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Depression, anxiety and stress among emerging adult undergraduates. A longitudinal and two-cohort study

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Abstract

Mental disorders constitute one of the population's principal health problems, especially among undergraduates. This quantitative study compared levels of depression, anxiety and stress in a sample of emerging adult university undergraduates from a gender perspective (1) during the initial and intermediate years of emerging adulthood, and (2) in two different cohorts. 383 Spanish emerging adult university undergraduates were monitored longitudinally (2015-2018) and two cohorts were compared (2015-2020). Participants completed the validated Spanish version of the DASS-21. Mean-level and rank-order stability was found across the two waves of the longitudinal study in relation to levels of depression, anxiety and stress. Significant differences were found between the two cohorts, indicating higher levels of psychological distress in 2020 than in 2015. Women were found to have higher levels of psychological distress, particularly stress, than men in both waves and cohorts. Results are discussed in relation to the negative effects of the COVID-19 health crisis on the emotional health of emerging adults. The present study highlights the need to establish measures designed to improve the mental health of emerging adults, which was more severely affected by the COVID-19 crisis than by the aftermath of the 2008 financial crisis. It also underscores the need to develop interventions designed to alleviate the greater degree of stress suffered by women.

Keywords: depression, anxiety, stress, emerging adults, gender, longitudinal.

Introduction

According to the WHO (World Health Organization [WHO], 2015), mental disorders such as anxiety, depression and stress constitute one of the principal health problems in the world today, with significantly higher rates being observed among women than among men. These disorders have a negative effect on people's health and quality of life (Homel et al., 2020; Kellett et al., 2016; Muñoz-Navarro et al., 2021). In 2022, following the COVID-19 pandemic, the data gathered indicated an increase in psychological distress models among the population (WHO, 2022).

Emerging adulthood is a transitional stage between adolescence and adulthood (Arnett, 2014). For those who attend university, it is a period of adaptation to a new institution and new classmates. This two-fold transition affects the mental health of young university undergraduates (e.g., Hunt & Eisenberg, 2010), who seem to suffer more psychological problems than both their non-university counterparts (Blanco et al. 2008) and the general population (e.g., Denovan & Macaskill, 2017).

In addition to these transitions, we must also take macrosystemic aspects into account, since these have a greater impact during the transition to adulthood than during other life stages (Baltes et al., 1980; Pew Research Center, 2015). Over recent decades, society has faced several major crises, including the 2008 financial crisis and the crisis generated by the spread of the COVID-19 virus in 2020. The former triggered a harsh recession that lasted until 2013. By 2015, the effects of the financial crisis and subsequent recession had abated slightly, but levels of youth unemployment continued to be very high. The situation was particularly concerning in Spain, where youth unemployment rates were over 46% (Instituto Nacional de Estadística, [INE], 2015). Indeed, this seems to be a structural problem in that country, with Spain continuing to have one of the highest youth unemployment rates in Europe (Statista, 2023). This situation, coupled with the high levels of uncertainty and insecurity about the future generated by the recession, prompted many young people in many developed countries to delay the moment they left the family home (Kathleen, 2010). Spain continues to have higher family cohabitation rates than its neighbouring countries in Europe (Moreno, López & Segado, 2012). The situation outlined above resulted in a sharp increase in depression, anxiety and stress levels among the general population (Mucci et

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al., 2016), and particularly among university students, who reported higher distress levels (Oswalt, et al., 2020).

The second crisis also had important repercussions for the mental health of both the general population (Ausín et al., 2022; Fancourt et al. 2020) and, in particular, emerging adults (e.g., Johansson et al., 2021) and young undergraduates (e.g., Birmingham et al., 2020; Lee et al., 2021; Pateralou et al., 2021). Indeed, studies seem to suggest that levels of psychological distress increased at the start of the pandemic, dropped with the arrival of the ‘new normal’ and then rose sharply again one year later. However, to the best of our knowledge, no study in Spain has yet sought to compare the consequences of the two crises in order to shed light on which specific type of macrosystemic crisis has a stronger effect on young people.

Although the negative consequences of the crisis on young people’s mental health seem evident, the results regarding the stability/variability of psychological distress throughout the university years are less clear. Possible gender differences also require further clarification. Few longitudinal studies have been carried out in relation to stability or variability, and those that have report contradictory results. For example, Puthran et al. (2016) found that distress levels among university students dropped from the start of their degree to graduation. Othman et al. (2019) found similar results, although in this case only in relation to anxiety. However, other authors report that students in the final years of their degree had higher distress levels than first-year undergraduates (Beiter et al., 2015).

Something similar occurs in studies exploring gender differences in distress among emerging adult university students. Most studies have found that female university undergraduates have more mental health problems than their male counterparts (see Ochnik et al., 2021 for a cross-national study). Others, however, claim that male undergraduates report higher levels of depression, anxiety and stress than their female classmates (e.g., Jiang et al., 2021). Finally, some authors fail to find any gender differences in this respect (e.g., Othman et al., 2019).

There is also disagreement between studies regarding gender differences in some of the distress measures, when assessed individually. Some studies report higher levels of anxiety among female undergraduates (e.g., Bayram & Bilgel, 2008). Others, such as the meta-analysis by Quek et al. (2019), found no significant gender differences

in the prevalence of this particular form of psychological distress. In relation to depression, some studies have reported higher prevalence rates among female students (e.g., Tung et al., 2018), whereas others have found that male students suffer more frequently from depressive disorders (e.g., Al-Qaisy, 2011). In terms of stress, the majority of studies (e.g., Manti et al., 2022) have found higher stress levels among female undergraduates than among their male counterparts, although others report no gender differences in this sense (e.g., Popa-Velea et al., 2021).

In light of the above, and in an attempt to help clarify the discrepancies found in the extant research in relation to both the stability of distress levels and gender differences, the principal aim of the present study was to analyse depression, anxiety and stress (DAS) levels in a sample of emerging adult university undergraduates in Spain. The analysis was conducted at two different moments (2015 and three years later - longitudinal study) and in two cohorts (2015 and 2020), taking gender differences into account in all cases. The present study goes beyond the scope of others carried out with the university population, since it focuses on a sample recruited from all knowledge areas. It also monitors participants longitudinally across a three-year time period, and compares the cohort that suffered the consequences of the 2008 financial crisis and ensuing recession with the cohort that suffered the effects of the 2020 health crisis.

Materials & Methods

Sample

A longitudinal study was conducted with 383 emerging adults, 259 women (67.6%) and 124 men. Furthermore, a sample of 1502 emerging adults (Cohort 1, C1), comprising 903 women (60.1%) and 599 men, was compared with another sample of 1715 emerging adults, comprising 1116 women (65.1%) and 599 men (Cohort 2, C2).

Longitudinal study: During the first wave of data collection (W1, 2015), participants were aged between 18 and 28 years ($M = 20.31$ and $SD = 2.04$). Three years later (W2, 2018), they were aged between 21 and 32 years ($M = 23.66$; $SD = 2.08$). In the first wave, all participants in the study were undergraduate students from different knowledge areas. In the second wave, 31.5% were still undergraduate students, 39.5%

had left university after graduating, 14.5% were engaged in postgraduate studies and 14.5% had completed a postgraduate degree.

Comparison of two cohorts: Participants in C1 (2015) were aged between 18 and 29 years ($M = 20.32$; $SD = 2.13$) and were all undergraduate students. Participants in C2 (2020) were also aged between 18 and 29 years ($M = 20.60$; $SD = 2.49$) and were all undergraduate students. The representative distribution of the different knowledge areas was taken into consideration when recruiting students for both cohorts (Ministerio de Educación, Cultura y Deporte [MEC], 2020).

Instrument

The validated Spanish version (Bados et al., 2005) of the DASS-21 (Lovibond & Lovibond, 1995) was used to measure depression, anxiety and stress levels. This scale comprises 21 items (7 for each scale) rated on a 4-point Likert-type scale, with higher scores indicating higher levels of depression, anxiety and stress. Table 1 shows the reliability values for the scale.

Table 1. DASS reliability

		Cronbach's α
Longitudinal study	DepressionW1	.79
	AnxietyW1	.76
	StressW1	.78
	DepressionW2	.74
	AnxietyW2	.76
	StressW2	.85
Cross-sectional study	DepressionC1	.74
	AnxietyC1	.76
	StressC1	.78
	DepressionC2	.86
	AnxietyC2	.83
	StressC2	.83

Note. W1 = Wave 1; W2 = Wave 2; C1 = Cohort 1; C2 = Cohort 2;

Although the DASS-21 is not a diagnostic tool, higher scores on it do reflect the existence of mental issues (Lovibond & Lovibond, 1995) and the scale is widely used in both clinical practice and research. Following Cullinan et al. (2022), and to facilitate the presentation and discussion of the principal results, the three scales were analysed separately in three categories, in accordance with the severity of the symptoms. The three categories were normal (with scores of 0-9, 0-7 and 0-14 for depression, anxiety

and stress, respectively); mild/moderate (10-20, 8-14, 15-25) and severe/extremely severe (21-28+, 15-20+, 26-34+).

Procedure

To recruit both C1 and C2, we contacted professors at the universities of (blinded) in order to ask them to provide access to their students. The participants in C1 completed the instrument in pencil and paper format. In contrast, since the data for C2 were collected following the lockdown when teaching was mainly carried out online, with few face-to-face classes, the participants in C2 completed the instrument online.

The longitudinal study is the continuation of C1, in which 902 students provided contact details. Three years later, 400 students completed the questionnaire online. The attrition analysis revealed that more women than men remained in the study ($\chi^2 = 10.76$; $p = .001$, Cramer's $V = .08$, small effect size) and as did emerging adults with higher levels of stress ($t = -4.98$, $p < .001$, $d = .29$, small effect size) and similar levels of depression ($t = -2.73$; $p = .006$; $d = .17$, negligible effect size) and anxiety ($t = -1.94$; $p = .052$).

Participants were informed of the purpose of the study and were assured that they would remain anonymous and that their responses would be kept in the strictest confidentiality. Participation was voluntary. The study was approved by the (blinded)'s Ethics in Biomedical Research Committee.

Statistical procedure

In order to explore gender differences in the DAS scores, means differences were calculated using the t test for related samples in the longitudinal study, and the t test for independent samples in the cohort comparison study. *Cohen's d* was calculated in all cases (Cohen, 1988).

Next, in order to identify possible differences between W1 and W2 in terms of perceived depression, anxiety and stress levels, the mean level change of the variables was calculated by means of a repeated measures analysis of variance (ANOVA), using Pillai's F test. Time was viewed as an intra-subject factor (W1 and W2) and gender was included as an inter-subject factor. In order to determine whether participants changed position in relation to their group between W1 and W2, rank-order stability was calculated using the Pearson correlation coefficient. To explore the differences between

the two cohorts in terms of their DAS scores, univariate analyses of variance were performed for both the general sample and for men and women separately. In this case, the effect size was calculated on the basis of eta squared values.

To determine whether, in addition to there being significant changes in psychological distress between the two cohorts (2015-2020), the number of emerging adults with scores indicating normal, moderate or severe depression, anxiety or stress had also changed, and whether these changes were modulated by gender, two types of analysis were carried out. First, a log-linear model was calculated. Second, the cohort and gender effects on DASS were analysed separately. Finally, *Cramer's V* was calculated to determine the effect size of this interaction effect.

Results

Table 2 shows the mean scores obtained on each of the DAS scales during each data collection wave and by both cohorts. It also shows the mean differences between men and women. During W1, no significant differences were found between men and women in terms of DAS. Three years later, during W2, women had higher stress levels than men, with a small effect size (Cohen's $d = -.29$). In relation to the cohorts, in 2015, women had significantly higher anxiety and stress levels than men, with a negligible and small effect size (Cohen's $d = -.12$ for anxiety; Cohen's $d = -.31$ for stress), respectively. In 2020, women had higher depression levels, with a negligible effect size (Cohen's $d = -.18$), as well as higher anxiety and stress levels, both with a small effect size (Cohen's $d = .27$ for anxiety; Cohen's $d = .33$ for stress).

Table 2. Descriptive statistics pertaining to depression, anxiety and stress scores during the different waves, and differences between men and women.

		Total		Men		Women				
		M	(SD)	M	(SD)	M	(SD)	<i>t</i>	<i>p</i>	<i>d</i>
Long study (N=381)	DepressionW1	10.67	8.53	10.63	8.85	10.69	8.38	-.07	.94	—
	AnxietyW1	8.59	7.94	8.63	8.05	8.58	7.90	.06	.95	—
	StressW1	16.22	9.18	15.36	9.03	16.64	9.25	-1.30	.19	—
	DepressionW2	9.75	9.32	10.26	9.67	9.05	9.15	.74	.45	—
	AnxietyW2	8.65	9.02	8.37	9.07	8.79	9.01	-.42	.67	—
	StressW2	15.24	9.77	13.23	8.76	16.13	10.12	-2.58	.01	-.29
Cohort comparison (N _{c1} =1502; N _{c2} =1715)	DepressionC1	9.49	8.05	9.08	8.05	9.76	8.04	-1.59	.11	—
	AnxietyC1	7.75	7.64	7.29	7.25	8.11	7.87	-2.26	.02	-.12
	StressC1	14.18	8.94	12.56	8.64	15.26	8.97	-5.78	<.00	-.31
	DepressionC2	13.98	10.48	12.70	10.17	14.59	10.57	-3.57	<.00	-.18
	AnxietyC2	10.57	9.73	8.88	8.69	11.44	10.10	-5.24	<.00	-.27
	StressC2	16.56	10.23	14.33	9.94	17.70	10.17	-6.57	<.00	-.33

Cohen's *d*: .20: small; .50: medium; .80: large

Differences in DAS between the two time points included in the longitudinal study and between the two cohorts are described in more detail below.

Depression: Mean-level stability was observed for depression between W1 and W2. This means that no changes were observed between depression levels during W1 and those same levels during W2 (*Pillai multivariate analysis*, $F=1.32$; $p=.25$; $\eta^2=.003$), or in terms of the wave*gender interaction ($F= 1.44$; $p=.23$; $\eta^2= .004$). **Table 3** shows the results of the correlations between depression during W1 and W2, which indicate rank-order stability in both the overall sample and in the gender-differentiated samples (men and women).

Significant differences were observed between Cohort 1 and Cohort 2, with higher levels of depression being found in 2020 than in 2015, with a small effect size ($F=180.64$; $p<.001$; $\eta^2=.05$). These differences were observed in both the male

($F=46.31$; $p<.001$; $\eta^2=.03$) and the female samples ($F=126.62$; $p<.001$; $\eta^2=.06$), with a small and medium effect size, respectively.

Anxiety: Mean-level stability was observed for anxiety between W1 and W2. No significant differences were observed between mean scores at W1 and mean scores at W2 (*Pillai multivariate analysis*, $F=00$; $p=.94$; $\eta^2=.001$), or in terms of the wave*gender interaction ($F= 29$; $p=.58$; $\eta^2= .001$). The correlations between anxiety during W1 and W2 (Table 3) were between .37 and .44, which indicate mean rank-order stability in both the overall sample and in the gender-differentiated samples (men and women).

Significant differences were found between the two cohorts, with higher levels of anxiety in Cohort 2 than in Cohort 1 ($F=81.88$; $p<.001$; $\eta^2=.02$). These differences were observed in both the male ($F=13.07$; $p<.001$; $\eta^2=.01$) and the female samples ($F=65.30$; $p<.001$; $\eta^2=.03$), both with a small effect size.

Table 3. Rank-order stability of psychological distress

	W1-W2 Total	W1-W2 Men	W1-W2 Women
Depression	.40**	.33**	.44**
Anxiety	.42**	.37**	.44**
Stress	.39**	.35**	.40**

** $p < .001$. Eta squared: .01: small; .06: medium; .14: large

Stress: Mean-level stability was observed for stress between W1 and W2. No significant differences were observed between mean scores at W1 and mean scores at W2 (*Pillai multivariate analysis*, $F=3.53$; $p=.06$; $\eta^2=.009$), or in terms of the wave*gender interaction ($F= 78$; $p=.37$; $\eta^2= .002$). Table 3 shows the results of the correlations between stress during W1 and W2, with values of between .35 and .40, which indicate rank-order stability in both the overall sample and in the gender-differentiated samples (men and women).

Significant differences were found between the two cohorts, with higher levels of stress in Cohort 2 (2020) than in Cohort 1 (2015) ($F=48.41$; $p<.001$; $\eta^2=.01$). These

differences were observed in both the male ($F=10.73$; $p<.001$; $\eta^2=.01$) and the female samples ($F=31.54$; $p<.001$; $\eta^2=.01$), both with a small effect size.

To explore the possible existence of a joint cohort and gender effect on clinical DAS scores, first, a log-linear model was developed to determine whether or not there was any interaction between DAS, cohort and gender. The results revealed that the three-way interaction term (cohort*gender*depression/anxiety/stress) was not statistically significant in any of the three cases ($\chi^2=.65$; $p=.72$; $\chi^2=1.62$; $p=.44$; $\chi^2=2.36$; $p=.30$, respectively).

Table 4.

Severity distribution (%) of DASS-21 scores by cohort and gender.

	C1-C2					Men-Women				
	C1	C2	χ^2	p	V	M	W	χ^2	p	V
	%	%				%	%			
Depression										
1	59.2 ^a	40.6 ^b				52.8 ^a	47.2 ^b			
2	30.1 ^b	34.2 ^a	150.06	<.001	.21	31.9	32.5	14.74	<.001	.07
3	10.7 ^b	25.2 ^a				15.3 ^b	20.3 ^a			
Anxiety										
1	58.5 ^a	47.1 ^b				57.3 ^a	49.5 ^b			
2	25.9	25.8	68.66	<.001	.14	25.1	26.2	35.06	<.001	.08
3	15.6 ^b	27.2 ^a				17.5 ^b	24.3 ^a			
Stress										
1	57.2 ^a	49.1 ^b				60.2 ^a	48.5 ^b			
2	30.7	28.9	55.32	<.001	.13	28.4	30.5	59.17	<.00	.13
3	12.1 ^b	22.0 ^a				11.4 ^b	21.0 ^a			

1=Normal; 2= Mild/moderate; 3= Severe/extremely severe. Corrected typified residuals of over 1.96; Corrected typified residuals of under 1.96; Cramer's V .10: small; .30: medium; .50: large

Next, cohort and gender effects on DASS were analysed separately. These analyses (**Table 4**) revealed that Cohort 2 contained more younger people than would be expected by chance in the mild/moderate and severe/extremely severe depression ranges, as well as in the severe/extremely severe anxiety and stress ranges, with a small

effect size in all cases. These results were not observed for Cohort 1. In relation to gender, in the sample comprising the two cohorts, more women than would be expected by chance were found in the severe/extremely severe ranges of all three scales, and more men than would be expected by chance were found in the normal ranges. The effect size was negligible for the depression and anxiety scales and small for the stress scale.

Discussion

The results of the present study indicate that DAS scores remain stable between the initial and intermediate years of emerging adulthood, in terms of both mean-level stability and rank-order stability. Unlike that found in previous studies (e.g., Beiter et al., 2015; Othman et al., 2019; Puthran et al., 2016), the data therefore reflect more stability than changes in the DAS levels of young university students. This finding is particularly interesting because the present study used a varied sample that included graduate and postgraduate students, as well as those who had finished their postgraduate studies. In contrast, the studies cited above focused exclusively on undergraduates. As expected, and consistently with that reported by other previous studies that focused on the personality of young university students and included DAS variables, DAS levels were found to remain stable (e.g., Klimstra et al., 2018). Moreover, it is important to bear in mind that most of the emerging adults in the present study scored within the normal range for these variables. This finding supports the idea that, for most of the population, DAS is more a personality trait than a temporary state. Indeed, there is evidence in the extant literature to show that trait and state DAS are different issues maintained by different brain structures (Saviola et al., 2020).

The results of the present study also reveal that in 2020, DAS levels were higher than in 2015, with these differences being observed among both men and women. Equally, more young people (men and women) than would be expected by chance were found in the clinical range of DAS in 2020 than in 2015. These results indicate that the pandemic had a very negative effect on the wellbeing of young university students, as indeed has been reported by longitudinal studies carried out during the health crisis itself in both Spain (Ausín et al., 2022) and other European countries (Fancourt et al.,

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2020). The start of the pandemic was characterised by a series of very stressful events: fear of contagion and disease, very high death rates, lockdown, and drastic changes in the way classes were taught, etc. Exposure to these events most likely explains the higher levels of DAS found among young people assessed after the pandemic than among those assessed five years earlier. In 2015, young Spanish people continued to suffer the consequences of the recession triggered by the financial crisis of 2008, and youth unemployment rates continued to be very high. Nevertheless, their DAS levels were still lower than the ones reported by young people in the 2020 sample. The results of the present study, therefore, confirm that the emotional consequences of the 2020 health crisis for young people were unprecedented over recent decades (Varma, Junge, Meaklim & Jackson, 2021).

In terms of gender differences, women generally had higher levels of DAS than men and were also overrepresented in the severe/extremely severe DAS level ranges. This finding is consistent with that reported to date in the scientific literature, which indicates that women suffer more DAS than men (e.g., Ochnik et al., 2021). Traditionally, women have been considered more likely to report more physical and somatic symptoms than men (Gijsbers van Wijk & Kolk, 1997). Although this may indicate that they truly suffer more internal symptoms, it may also be the result of social desirability bias, to the extent that women may feel less embarrassed than men about talking about their distress. Whatever the case, the results presented here indicate gender differences, particularly in relation to stress, in both the second wave of the longitudinal study and in the two cohorts. Studies that have examined gender differences in relation to emotional health during the COVID-19 pandemic have found more emotional symptoms among women than among men, both in Spain (Muñoz-Fernández et al., 2021) and in other countries (Li et al., 2022). Although in this study effect sizes were small for all three DAS dimensions, the largest one was found for stress. One possible explanation for these differences may be found in Lazarus and Folkman's Transactional Stress and Coping Model (1984), combined with the stress process perspective proposed by Sandín (1999). Lazarus and Folkman's model holds that stress levels depend on a person's assessment of themselves and the nature of the situation and the resources available for successfully coping with it. It is known that women tend to value themselves less highly than men (e.g., Orth et al., 2010), which may perhaps explain

why the young women in this study perceived higher stress levels. Furthermore, previous research has found that women habitually have recourse to social coping strategies, such as seeking support (Reevy et al., 2001), whereas men tend to use more active ones that are mainly cognitive in nature (Cabanach, et al., 2009). The pandemic had a major impact on social relationships, thereby drastically affecting the more typically female way of coping with stressful situations. Moreover, the pandemic objectively worsened the living conditions of women more than it did the living conditions of men, since female workers suffered greater employment losses. Also, women were overrepresented among both first-line workers and unpaid caregivers (Kabeer et al., 2021). Female university students reported more concern about others and more difficulty focusing on schoolwork (Birmingham et al., 2021). Taken overall, these data may help explain the higher levels of stress found among the women in C2, during the COVID-19 pandemic.

The present study has certain limitations that should be taken into consideration. First, the entire emerging adulthood stage was not analysed, but rather just the early years. It would be interesting to explore also the changes that take place between the ages of 24 and 29 years. Second, although common in longitudinal studies, sample attrition in Wave 2 significantly reduced the size of the sample. Finally, having more women than men in the sample may have influenced the results of the study.

Despite these limitations, due to its novel design, which is the first of its kind in Spain to combine a longitudinal methodology with the comparison of two cohorts, the present study makes a significant contribution to the literature at two different levels. First, it highlights the need to take steps to mitigate the internal symptoms suffered by young university students who have been more affected by the COVID-19 pandemic than by the effects of the recession triggered by the 2008 financial crisis. And second, it underscores the need to do so from a gender perspective, paying special attention to the higher levels of internal symptoms, particularly stress, suffered by young women.

Although the present study was carried out in Spain, the conclusions drawn here can probably be extrapolated to other developed countries. While certain social, economic and cultural differences influenced how countries coped with the COVID-19 pandemic, in many places (including the USA, UK, Korea, Australia and China, for

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example), studies have shown that young people experienced the greatest increase in psychological distress (Jung et al., 2020; Le et al., 2020; McGinty et al., 2020; Pierce et al., 2020; Rossell et al 2020). Moreover, the seriousness and global nature of the pandemic, coupled with the common responses enacted by many countries (attempts to detect and isolate cases, lockdown orders and mass vaccinations, etc.), meant that the consequences for the population were very similar. These results are therefore relevant beyond Spain and may be extrapolated to other developed countries.

In future studies, we plan to contact the two samples once again to carry out a third wave (W3) in C1 and a second wave (W2) in C2. Having a third data collection point in our longitudinal study would provide an almost complete view of the evolution of DAS symptoms throughout the entire emerging adulthood period. Furthermore, analysing the sample recruited in 2020 again at a later date will provide greater insight into young people's recovery process and the resources that facilitate it. It is vital to pay attention to emerging adults and to design public health initiatives to provide them with the resources they need to enhance their resilience and optimise their development, particularly during moments of crisis.

Declaration of Conflicting Interests Statement: The Authors declare that there is no conflict of interest

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References

- Al-Qaisy, L. M. (2011). The relation of depression and anxiety in academic achievement among group of university students. *International journal of psychology and counselling*, 3(5), 96-100. <https://doi.org/10.5897/IJPC.9000056>
- Arnett, J. J. (2014). Presidential address: The emergence of emerging adulthood: A personal history. *Emerging Adulthood*, 2(3), 155-162. <https://doi.org/10.1177/2167696814541096>
- Ausín, B., González-Sanguino, C., Castellanos, M. A., Sáiz, J., Zamorano, S., Vaquero, C., & Muñoz, M. (2022). The Psychological Impact of the COVID-19 Pandemic in Spain: A Longitudinal Study. *Psicothema*, 34(1), 66-73. <https://doi.org/10.7334/psicothema2021.290>
- Bados, A., Solanas, A. y Andrés, R. (2005). Psychometric properties of the Spanish version of Depression, Anxiety and Stress Scales. *Psicothema*, 17, 679-683.
- Baltes, P.B., Reese, H. W. y Lipsitt, L.P: (1980). Life span developmental psychology. *Annual Review of Psychology*, 31, 65-110. <https://doi.org/10.1146/annurev.ps.31.020180.000433>
- Homel, J., Thompson, K., & Leadbeater, B. (2020). Changes in positive and negative peer influences and depressive symptoms from adolescence to young adulthood. *Journal of Adolescence*, 84, 113-122. <http://doi.org/10.1016/j.adolescence.2020.08.009>
- Bayram, N., & Bilgel, N. (2008). The prevalence and socio-demographic correlations of depression, anxiety and stress among a group of university students. *Social psychiatry and psychiatric epidemiology*, 43(8), 667-672. <https://doi.org/10.1007/s00127-008-0345-x>
- Beiter, R., Nash, R., McCrady, M., Rhoades, D., Linscomb, M., Clarahan, M., & Sammut, S. (2015). The prevalence and correlates of depression, anxiety, and stress in a sample of college students. *Journal of affective disorders*, 173, 90-96. <https://doi.org/10.1016/j.jad.2014.10.054>

- Diez, M., Parra, A., García-Mendoza, M.C., Sánchez-Queija, I. (2024). Depression, anxiety and stress among emerging adult undergraduates. A longitudinal and two-cohort study. *Health Education and Behavior*, 0(0). <https://doi.org/10.1177/10901981241240745>
- Birmingham, W. C., Wadsworth, L. L., Lassetter, J. H., Graff, T. C., Lauren, E., & Hung, M. (2021). COVID-19 lockdown: Impact on college students' lives. *Journal of American College Health*, 1-15. <https://doi.org/10.1080/07448481.2021.1909041>
- Blanco, C., Okuda, M., Wright, C., Hasin, D. S., Grant, B. F., Liu, S. M., & Olfson, M. (2008). Mental health of college students and their non-college-attending peers: results from the national epidemiologic study on alcohol and related conditions. *Archives of general psychiatry*, 65(12), 1429-1437. <https://doi.org/10.1001/archpsyc.65.12.1429>
- Denovan, A. and Macaskill, A. (2017) Stress and subjective well-being among first year UK undergraduate students. *Journal of Happiness Studies*, 18, 505–525. <https://doi.org/10.1007/s10902-016-9736-y>
- Cabanach, R.G., González, P. y Freire, C. (2009). El afrontamiento del estrés en estudiantes de ciencias de la salud. Diferencias entre hombres y mujeres [Coping with stress among health science students. Differences between men and women]. *Aula Abierta*, 37(2), 3-10
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates. <https://doi.org/10.4324/9780203771587>
- Cullinan, J., Walsh, S., Flannery, D., & Kennelly, B. (2022). A cross-sectional analysis of psychological distress among higher education students in Ireland. *Irish Journal of Psychological Medicine*, 1-9. <https://doi.org/10.1017/ipm.2022.2>
- Fancourt, D., Bu, F., Mak, H. W., & Steptoe, A. (2020). COVID-19 social study. *Results release*, 22. <https://www.nuffieldfoundation.org/wp-content/uploads/2022/04/COVID-19-Social-Study-Results-Release-7-April-2022.pdf>
- Gijsbers van Wijk, C.M.T. & Kolk, A.M. (1997). Sex differences in physical symptoms: the contribution of symptom perception theory. *Social Science and Medicine*, 45, 231-246. [https://doi.org/10.1016/S0277-9536\(96\)00340-1](https://doi.org/10.1016/S0277-9536(96)00340-1)

- Diez, M., Parra, A., García-Mendoza, M.C., Sánchez-Queija, I. (2024). Depression, anxiety and stress among emerging adult undergraduates. A longitudinal and two-cohort study. *Health Education and Behavior*, 0(0). <https://doi.org/10.1177/10901981241240745>
- Graham, J., Salimi-Khorshidi, G., Hagan, C., Walsh, N., Goodyer, I., Lennox, B., & Suckling, J. (2013). Meta-analytic evidence for neuroimaging models of depression: state or trait? *Journal of affective disorders*, 151(2), 423-431. <https://doi.org/10.1016/j.jad.2013.07.002>
- Homel, J., Thompson, K., & Leadbeater, B. (2020). Changes in positive and negative peer influences and depressive symptoms from adolescence to young adulthood. *Journal of Adolescence*, 84, 113-122. <http://doi.org/10.1016/j.adolescence.2020.08.009>
- Hunt, J., & Eisenberg, D. (2010). Mental health problems and help-seeking behavior among college students. *Journal of adolescent health*, 46(1), 3-10. <https://doi.org/10.1016/j.jadohealth.2009.08.008>
- Instituto nacional de estadística (INE) (2015). Encuesta de Población Activa (EPA). Madrid: INE. <https://www.ine.es/daco/daco42/daco4211/epa0315.pdf>
- Jiang, W., Luo, J., & Guan, H. (2021). Gender Difference in the Relationship of Physical Activity and Subjective Happiness Among Chinese University Students. *Frontiers in psychology*, 12. <https://doi.org/10.3389/fpsyg.2021.800515>
- Johansson, F., Côté, P., Hogg-Johnson, S., Rudman, A., Holm, L. W., Grotle, M., ... & Skillgate, E. (2021). Depression, anxiety and stress among Swedish university students before and during six months of the COVID-19 pandemic: A cohort study. *Scandinavian journal of public health*, 49(7), 741-749. <https://doi.org/10.1177/14034948211015814>
- Jung, S. J., Yang, J. S., Jeon, Y. J., Kim, K., Yoon, J. H., Lori, C., Koenen, K. & Kim, H. C. (2020). The Impact of COVID-19 on Psychological Health in Korea: A Mental Health Survey in Community Prospective Cohort Data. *Available at SSRN 3618193*.
- Kabeer, N., Razavi, S., & van der Meulen Rodgers, Y. (2021). Feminist economic perspectives on the COVID-19 pandemic. *Feminist Economics*, 27(1-2), 1-29. <https://doi.org/10.1080/13545701.2021.1876906>
- Kathleen, M.H. (2010): «Impact of the economic downturn on young adults», Congressional Briefing on Recession and Recovery: How are Americans

Diez, M., Parra, A., García-Mendoza, M.C., Sánchez-Queija, I. (2024). Depression, anxiety and stress among emerging adult undergraduates. A longitudinal and two-cohort study. *Health Education and Behavior*, 0(0). <https://doi.org/10.1177/10901981241240745>

Affected?, sponsored by the Population Association of America, Washington, DC: Capitol Hill
Kellett, S., Webb, K., Wilkinson, N., Bliss, P., Ayers, T., & Hardy, G. (2016). Developing services for patients with depression or anxiety in the context of long-term physical health conditions and medically unexplained symptoms: Evaluation of an IAPT pathfinder site. *Behavioural and Cognitive Psychotherapy*, 44, 553–567. <https://doi.org/10.1017/s1352465816000114>

Klimstra, T. A., Nofle, E. E., Luyckx, K., Goossens, L., & Robins, R. W. (2018). Personality development and adjustment in college: A multifaceted, cross-national view. *Journal of Personality and Social Psychology*, 115(2), 338–361. <https://doi.org/10.1037/pspp0000205>

Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. New York: Springer.

Lee, C. M., Cadigan, J. M., & Rhew, I. C. (2020). Increases in loneliness among young adults during the COVID-19 pandemic and association with increases in mental health problems. *Journal of Adolescent Health*, 67(5), 714-717. <http://doi.org/10.1016/j.jadohealth.2020.08.009>

Lee, J., Jeong, H. J., & Kim, S. (2021). Stress, anxiety, and depression among undergraduate students during the COVID-19 pandemic and their use of mental health services. *Innovative Higher Education*, 46, 519-538. <https://doi.org/10.1007/s10755-021-09552-y>

Li, M., Yu, C., Zuo, X., Karp, C., Ramaiya, A., Blum, R., & Moreau, C. (2022). COVID-19 Experiences and Health-Related Implications: Results From a Mixed-Method Longitudinal Study of Urban Poor Adolescents in Shanghai. *Journal of Adolescent Health*. <https://doi.org/10.1016/j.jadohealth.2022.03.016>

Li Y, Qin Q, Sun Q, Sanford LD, Vgontzas AN, Tang X. Insomnia and psychological reactions during the COVID-19 outbreak in China. *J Clin Sleep Med*. 2020;16(8):1417–1418.

Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck

Diez, M., Parra, A., García-Mendoza, M.C., Sánchez-Queija, I. (2024). Depression, anxiety and stress among emerging adult undergraduates. A longitudinal and two-cohort study. *Health Education and Behavior*, 0(0). <https://doi.org/10.1177/10901981241240745>

Depression and Anxiety Inventories. *Behaviour research and therapy*, 33(3), 335-343.

Manti, P., Mastrogiannis, D., Mantzourou, M., Adamakidou, T., Mantoudi, A., Stefanidou, S., & Timmins, F. (2022). Stress levels and coping strategies among undergraduate nursing students in Greece during economic recession: a cross-sectional study. *Nurse Education in Practice*, 60, 103299. <https://doi.org/10.1016/j.nepr.2022.103299>

McGinty, E.E., Presskreischer, R., Han, H., Barry, C.L., 2020. Psychological distress and loneliness reported by US adults in 2018 and April 2020. *JAMA* 324 (1), 93–94.

Ministerio de Educación, Cultura y Deporte (2020). Datos y cifras del Sistema Universitario Español. Curso 2019–20. [Data and figures of the Spanish University System. Academic year 2019–2020]. Madrid: Ministerio de Educación, Cultura y Deporte.

Moreno, A., López, A., & Segado, S. S. (2012). La transición de los jóvenes a la vida adulta. *Barcelona: Obra Social "La Caixa*.

Mucci, N., Giorgi, G., Roncaioli, M., Perez, J. F., & Arcangeli, G. (2016). The correlation between stress and economic crisis: a systematic review. *Neuropsychiatric disease and treatment*, 12, 983. <https://doi.org/10.2147/NDT.S98525>

Muñoz-Fernández, Noelia, and Ana Rodríguez-Meirinhos. "Adolescents' concerns, routines, peer activities, frustration, and optimism in the time of COVID-19 confinement in Spain." *Journal of Clinical Medicine* 10.4 (2021): 798. <https://doi.org/10.3390/jcm10040798>

Muñoz-Navarro, R., Cano Vindel, A., Schmitz, F., Cabello, R., & Fernández-Berrocal, P. (2021). Emotional disorders during the COVID-19 outbreak in Spain: the role of sociodemographic risk factors and cognitive emotion regulation strategies. *Health Education & Behavior*, 48(4), 412-423. <http://doi.org/10.1177/10901981211014101>

Diez, M., Parra, A., García-Mendoza, M.C., Sánchez-Queija, I. (2024). Depression, anxiety and stress among emerging adult undergraduates. A longitudinal and two-cohort study. *Health Education and Behavior*, 0(0). <https://doi.org/10.1177/10901981241240745>

Ochnik, D., Rogowska, A. M., Kuśnierz, C., Jakubiak, M., Schütz, A., Held, M. J., ... & Cuero-Acosta, Y. A. (2021). Mental health prevalence and predictors among university students in nine countries during the COVID-19 pandemic: A cross-national study. *Scientific reports*, 11(1), 1-13. | <https://doi.org/10.1038/s41598-021-97697-3>

Orth, U., Trzesniewski, K. H., & Robins, R. W. (2010). Self-esteem development from young adulthood to old age: A cohort-sequential longitudinal study. *Journal of Personality and Social Psychology*, 98(4), 645–658. <https://doi.org/10.1037/a0018769>

Oswalt, S.B., Lederer, A.M., Chestnut-Steich, K., Day, C., Halbritter, A. & Ortiz, D. (2020). Trends in college students' mental health diagnoses and utilization of services 2009-2015. *Journal of American College Health*, 68 (1), 41-51. <https://doi.org/10.1080/07448481.2018.1515748>

Othman, N., Ahmad, F., El Morr, C., & Ritvo, P. (2019). Perceived impact of contextual determinants on depression, anxiety and stress: a survey with university students. *International journal of mental health systems*, 13(1), 1-9. <https://doi.org/10.1186/s13033-019-0275-x>

Patelarou, A., Mechili, E. A., Galanis, P., Zografakis-Sfakianakis, M., Konstantinidis, T., Saliadj, A., ... & Patelarou, E. (2021). Nursing students, mental health status during COVID-19 quarantine: evidence from three European countries. *Journal of Mental Health*, 30(2), 164-169. <https://doi.org/10.1080/09638237.2021.1875420>

Pew Research Center (september 3, 2015). The Whys and Hows of Generations Research. <https://www.pewresearch.org/politics/2015/09/03/the-whys-and-hows-of-generations-research/>

Pierce, M., Hope, H., Ford, T., et al., 2020. Mental health before and during the COVID- 19 pandemic: a longitudinal probability sample survey of the UK population. *Lancet Psychiatry* 7 (10), 883–892.

Popa-Velea, O., Pîrvan, I., & Diaconescu, L. V. (2021). The Impact of Self-Efficacy, Optimism, Resilience and Perceived Stress on Academic Performance and Its Subjective Evaluation: A Cross-Sectional Study. *International Journal of*

Diez, M., Parra, A., García-Mendoza, M.C., Sánchez-Queija, I. (2024). Depression, anxiety and stress among emerging adult undergraduates. A longitudinal and two-cohort study. *Health Education and Behavior*, 0(0). <https://doi.org/10.1177/10901981241240745>

Environmental Research and Public Health, 18(17), 8911.

<https://doi.org/10.3390/ijerph18178911>

Puthran, R., Zhang, M. W., Tam, W. W., & Ho, R. C. (2016). Prevalence of depression amongst medical students: A meta-analysis. *Medical education*, 50(4), 456-468. <https://doi.org/10.1111/medu.12962>

Quek, T.T., Tam, W.W., Tran, B.X., Zhang, M., Zhang, Z., Ho, C.S., Ho, R.C. (2019). The global prevalence of anxiety among medical students: A meta-analysis. *International Journal of Environmental Research and Public Health*. 16, 2735. <https://doi.org/10.3390/ijerph16152735>.

Reevy, G. M., & Maslach, C. (2001). Use of social support: Gender and personality differences. *Sex roles*, 44(7), 437-459. <https://doi.org/10.1023/A:1011930128829>

Reifman, A., Arnett, J. J., & Colwell, M. J. (2007). Emerging adulthood: Theory, assessment and application. *Journal of Youth Development*, 2(1), 37-48. <https://doi.org/10.5195/jyd.2007.359>

Rossell, S., Neill, E., Phillipou, A., et al., 2020. An overview of current mental health in the general population of Australia during the COVID-19 pandemic: Results from the COLLATE project. medRxiv 2020.07.16.20155887.

Sandín, B. (1999). *El estrés psicosocial: Conceptos y consecuencias clínicas*. Klinik.

Saviola, F., Pappaianni, E., Monti, A., Grecucci, A., Jovicich, J., & De Pisapia, N. (2020). Trait and state anxiety are mapped differently in the human brain. *Scientific Reports*, 10(1), 1-11. <https://doi.org/10.1038/s41598-020-68008-z>

Tung, Y. J., Lo, K. K., Ho, R. C., & Tam, W. S. W. (2018). Prevalence of depression among nursing students: A systematic review and meta-analysis. *Nurse education today*, 63, 119-129. <https://doi.org/10.1016/j.nedt.2018.01.009>

Varma, P., Junge, M., Meaklim, H., & Jackson, M. L. (2021). Younger people are more vulnerable to stress, anxiety and depression during COVID-19 pandemic: A global cross-sectional survey. *Progress in Neuro-Psychopharmacology and Biological Psychiatry*, 109, 110236.

Diez, M., Parra, A., García-Mendoza, M.C., Sánchez-Queija, I. (2024). Depression, anxiety and stress among emerging adult undergraduates. A longitudinal and two-cohort study. *Health Education and Behavior*, 0(0). <https://doi.org/10.1177/10901981241240745>

World Health Organization. Regional Office for Europe. (2015). *The European Mental Health Action Plan 2013–2020*. World Health Organization. Regional Office for Europe. <https://apps.who.int/iris/handle/10665/175672>

World Health Organization. Regional Office for Europe (2022). *Regional technical consultation on implementation of the WHO European Framework for Action on Mental Health 2021–2025 through the Pan-European Mental Health Coalition: virtual meeting, 15–16 February 2022*. World Health Organization. Regional Office for Europe. <https://apps.who.int/iris/handle/10665/353412>.

Díez, M., Parra, A., García-Mendoza, M.C., Sánchez-Queija, I. (2024). Depression, anxiety and stress among emerging adult undergraduates. A longitudinal and two-cohort study. *Health Education and Behavior*, 0(0). <https://doi.org/10.1177/10901981241240745>