



## ORIGINAL ARTICLE

## Psychometric Properties of the Patient Health Questionnaire-15 (PHQ-15) and the General Health Questionnaire-28 (GHQ-28). Validation in Spanish University Students During COVID-19 Outbreak

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### Introduction

Nowadays, the emergence of a novel form of Coronavirus (COVID-19) has created a confused and rapidly evolving situation. 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.

In this situational framework, many people are vulnerable to the emotional impact of coronavirus suffer mental health problems and disorders [1,2] with significant psychological symptoms related to anxiety, stress and depression [3-5]. Even, important psychological effects and psychological symptoms have been pointed in university students [5-8]. However, somatic symptoms and psychological impact of the somatic symptoms, has

received little attention in the context of the current pandemic between college students.

Somatic symptoms and somatization process is prevalent in primary care and is associated with substantial functional impairment and healthcare utilization. However, instruments for identifying and monitoring somatic symptoms are few in number and not widely used. Adequate psychometric instruments are needed to know and check somatic symptoms.

One of the most commonly used questionnaires is the Patient Health Questionnaire (PHQ-15), which has been recommended by the American Psychiatric Association (2013) [9] as an emerging measure of somatic symptoms in general population [10,11].

The PHQ-15 developed by Kroenke, Spitzer &



**Citation:** Lorca AM, Lorca MM, Álvarez JJC, García JA, Armesilla MDC (2021) Psychometric Properties of the Patient Health Questionnaire-15 (PHQ-15) and the General Health Questionnaire-28 (GHQ-28). Validation in Spanish University Students During COVID-19 Outbreak. Int J Psychol Psychoanal 6:049. doi.org/10.23937/2572-4037.1510049

**Accepted:** June 19, 2021; **Published:** June 21, 2021

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Williams (2002) [12], is a brief, self-administered somatic symptoms scale that is useful in screening for somatization and in monitoring somatic symptom severity in clinical practice and research. It screens for 15 somatic symptoms that account for more than 90% of the somatic symptoms reported in the primary care setting [10-12]. High scores on the PHQ-15 are strongly associated with functional impairment, disability, health care use and with somatoform disorder symptom [13].

For these reasons, the PHQ-15 is one of the two best somatic symptom scales available [14]. The PHQ-15 has also been used as a secondary measure in a variety of different studies examining mental disorders or physical symptom syndromes [13]. However, there are discrepancies about the internal consistency and factorial structure of the PHQ-15. Different studies have been performed to investigate whether the latent structure of somatic symptoms reflects one or more constructs. Some studies found three, four, or even five specific factors (although the most recent data support the four-factor structure). Another, studies conducted two factors-cardiopulmonary and gastrointestinal symptoms -whereas other factors-pain, fatigue, and neurological symptoms-are not. And other researches showed a bifactor structure, providing both a single global measure of somatisation and specific measures of pain, gastrointestinal, cardiopulmonary and fatigue factors [10,11,15]. However, the current level of evidence for the factor structure of the PHQ-15 is neither sufficient nor unequivocal.

Another, questionnaire is the General Health Questionnaire-28 (GHQ-28) developed by [16-18]. It is a self-report instrument, most widely used and validated questionnaires to screen for common mental disorders in non-psychiatric populations, for emotional distress, to detect those likely to have or to be at risk of developing psychiatric disorders and possible psychiatric morbidity and it is a community screening tool and for the detection of non-specific psychiatric disorders among individuals in primary care setting [19,20].

It has been tested in numerous populations and has since been translated into 38 languages [19,20] and prepared mainly for research purposes. The factor analysis of the GHQ-28 has found a four-factor structure of GHQ-28 (A: Somatic symptoms, B: Anxiety and insomnia, C: Social dysfunction, and D: Depression). The existence of four subscales permits analyses within the subscales [19-23].

Both questionnaires are two of the most frequently used psychopathology screening questionnaires in mental health in the detection and assessment of individuals with an increased likelihood of current psychiatric disorders and somatic symptoms [13, 23]. Therefore, it is crucial to analyze these during the COVID-19 crisis and confinement in order to develop measures and implement psychological interventions properly adjusted

to this situation [7,8,24].

The present study was undertaken to assess the internal consistency and factorial structure of the PHQ-15 and GHQ-28 in Spanish university students during the confinement of the COVID-19 pandemic. With this work we try to contribute some of the needed empirical supporting data in order to ensure the psychometric characteristics attributed to these questionnaires. Furthermore, we try to know the severity of somatic symptoms and psychological disorders.

## Methods

### Participants and procedure

This was a descriptive, epidemiological, cross-sectional study. The target population was university students in different degrees and years of study at the University of Castilla-La Mancha at its campus in Talavera de la Reina (n = 473) (Table 1). Non-probability quota sampling was used. The inclusion criteria of the study were minimum age of 18 years and being enrolled in a university degree course, years 1 to 4.

The sampling process was carried out with the collaboration of the academic secretary's office of the Faculty of Health Sciences and the Faculty of Social Sciences at the University of Castilla-La Mancha. Social

**Table 1:** Socio-demographic data.

<b>Entire Cohort</b>	<b>(n = 473)</b>
Age (median. SD)	21.6 (4.18)
	Range (18-54)
<b>Sex (n. %)</b>	
Male	56 (11.8)
Female	417 (88.2)
<b>Degrees (n. %)</b>	
<b>Health Sciences</b>	<b>330 (69.8)</b>
Nursing	102 (21.6)
Podiatry + Nursing	29 (6.1)
Speech and Language Therapy	102 (21.6)
Occupational Therapy	82 (17.3)
Podiatry	15 (3.2)
<b>Social Sciences</b>	<b>139 (29.4)</b>
Working Social	53 (11.2)
Education Social	50 (10.6)
Business Administration and Management	36 (7.6)
<b>Others Degrees</b>	<b>4 (0.8)</b>
<b>Course (n. %)</b>	
First	189 (40)
Second	106 (22.4)
Third	90 (19)
Fourth	88 (18.6)

media and WhatsApp were also used among students, colleagues and friends.

Participants were recruited by e-mail, having received an e-mail from the secretary of the University. This study received ethical approval and was supervised by the Research Commission of the Integrated Healthcare Services, in Talavera de la Reina, Spain (45/2019). Informed consent was obtained electronically before data were collected from the participants.

Data collection began on 12 May 2020 eight weeks after the Spanish government decreed a state of alarm. The online questionnaire was openly accessible for 7 days from 12 May 2020 to 19 May 2020 (Google Forms®). On 12 May 2020, the university secretary's office sent an email from the corporate platform to students from all years enrolled in degrees in the previously mentioned faculties, explaining the aim of the research and including a link to respond to the questionnaire. Students, colleagues, and friends were also asked to invite others to respond.

### Instruments

An anonymous online questionnaire was developed for this study. First, we collected background demographic information on gender, age, degree and year of study.

Second, we administered the GHQ-28. It was developed by Goldberg in 1972 [17]. The GHQ-28 is a 28-item measure of emotional distress in the last few weeks, and is therefore an indication of state rather than trait characteristics at a point in time. Through factor analysis, the GHQ-28 has been divided into four subscales: Somatic symptoms (items 1-7); anxiety/insomnia (items 8-14); social dysfunction (items 15-21), and severe depression (items 22-28). Answers on the GHQ are coded on a 4-point Likert scale (0-1-2-3) or on a dichotomous GHQ scale (0-0-1-1). We used the GHQ scale where the GHQ-28 can be scored with a binary method where "not at all", and "no more than usual" score 0, and "rather more than usual" and "much more than usual" score 1. Using this method any score above 4 indicates the presence of distress or 'caseness'. The Cronbach's  $\alpha$  has been excellent (0.9-0.95).

The Spanish-language version of the GHQ-28 by Lobo and Muñoz (1986) [25,26] was used for this study which have a good psychometric measures (Cronbach's  $\alpha$  0.90).

Third, we administered the Patient Health Questionnaire PHQ-15 developed by Kroenke, et al. (2002) [12]. It is a self-administered 15 somatic symptoms in the last four weeks. The PHQ-15 comprises 15 somatic symptoms, each symptom scored from 0 ("not bothered at all") to 2 ("bothered a lot"). The total PHQ-15 score ranges from 0 to 30 and scores of  $\geq 5$ ,  $\geq 10$ ,  $\geq 15$  repre-

sent mild, moderate, and severe levels of somatization. The Cronbach's  $\alpha$  is 0.8.

We used for this research the Spanish version of the PHQ-15 by Ros Montalbán, et al. (2010) [27] with adequate psychometric properties (Cronbach's  $\alpha$  0.78).

### Data analysis

Data analysis was conducted using the IBM® SPSS® Statistics 22.0. For the statistical analysis, we first checked whether the variables to be statistically analysed were normally distributed, using the K-S test for normality. The sample did not follow a normal distribution of data, as indicated by the analysis of the Kolmogorov-Smirnov test of normality, in which all the variables evaluated follow a probability of less than or equal to 0.05. Therefore, for the data analysis, we performed the non-parametric Mann-Whitney test, which is the non-parametric test parallel to the t test for independent samples. A confidence level of .05 was taken into account for all statistical analyses. In addition, descriptive and frequency distribution (mainly means and standard deviations) and Chi-square independence tests were used.

Analyses of psychometric properties and statistical analyses were carried out using R version 4.0.0, and the following R packages: GPArotation [28], psych [29], and Rcmdr [30]. In order to account for the ordinal nature of the items, the polychoric correlation matrix was used [31]. Thus, following the Viladrich, Angulo-Brunet, and Doval's (2017) [32] recommendations the ordinal omega coefficient (ordinal  $\omega$ ) was used to estimate internal consistency reliability of the scores because the underlying models were congeneric not essentially tau-equivalent.

## Results

### GHQ-28 and PHQ-15 mean scores

Table 2 shows the data regarding PHQ-15, GHQ-28 and subscales mean scores in the study. The total PHQ-15 mean score was 12.90 and GHQ-28 was 13.67. Both mean scores were above the normal point. However, the mean score on the subscale anxiety and insomnia was higher than the rest of subscales.

**Table 2:** Descriptive statistics in measures of GHQ-28 and PHQ-15 in total sample.

	TOTAL (473)		
	M (SD)	Min	Max
<b>Somaticsymptoms</b>	3.87 (2.16)	0	7
<b>Anxiety and insomnia</b>	4.71 (2.18)	0	7
<b>Social dysfunction</b>	3.77 (2.24)	0	7
<b>Severedepression</b>	1.3 (1.64)	0	7
<b>Total GHQ-28</b>	13.67 (6.67)	0	28
<b>Total PHQ-15</b>	12.90 (5.59)	0	28

**Table 3:** Association of GHQ-28 and PHQ-15 and gender, degree and course, mean ranges.

	Somatic symptoms	Anxiety and insomnia	Social dysfunction	Severe depression	Total GHQ-28	Total PHQ-15
<b>Sex (n)</b>						
Male (56)	201.35*	179.92**			189.71**	148.71**
Female (417)	241.79	244.67			243.35	248.86
<b>Degree (n)</b>						
H.S (330) vs. O.D (4)		168.65/72.50				
S.S (139) vs O.D (4)		73.14/32.25				
<b>Course(n)</b>						
1° (189) vs. 2° (106)			138.59/164.78*	131.98/156.84*		
1° (189) vs. 3° (90)						

\*\*=  $p < 0.01$ ; \* =  $p < 0.05$

### Association of GHQ-28 and PHQ-15 and gender, degree and course

We can see GHQ-28 and PHQ-15 significant differences by gender, degree and course (Table 3). In general, males reported significantly less symptoms than females in somatic symptoms ( $Z$ :- 2,101;  $p \leq 0.036$ ); anxiety and insomnia ( $Z$ :- 3,387;  $p \leq 0.001$ ); total GHQ-28 ( $Z$ :- 2,760;  $p \leq 0.006$ ) and PHQ-15 ( $Z$ :- 5,156;  $p \leq 0.000$ ).

Students enrolled in Social Sciences degrees scored higher mean ranges in anxiety and insomnia ( $Z$ :- 1,981;  $p \leq 0.048$ ) than students enrolled in other degrees. And students enrolled in Health Sciences degrees scored higher mean ranges in anxiety and insomnia ( $Z$ :- 2,014;  $p \leq 0.044$ ) than students in other degrees.

Regarding the academic year, we found two significant differences between students enrolled in different courses. Third-year students showed higher mean ranges ( $Z$ :- 2,527;  $p \leq 0.012$ ) in severe depression than those enrolled in 1<sup>st</sup>. And second-year students showed higher mean ranges ( $Z$ :- 2,552;  $p \leq 0.011$ ) in social dysfunction than those enrolled in 1<sup>st</sup>.

### Exploratory factor analyses

As regards the process of validation of the PHQ-15, in the exploratory factor analysis the KMO coefficient showed a value of 0.771, while Bartlett's statistic ( $\chi^2$  (105) = 3317.2  $p < 0.000$ ) was significant, suggesting that the data matrix is appropriate for conducting an exploratory factor analysis. The parallel analysis [33] revealed a dimension explaining more variance than expected in random matrices. This factor overall explained 40.2% of the total variance for the 15 items on the instrument.

All items loadings of the general factor model were statistically significant ( $p < 0.01$ ), ranging from 0.359 to 0.719.

In the exploratory factor analysis of the GHQ-28, the KMO coefficient was significant, suggesting that the data matrix is appropriate for conducting an exploratory factor analysis. The parallel analysis [33] revealed four factors, although different items (7, 8, 9, 21 y 26) load onto one other factor different from the original scale, were not well represented and showed low extraction. These five items (7, 8, 9, 21 y 26) were subsequently dropped from the questionnaire. In the exploratory factor analysis of GHQ-28 (without item 7, 8, 9, 21 y 26) the KMO coefficient showed a value of 0.94335, while Bartlett's statistic ( $\chi^2$  (253) = 5347.8,  $p < 0.000$ ) was significant, suggesting that the data matrix is appropriate. The parallel analysis [33] revealed four factors explaining together 66.7% of the variance. Table 4 shows the psychometric properties and those of the items.

The items on each of the four factors were the following:

- Somatic Symptoms: 1, 2, 3, 4, 5, 6
- Anxiety/Insomnia: 10, 11, 12, 13, 14
- Social Dysfunction: 15, 16, 17, 18, 19, 20
- Severe Depression: 22, 23, 24, 25, 27, 28

### Internal consistency

The GHQ-28 and PHQ-15 showed good alpha measures of internal consistency or reliability analysis. The findings on reliability allow us to affirm that the PHQ-15 scores were adequate in their internal consistency as measured by ordinal alpha ( $O\alpha = 0.86$ ) and ordinal omega ( $O\omega = 0.9$ ). The GHQ-28 measures were also adequate: Ordinal alpha F1 ( $O\alpha = 0.71$ ); F2 ( $O\alpha = 0.71$ ); F3 ( $O\alpha = 0.71$ ) and F4 ( $O\alpha = 0.71$ ) and ordinal omega in each of the four factors above of 0.9.

### Construct validity

Criterion validity was supported by the GHQ-28 and

**Table 4:** Item loadings of GHQ-28 and PHQ-15.

Item GHQ-28	Factor structure			
	Factor 1 Social Dysfunction	Factor 2 Somatic Symptoms	Factor 3 Severe Depression	Factor 4 Anxiety/ Insomnia
1		0.569		
2		0.491		
3		0.667		
4		0.609		
5		0.847		
6		0.582		
10				0.708
11				0.773
12				0.482
13				0.750
14				0.947
15	0.430			
16	0.630			
17	0.928			
18	0.885			
19	0.766		0.331	
20	0.565			
22			0.525	
23	0.428		0.447	
24			0.729	
25			0.937	
27			0.834	
28			0.772	
Item PHQ-15	Factor structure			
1	0.633			
2	0.513			
3	0.463			
4	0.359			
5	0.655			
6	0.707			
7	0.634			
8	0.657			
9	0.718			
10	0.666			
11	0.392			
12	0.549			
13	0.719			
14	0.618			
15	0.589			

\*Extraction method: Factor loadings using the extraction method: Unweighted least squares.



**Table 5:** Correlations between the subscales and the total scale GHQ-28 and PHQ-15.

	Somatic Symptoms	Anxiety and Insomnia	Social Dysfunction	Severe Depression	Total GHQ-28	Total PHQ-15
<b>Somatic Symptoms</b>	1.000	0.662** 0.000	0.535** 0.000	0.455** 0.000	0.833** 0.000	0.671** 0.000
<b>Anxiety and Insomnia</b>		1.000	0.559** 0.000	0.462** 0.000	0.843** 0.000	0.622** 0.000
<b>Social Dysfunction</b>			1.000	0.529** 0.000	0.823** 0.000	0.516** 0.000
<b>Severe Depression</b>				1.000	0.723** 0.000	0.496** 0.000
<b>Total GHQ-28</b>					1.000	0.716** 0.000
<b>Total PHQ-15</b>						1.000

\*\* =  $p < 0.01$

PHQ-15 as indicated by the significant correlations (both  $p < 0.000$ ). There were significant positive correlations between each subscale and the total scale of GHQ-28 (see Table 5). The correlation between the subscale Severe Depression and the total scale of GHQ-28 (0.723) was lower than the correlations between subscales Social Dysfunction (0.823), Somatic Symptoms (0.833) and Anxiety and Insomnia (0.843) and the total scale GHQ-28. The intersubscale correlations ranging from 0.455 to 0.529 indicate considerable overlap between the subscales. Besides, were significant correlations by the GHQ-28 and his scales and PHQ-15 where scores were moderate in all the measures.

## Discussion

On the one hand, the present work aims to know the severity of somatic symptoms and psychological disorders measured by two questionnaires (PHQ-15 and GHQ-28) in a sample of Spanish university students during quarantine because of the global pandemic caused by COVID-19. On the other hand, the aim of the present work was to assess the psychometric properties of both questionnaires.

### GHQ-28

The scores obtained by our university students on the total GHQ-28 [17] suggest that health in Spanish university students are normal with scores are not particularly high. These results were similar with other studies with college [21-23] and with general population [19]. However, the scores in sub-scales on GHQ-28 indicated moderate levels of anxiety and insomnia, medium levels of somatic symptoms and social dysfunction. Sub-scale severe depression was so low. Other studies with university students found elevate levels of social dysfunction subscale [23] and severe depression subscale [21,22]. The high prevalence of psychological symptoms (depression, anxiety, and stress) in university students has been

frequently pointed out [34,35] and recently in this situation of COVID-19 pandemic [5,8], even among Spanish university students [7]. However, in our results we found moderate scores but more research would be needed to elucidate this issue.

The relationships between the variables revealed few significant differences. Firstly, women had significantly higher mean ranges than men in somatic symptoms, anxiety and insomnia and total GHQ-28. It is similar in Ignatyev, et al. (2012) [19]. However, no difference was found by Farahangiz, et al. (2016) [21] and Makhal, et al. (2015) [22] in GHQ-28 subscales between male and female students.

Secondly, students of Social Sciences degrees (Education Social Work, Social Education and Business Administration and Management) and Health Sciences degrees (Speech and Language Therapy, Occupational Therapy, Podiatry, Nursing and the double degree in Podiatry and Nursing) showed significant associations only in anxiety and insomnia subscale than students enrolled in other degrees. Previous studies have found prevalence of anxiety symptomatology among Spanish college in different degrees, basically in Arts and Humanities degrees [7,36]. Even, among Canadian medical students [37] reported higher mean scores of anxiety and insomnia rather than somatic and social subscales due to high proportion of these morbidities measured by their specific tools, and this shows that years of training may negatively influence mental health [21].

Finally, our study did not find any significant difference in GHQ-28 scores among the students of different academic year except 3<sup>rd</sup> and 2<sup>nd</sup> year students. Third-year students showed higher mean ranges in severe depression than those enrolled in 1<sup>st</sup>. And second-year students in social dysfunction than those enrolled in 1<sup>st</sup>. Makhal, et al. (2015) [22] with dental students found an increased psychological morbidity

among 3<sup>rd</sup> year students in total score in GHQ-28. With medical students, Farahangiz, et al. (2016) [21], the third and fourth year medical students had higher mean scores in all subscales of GHQ-28. Although Uner, et al. (2008) [38] no showed significant difference between the first- and fourth-year students.

There seems to be no evident explanation for these findings because in general there were not differences between degrees and academic years. In fact, the emotional distress measured with GHQ-28 affect all degrees and courses and the results do not allow detect those likely to have or to be at risk of developing psychiatric disorders and possible psychiatric morbidity for each degree or academic year. In previous studies with Spanish university students [36] were difficult to find a particular profile of students according to their degree or course. However, our results, as a consequence of the emotional impact of the COVID-19 pandemic in 2<sup>nd</sup> and 3<sup>rd</sup> college, could be related to factors such as their perception of the future, the uncertainty and the potential negative impact on academic progress, the poor academic performance, the longer time exposure to stress during the years of education and the future consequences of pandemic in their lives, etc. [7,21,22]. Future research is needed to confirm this results.

With this low effect size and with impossibility to confirm a characteristic emotional profile of students according to their degree of study, we could suggested that our Faculties should collaborate to resolve this problem in order to provide high-quality, timely crisis-oriented psychological services to students to reduce psychological distress and prevent further mental health problems [6,7,36] because our university students have more anxiety and insomnia than other college and among our students of final courses.

In this context, promoting healthy habits and offering counselling and psychological treatment for university students is tantamount to improving the quality of their education and daily lives.

The factor structure of GHQ-28 showed a plausible factor structure with four factors explaining 66.7% of the variance. The factors explained more variance than in most other studies [19,20,23]. However, different items (7, 8, 9, 21 y 26) were not well represented and showed low extraction and were subsequently dropped from the questionnaire. The 28 items of the GHQ total scale can be divided into four subscales with different number of items in each subscale. Somatic symptoms, social dysfunction and severe depression subscales lost one item each factor. However, anxiety and insomnia subscale showed a low stability and items 8 and 9 did not sufficiently load on the factor. Previous studies have found different number of items in each factor [19,20].

We can conclude that the validation in Spanish college did not support the structure of the original scale of

GHQ-28 in some items [12,25,26]. This is an interesting finding and future studies have to test GHQ-28 and try to establish the optimal number. However, we can say that the GHQ-28 is a suitable screening instrument for Spanish university students but is necessary to develop other studies with larger samples of general population and in different times on the pandemic situation.

Despite the inconsistency in the number of items for each factor, the GHQ-28 showed good measures of internal consistency or reliability analysis. It could be said that the GHQ-28 scores were adequate in their internal consistency as measured by ordinal alpha and omega. Other studies have found good internal consistency [19,20,23].

The concurrent validity of the total scale of GHQ-28 significantly correlated with subscales of GHQ-28. The intersubscale correlations between each subscale and the total scale of GHQ-28, could indicate considerable overlap between the subscales and comorbid disorders. It finding was similar in other studies [19,20,23].

### PHQ-15

The scores obtained by our undergraduates on the total PHQ-15 [12] suggest that somatic symptoms among Spanish university students are normal with a medium somatic symptoms severity. However, Hinz, et al. (2017) [11] found low scores with scores above the normal point.

Our study did not find any significant difference in PHQ-15 scores among the variables except gender. Mean ranges were higher for women compared to men. These were similar to previous studies [11,13]. These results would indicate the presence of a gender pattern where women have a tendency to suffer somatic symptoms or somatise. So, the prevention, identification and treatment of somatic symptoms in female should be included amongst the concerns and competences of Universities because they are a risk group in COVID-19 crisis.

In this case, we can conclude that somatic symptoms are not different among degrees and academic year. Total somatic symptoms are similar among Spanish university students in this moment of COVID-19 pandemic.

Another aim of this study is related to the psychometric properties of the PHQ-15. Our data showed that the PHQ-15 presents sufficient empirical evidence of reliability and validity to support its use in the context presented in this work. Our analysis of the theoretical structure of the PHQ-15 confirmed the unidimensionality of the 15-item scale in a Spanish undergraduate sample where the construct was found to be stable with a one-factor structure explaining 40.2% of the variance. All 15 items significantly loaded

on the global somatisation factor. Our model presents one global factor of somatisation that is not correlated with the four specific factors (pain, gastrointestinal, cardiopulmonary, and fatigue symptoms). Other studies [10,15,39] found a bifactor structure, providing both a single global somatisation factor and specific symptom factors (pain, gastrointestinal, cardiopulmonary and fatigue factors). Future proposals are needed to solve the latent structure of PHQ-15.

The reliability of the scale and internal consistency showed the good level of precision for measuring of somatic symptoms in Spanish college. The PHQ-15 showed good alpha measures of internal consistency or reliability analysis. Similar studies have found adequate internal consistency [10,11,13].

The concurrent validity of the PHQ-15 significantly correlated with GHQ-28 and subscales which suggests that individuals with high scores in PHQ-15 may have these comorbid disorders. Thus, scores in PHQ-15 increases somatic symptoms, anxiety and insomnia, social dysfunction, severe depression and total GHQ-28, in undergraduates and may intensify the symptoms of those with pre-existing psychiatric disorders [11,13,23]. This situation is clinically understandable given that somatic symptoms are frequent in anxiety disorders and because that somatization has a greater impact on quality of life [11,23,40,41], even eight weeks after the lockdown of the Spanish college. We need future research to deeply understand these findings.

## Conclusion

The present study was directed to the evaluation of the psychometric properties of the GHQ-28 and the PHQ-15 in Spanish college during the confinement by COVID-19.

Firstly, the scores obtained by our university students on the total GHQ-28 and the PHQ-15 suggested that health in Spanish university students are normal with scores are not particularly high. These results should be interpreted in light of when the data were collected. The study took place from 12 to 19<sup>th</sup> May 2020, eight weeks after the Spanish government declared the state of alarm of the virus outbreak on 14<sup>th</sup> March [42], with all Spanish citizens being confined at home. On one hand, the length of time passed from the implementation of confinement in Spain and the subsequent gradual fall both in the number of new infections and deaths [43] until the data for this study were collected, may have had an impact on the results with a reduction in somatisation and somatic symptoms. Studies on the trajectory of past pandemics have found the impact and decrease of psychological symptoms over the course of the pandemic [1,44,45]. On the other hand, could there are many factors among our university students that may reduce the psychological impact in their health,

such as stay at home with family support [6,46]; have several intrapersonal sources or resilience strategies of help for coping with restrictions [47]; have other psychological mechanisms, such as illusion of control or decreased risk perception, among others. Future researches are needed in different moments during the pandemic could be helpful to better understand the development of somatic disorders to promote possible identified preventive interventions as the pandemic progresses.

Secondly, the PHQ-15 and the GHQ-28 showed good psychometric properties. With high scores internal consistency and criterion validity. Factorial analysis results for PHQ-15 showed one factor structure on the global somatisation factor with a 40.2% of the variance. All 15 items significantly loaded on the global somatisation factor. It would support the concept that somatic symptoms represent a homogeneous latent construct [15,39].

The factor structure of GHQ-28 showed a plausible factor structure with four factors explaining 66.7% of the variance, however, different items were not well represented and showed low extraction and were subsequently dropped from the questionnaire. For this reason, subscales had different number of items in each subscale. Somatic symptoms, social dysfunction and severe depression subscales lost one item each factor. However, anxiety and insomnia subscale lost two items. Previous studies have found different number of items in each factor [19,20].

Nonetheless, we can say that both scales, the GHQ-28 and the PHQ-15, showed satisfactory internal consistency and structural validity, even in this COVID-19 outbreak among Spanish university students. Further research should be carried out to confirm this data, but our study supports use of these assessment tools in an easily way to detect among colleges different somatisation disorders, psychological disorders and mental health.

Thirdly, the relationships between the variables revealed some interesting findings in gender, degrees and academic year in the GHQ-28 and the PHQ-15. Finally, it is extremely necessary to implement mental health strategies at the University in conjunction with epidemic and pandemic response strategies before, during and after of COVID-19 outbreak to reduce future psychosomatic problems, psychological distress and prevent further mental health problems [6,24]. Mental health professionals, such as psychologists, psychiatrists and social workers, must be on the front line and play a leading role in emergency planning and management teams [24] and the prevention, identification and treatment of these psychosomatic problems should be included amongst the concerns and competences of



universities, particularly when the therapeutic effect of psychological care amongst university students has repeatedly been identified as a factor in preventing university drop-out and in promoting performance and quality of life [6-8,21,24,36,47]. We are facing an important challenge where the University will have to take a lead in the process through academic curricula in the next months.

The study has several limitations. First, the sample was a convenience sample of university students with majority of females and was not necessarily representative of the general Spanish population. Future studies using nationally representative samples with students of different degrees and with more number of students are needed to confirm the results reported here. Second, this study did not examine the stability of the questionnaires over time. Future research should therefore incorporate test-retest reliability measures at other moments of the pandemic to confirm the psychometric properties of our results. Third, the descriptive, cross-sectional nature of this research means it was not possible to establish cause-effect conclusions. Longitudinal studies should assess somatic symptoms and psychological disorders in different times without confinement measures.

### Data Availability Statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

### Ethics Statement

This study received ethical approval and was supervised by the Research Commission of the Integrated Healthcare Services, in Talavera de la Reina, Spain (45/2019). The participants provided their written informed consent to participate in this study.

### Author Contributions

The paper is the result of my team and I. This paper does not contain any published or written content by others, except as expressly indicated and quoted in the paper.

M. Martínez-Lorca and A. Martínez-Lorca developed the study concept and designed the study. A. Martínez-Lorca collected the data. M. Martínez-Lorca and A. Martínez-Lorca analyzed the data, with assistance from J.A. García. J.J. Criado-Alvárez and M.D. Cabañas Armesilla drafted the manuscript and review version final. All authors provided critical revisions. All authors approved the final manuscript for submission.

### Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential

conflict of interest. The authors declare no conflict of interest.

### Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

### Acknowledgments

The authors thank the participants for their contribution to the study.

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