csd.2016.0094>.

Ruiz, F.J., García-Martín, M.B., Suárez-Falcón, J.C., Odriozola-González, P., 2017. The hierarchical factor structure of the Depression Anxiety and Stress Scale-21. *Int. J. Psychol. Psychol. Ther.* 17, 97–105.

Sahu, P., 2020. Closure of universities due to coronavirus disease 2019 (COVID-19): impact on education and mental health of students and academic staff. *Cureus* 12, e7541. <https://doi.org/10.7759/cureus.7541>.

Shigemura, J., Ursano, R.J., Morganstein, J.C., Kurosawa, M., Benedek, D.M., 2020. Public responses to the novel 2019 coronavirus (2019-nCoV) in Japan: mental health consequences and target populations. *Psychiatry Clin. Neurosci.* 74, 281–282. <https://doi.org/10.1111/pcn.12988>.

Wang, C., Pan, R., Wan, X., Tan, Y., Xu, L., Ho, C.S., Ho, R.C., 2020. Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. *Int. J. Environ. Res. Public Health* 17, 1729. <https://doi.org/10.3390/ijerph17051729>.

Xiang, Y.-T., Yang, Y., Li, W., Zhang, L., Zhang, Q., Cheung, T., Ng, C.H., 2020. Timely mental health care for the 2019 novel coronavirus outbreak is urgently needed. *Lancet. Psychiatry* 7, 228–229. [https://doi.org/10.1016/S2215-0366\(20\)30046-8](https://doi.org/10.1016/S2215-0366(20)30046-8).

Yang, Y., Li, W., Zhang, Q., Zhang, L., Cheung, T., Xiang, Y.-T., 2020. Mental health services for older adults in China during the COVID-19 outbreak. *Lancet. Psychiatry* 7, e19. [https://doi.org/10.1016/S2215-0366\(20\)30079-1](https://doi.org/10.1016/S2215-0366(20)30079-1).

Zhai, Y., Du, X., 2020. Addressing collegiate mental health amid COVID-19 pandemic. *Psychiatry Res.* 288, 113003. <https://doi.org/10.1016/j.psychres.2020.113003>.

Zhang, Y., Ma, Z.F., 2020. Impact of the COVID-19 pandemic on mental health and quality of life among local residents in Liaoning Province, China: a cross-sectional study. *Int. J. Environ. Res. Public Health* 17, 2381. <https://doi.org/10.3390/ijerph17072381>.