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## Hellenic Journal of Psychology

Online ISSN: 2732-7027

Journal homepage: <https://ejournals.lib.auth.gr/hjp/>

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To link to this article: <https://doi.org/10.26262/hjp.v19i2.8445>



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Published by Psychological Society of Northern Greece

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## PSYCHOMETRIC PROPERTIES OF THE CATALAN VERSION OF THE GOLDBERG ANXIETY AND DEPRESSION SCALE

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**Abstract.** This study aimed to test the psychometric properties of the Goldberg Anxiety and Depression Scale (GADS), applied to a Catalan sample of the adult general population. The scale was translated and adapted to the Catalan language. The sample comprised 741 participants of both sexes. The sample was split randomly into two groups: calibration and validation. Structural validity was analysed in the calibration group ( $n = 371$ ), using exploratory factor analysis, suggesting a one-factor structure. Confirmatory factor analysis was performed with the validation group ( $n = 370$ ). The one-factor model demonstrated adequate goodness of fit indices and satisfactory internal consistency. The two-factor model presented only acceptable goodness of fit indices and internal consistency, but the discriminant capacity was low. The obtained results support the use of the GADS as an acceptable instrument to measure anxiety and depression in the Catalan population, but not to distinguish between these two conditions.

**Key words:** Anxiety, Depression, Goldberg Anxiety and Depression Scale

### INTRODUCTION

High prevalence of anxiety or depression is an important issue in primary care units, where an initial diagnosis is usually made (Gancedo-García et al., 2020), particularly so considering the high rate of comorbidity between anxiety, depressive, and somatoform disorders (e.g., Mergl et al., 2007). The integration of short questionnaires within an initial clinical interview is a common practice aimed at facilitating and improving detection of potential psychopathology.

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**Acknowledgements:** The authors would like to thank the participants. We thank Dr. Paul Jenkins, University of Reading (UK), for his assistance in reviewing this manuscript.

e-ISSN 2732-7027

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The Goldberg Anxiety and Depression Scale (GADS; Goldberg et al., 1988) was created to be used as a screening instrument by healthcare personnel. The scale has demonstrated good sensitivity (high probability of giving a positive result when there is disease) and specificity (high probability of giving a negative result when there is no disease) in the diagnosis of depression and anxiety (Goldberg et al., 1988). The GADS is a simple diagnostic tool which can offer information about the presence and severity of anxiety and depression, and this has facilitated its wide application at the primary care level (López et al., 2011). GADS is applied routinely in primary care centres in most of the Spanish autonomous communities. A review of the availability of the GADS in the Autonomous Community of Catalonia showed that it was being used regularly in the Castilian-Spanish version, the version recommended in the Guide published by the Department of Health of that community for the diagnosis of anxiety and depression in primary care centres (ICS-Gencat, 2022).

Given its wide use, the scale was validated in the Castilian-Spanish version, the official language of the different Spanish Autonomous Communities (17) and autonomous cities of Ceuta and Melilla. High sensitivity and specificity have been obtained (Franco et al., 1993), as well as adequate psychometric properties (Lobos-Rivera & Gutiérrez-Quintanilla, 2020; Reivan-Ortiz et al., 2019). However, in a study carried out in Catalan adult population applying the Castilian-Spanish version, high sensitivity but moderate specificity was obtained (Gallego et al., 1998), suggesting that differences could be due to the cultural context of the study and, principally, language differences.

Spain is made up of 17 autonomous communities and two autonomous cities (with a Quasi-Federal Government), each with their cultural peculiarities, including four clearly differentiated official languages: Castilian, Catalan, Galician, and Basque. The language commonly known as Spanish is the Castilian language; Catalan is another Spanish language, with its own entity. The differences with respect to Castilian are significant, both at grammatical and lexical level. Catalan is the ninth most spoken language in the European Union – a similar level to Swedish, Greek, or Portuguese. It is spoken in Andorra (the official language), Spanish regions of Catalonia, Valencia, and Balearic Islands (co-official language), in Aragon (western areas) and Murcia (Carxe area), in the French-Occitan region, and in Sardinia (Alghero city) (Institut Ramon Llull, 2021). Although the two languages (Castilian and Catalan) coexist in Catalan-Spanish countries, Catalan is seen as the mother tongue.

Although GADS is a well-established instrument to measure depression and anxiety with good reliability and validity in different languages and contexts (e.g., Franco et al., 1993; Koloski et al., 2008; Lobos-Rivera & Gutiérrez-Quintanilla, 2020; Magnavita, 2007; Reivan-Ortiz et al., 2019). However, Catalan is not one of them.

It should be noted that the original factorial structure of the GADS has not always been confirmed in the adaptations made. Reivan-Ortiz et al. (2019), in a Castilian-speaking Ecuadorian sample, obtained the same structure and composition as the original scale. Lobos-Rivera and Gutiérrez-Quintanilla (2020), in a Castilian-speaking Salvadoran sample, obtained the two-factor structure, but considered it appropriate to eliminate two items from the anxiety subscale. Also Magnavita (2007), in an Italian-speaking sample, but different items distribution. In turn, the results obtained by Mackinnon et al. (1994) and Koloski et al. (2008), in English-speaking Australian samples, supported a uni-dimensional structure for the scale.

Cross-cultural adaptation problems could explain these findings. Authors have recommended that practitioners either avoid the use of non-native language in assessment questionnaires or carry out translations directly with adequate validation (Oei et al., 2013). Further, cultural variations can influence the experience and emotional expression of depression and anxiety, including symptomatology and symptom interpretation (Ballenger et al., 2001; Norton, 2007).

Developing a psychologically acceptable instrument for a different cultural group requires, in addition to a good translation, a good interpretation (Wallin & Ahlström, 2006). The impact on the instrument results is directly related to the cultural experience, knowledge and qualifications of the translator (Beck et al., 2003), as well as to the user's perceived power, their experience with the target group, and their ability to be neutral in the transmission of the message (Larkin et al., 2007). That is, a word or phrase spoken or written in one language may have a completely different meaning in another (Eboh et al., 2007). It is necessary to ensure conceptual or meaning equivalence to avoid biases related to the construct or the items that may influence the results as well as method-related bias, as a result of administering problematic instruments (Van de Vijver & Hambleton, 1996). All of this has given rise to the publication of guidelines how to carry out adaptations. As proposed by Beaton et al. (2000), naive native translators and content-expert native translators should participate independently, as well as those responsible for the study who establish, analyze, and validate conceptual equivalence and other validation issues to ensure a solid adaptation to the study sample.

The main objective of this research was the cross-cultural adaptation to Catalan of the Goldberg Anxiety and Depression Scale (GADS) for use in an adult sample for research. Furthermore, to investigate its psychometric properties, including factorial validity, reliability and internal consistency. The study included a calibration sample and a different sample for the confirmation of the GADS structure. The hypotheses were the following: (1) the Catalan version of the GADS, similarly to the Castilian version, would present a two-factor structure as in the original scale, able to discriminate anxiety from depression; and (2) that structure, obtained in the calibration sample, would be confirmed in the confirmation sample.

## **METHOD**

### ***Participants***

A random sample ( $n = 741$ ) from the Catalan adult general population was used, including 44.3% male, 54.4% female, and self-defined as other sex 1.3%. Their mean age was 40.94 years ( $SD = 15.21$ ), ranging from 18 to 82 years. The sample came from Catalonia (63.2%), Valencian Community (24.7%), Balearic Islands (5.9%), Andorra (4.2%), and other Catalan-speaking regions (2.0%). Other sample characteristics can be seen in Table 1. For the needs of statistical analysis, the sample was split into two equivalent subsamples (371 and 370 participants respectively) (For more details see the Statistical Analysis section.)

**Table 1. Demographic characteristics of the study sample**

Age (range: 18 to 82 years)	$M = 40.94$ ( $SD = 15.21$ )	%	( $f$ )
<b>Sex</b>			
Male		44.3%	(328)
Female		54.4%	(403)
Other		1.3%	(10)
<b>Marital situation</b>			
Couple/married		48.9%	(361)
Single		40.4%	(299)
Separated/Divorced		9.3%	(69)
Widower		1.5%	(11)
<b>Cohabitation</b>			
Living with dependents		35%	(259)
<b>Education</b>			
Student		8.8%	(65)
Compulsory studies		8.2%	(61)
Intermediate level studies		22.4%	(166)
Higher technical studies		8.0%	(59)
University studies		52.6%	(390)
<b>Annual income</b>			
≤ 12.000 €		35.5%	(263)
≤ 18.000 €		16.3%	(120)
≤ 28.000 €		22.8%	(168)
≤ 37.000 €		11.6%	(85)
> 37.000 €		14.2%	(105)
<b>Came from</b>			
Catalonia		63.2%	(468)
Valencian Community		24.7%	(183)
Balearic Island		5.9%	(44)
Andorra		4.2%	(31)
Other		2.0%	(15)
Total sample ( $N$ )	741		

**Note:** M: Mean; SD: Standard deviation; f: frequency

## Measures

### Sociodemographic information

The participants were asked about age, gender, marital status, education level, monthly income, and place of residence.

### *Catalan version of Goldberg Anxiety and Depression Scale*

The original Goldberg Anxiety and Depression Scale (GADS; Goldberg et al., 1988) was used for the adaptation in Catalan. GADS comprises two subscales of nine binary (yes/no) items each. In each subscale (items 1 to 9 for anxiety, items 10 to 18 for depression), the first four items are conditional, because two affirmative answers are required to continue with the subscale. In research, the full scale is usually applied, and that is how it was used in the present study. Higher scores indicate a more severe problem with 9 as the highest possible value for each subscale. The items of the GADS validated in the Castilian idiom by Franco et al. (1993), Gallego et al. (1998), Lobos-Rivera and Gutiérrez-Quintanilla (2020), or Reivan-Ortiz et al. (2019) were not available in the bibliography. It was not considered appropriate to use a version for translation published in a secondary source. For this reason, the cross-cultural adaptation was made from the original English version. The translation and cross-cultural adaptation were done according to the guide proposed by Beaton et al. (2000). The original version was translated into Catalan by two independent translators (one expert, one naive as to the content), to later draw up the first version by consensus. Then, two other naive translators independently performed the back translation. The working group drafted the final version after analysing the English and Catalan versions, guaranteeing semantic, idiomatic, experiential, and conceptual equivalence. This version was administered to seven people with anxiety and/or depression, to identify possible language problems, ambiguities, ease of understanding, etc. This made it possible to produce the final version in Catalan. Thus, as an example, for anxiety, the item "Have you felt keyed up or on edge?", or the item "Have you been worrying a lot?" have been translated as "*¿Se sent molt excitat, nerviós o en tensió?*" and "*¿Ha estat molt preocupat per alguna cosa?*". And for depression, as example, the items "Have you been lacking energy?" or the item "Have you felt hopeless?" have been translated as "*¿Heu perdut l'interès per les coses?*" and "*¿Se sent desesperançat, sense esperances?*".

The original GADS had satisfactory internal consistency, showing a Cronbach's alpha coefficient of .81 for the full scale, .70 for the depression subscale and .74 for the anxiety subscale (Mackinnon et al., 1994). For the Castilian version, Reivan-Ortiz et al. (2019) obtained a Cronbach's alpha coefficient of .75 for the anxiety subscale and .80 for the depression subscale. For the Italian version, Magnavita (2007) showed values of .82 and .78, for anxiety and depression, respectively. No data for the total scale was reported by these authors.

### *The Depression, Anxiety, and Stress Scale*

The Depression, Anxiety, and Stress Scale (DASS-21; Lovibond & Lovibond, 1995) is a self-report questionnaire with 21 items (seven items for each subscale). Responses are on a four-point scale ranging from 0 (did not apply to me at all) to 3 (applied to me very much, or most of the time). The scale has been validated in many languages, showing a stable structure, with three-factors correlated with each other, and good reliability. The Castilian-Spanish version was applied (Bados et al., 2005), indicating Cronbach's  $\alpha$  of .879, .727, and .776 for the Anxiety, Depression, and Stress subscales respectively, and .957 for the full scale.

### ***Procedure and ethics***

The two questionnaires were administered online. Secure Google Forms was used for data collection and storage. Recruitment was carried out with a message containing the study link, which was distributed by direct message through social networks to persons who habitually communicated in the Catalan language. Participation was voluntary. A consent form was presented at the beginning of the instructions to inform the participants of the aim of the research and the protection of privacy. To continue with the administration of the questionnaires, each participant had to accept the terms of the study that complied with the Helsinki declaration. The questionnaires were administered at the same time, one after the other. There was no time limitation to respond to them.

### ***Statistical analysis***

Both exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were conducted to examine the factor structure of GADS. The applied methodology is that suggested by Mackinnon et al. (1994) and Koloski et al. (2008).

The statistical analyses were conducted using the FACTOR package (Ferrando & Lorenzo-Seva, 2017), which affords analysis of dichotomous response data by implementing polychoric correlation matrices instead of Pearson correlation matrices which are better suited for the analysis of continuous variables. This is also applicable for CFA, where an assumption of the ML-estimator is that variables are continuous and follow the multivariate normal distribution, which makes it inappropriate for dichotomous data.

For the analysis, participants were randomly split into two subsamples. The Solomon method for splitting the sample into two equivalent subsamples was applied. This method splits the sample in two equivalent halves and guarantees the representativeness of the subsamples (Lorenzo-Seva, 2021). The equivalence between the subsamples is given by the Ratio Communality Index (the closer to 1 the better). In this case the obtained Ratio Communality Index inter-samples was .998. The mean, standard deviations, and the asymmetry, or kurtosis, of the samples were not determined, since the empirical data are dichotomous and therefore do not present a normal distribution. Subsample 1 ( $n = 371$ ) was used for EFA and Subsample 2 ( $n = 370$ ) for CFA.

Free exploratory latent trait analysis using one, two, and three dimensions was conducted. Polychoric correlations (with 95% confidence intervals), and Optimal implementation of Parallel Analysis (Timmerman & Lorenzo-Seva, 2011), with diagonally weighted least squares (DWLS) estimation procedure, was applied. The two- and three-factor solutions were rotated using the Robust Promax method. Ordinal Cronbach's alpha was used to assess internal consistency. The replicability of the construct was determined by calculating the generalized H-index (G-H). The H index evaluates how well a set of items represents a common factor. H-Latent assesses how well the factor can be identified by the continuous latent response variables that underlie the observed item scores, whereas H-Observed assesses how well it can be identified from the observed item scores (Ferrando & Lorenzo-Seva, 2018). CFA was performed with the other subsample. Starting from Procrustes rotation, the FACTOR package executes CFA (Timmerman & Lorenzo-Seva, 2011), expressing the fit to the

underlying data by the indices of chi-squared, Root Mean Square Error of Approximation (RMSEA), Weighted Root Mean Squared Residual (WRMR), Tucker and Lewis Index (NFI), Goodness-of-Fit Index (GFI), Adjusted Goodness-of-Fit Index (AGFI) and Comparative Fit Index (CFI). WRMR values below 1.0 have been recommended to represent good fit (Yu, 2002). For RMSEA, values  $\leq .08$  and  $\leq .05$  refer to acceptable and good fit of the model, respectively; and for the other indices, values  $\geq .90$  and  $\geq .95$  refer to adequate and good fit of the model, respectively (Hu & Bentler, 1999; Kline, 2015).

To produce further information about the construct validity of the scale correlations and Fisher's chi-squared were performed between the total scores obtained for GADS scale and theoretical subscales, and those obtained with the DASS-21. Gender differences and other sociodemographic data were also investigated. Data analysis was conducted using the SPSS v.27 package.

## RESULTS

### *Exploratory factor analysis*

Results obtained for polychoric correlations (95% confidence intervals) can be seen in Table 2. The obtained Kaiser-Meyer-Olkin (KMO) value was 0.6529 and the Bartlett's test of sphericity was  $\chi^2(df = 153) = 4181.1, p < .001$ , supporting the decision for performing EFA, and lending initial support to a unifactorial structure.

**Table 2. Standardised Variance / Covariance Matrix (Polychoric correlation)**

Item	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Q1	1.000																	
Q2	.846	1.000																
Q3	.542	.630	1.000															
Q4	.695	.923	.674	1.000														
Q5	.447	.589	.401	.618	1.000													
Q6	.361	.431	.347	.367	.456	1.000												
Q7	.628	.627	.521	.593	.380	.467	1.000											
Q8	.480	.480	.394	.428	.306	.294	.516	1.000										
Q9	.441	.589	.332	.624	.839	.364	.372	.365	1.000									
Q10	.533	<b>.617</b>	.599	.588	.463	.422	.482	.320	.502	1.000								
Q11	.586	.584	<b>.662</b>	.568	.341	.296	.488	.357	.452	.769	1.000							
Q12	<b>.653</b>	<b>.650</b>	.528	<b>.609</b>	.383	.283	.598	.434	.393	.610	.814	1.000						
Q13	<b>.705</b>	<b>.701</b>	<b>.624</b>	<b>.635</b>	.419	.200	.553	.438	.323	.615	.720	.838	1.000					
Q14	<b>.616</b>	<b>.724</b>	.522	<b>.721</b>	.464	.444	.595	.421	.425	.556	.642	.682	.675	1.000				
Q15	.429	.438	.448	.532	.442	.295	.585	.364	.534	.450	.505	.559	.548	.493	1.000			
Q16	.239	.274	.159	.320	.427	.208	.210	.160	.292	.217	.123	.169	.039	.235	.260	1.000		
Q17	.567	<b>.626</b>	.465	<b>.613</b>	.312	.398	.583	.422	.388	.655	.571	.632	.581	.722	.438	.366	1.000	
Q18	.508	.536	.335	.574	.444	.266	.480	.349	.430	.592	.463	.465	.513	.598	.455	.167	.544	1.000

Determinant of the matrix < .000001

Bartlett's statistic = 4181.1 ( $df = 153; p = .000010$ )

Kaiser-Meyer-Olkin (KMO) test = .65290 (mediocre)

Bootstrap 95% confidence interval of KMO = (-nan(ind) .266)



In parallel analysis (see Table 3), an initial eigenvalue of 9.09, explaining 54.99% of total variance, was obtained.

**Table 3. Number of common factors (Parallel analysis)**

Variable	Real-data % variance	Mean of random % variance	95 percentile of random % of variance
1	54.9960*	11.4494	12.7710
2	8.8123	10.3903	11.3688
3	5.2361	9.5781	10.4471
4	4.6640	8.8485	9.5515
5	4.3875	8.2001	8.7517
6	4.2225	7.5647	8.0883
7	3.7256	6.9691	7.4939
8	2.8166	6.3712	6.8290
9	2.5160	5.7838	6.2193
10	2.1925	5.2253	5.7224
11	1.9654	4.6375	5.2014
12	1.4861	4.0536	4.6585
13	1.4010	3.4508	4.0503
14	0.9652	2.8183	3.5245
15	0.8497	2.1759	2.8825
16	0.3008	1.5150	2.2737
17	0.0686	0.8220	1.4794

\* Advised number of dimensions: 1

The factor loadings ranged from good to very good or excellent (Tabachnick et al., 2007: poor: .32, fair: .45, good: .55, very good: .63, and excellent: .71) for all factors, except for Q16 (< .32; *Have you been waking early?*), which demonstrated a low communality (.092) (see Table 4). Eliminating the Q16 item, and repeating the analysis, the percentage of explained variance increased to 56.36% and the weight of the factors increased slightly (.476 to .879). However, the internal consistency (Factor Determination Index: .979) and the Construct Replicability Index (H-Latent: .958/ H-Observed: .842) did not change and, consequently, the quality and efficiency of the factorial score estimates was the same. Considering also that the load value of all the elements in the first analysis was greater than .30, none of the items was excluded from the scale.

**Table 4. Exploratory factor analysis (n = 371)**

Item	Un-rotated		Robust Promax rotated					CFA	
	Communality	One-factor solution	Two-factor		Three-factor			Theoretical scale	
		F1	F1	F2	F3	F1	F2	F1	F2
Q1	.633	.796	.760		.720			.794	
Q2	.774	.880	.680		.704			.905	
Q3	.483	.695	.715			.419		.660	
Q4	.730	.855	.582		.518			.917	
Q5	.360	.600		.864			.993	.661	
Q6	.230	.480		.398	.520			.588	
Q7	.542	.736	.679		.965			.661	
Q8	.301	.549	.473		.646			.534	
Q9	.367	.606		.741			.889	.558	
Q10	.575	.759	.699			.589			.801
Q11	.576	.759	.930			.975			.843
Q12	.635	.797	.991			.711			.860
Q13	.619	.787	1.052			.858			.827
Q14	.670	.819	.781		.721				.833
Q15	.421	.649	.493			---			.473
Q16	<b>.092</b>	<b>.303</b>		.531			.423		---
Q17	.568	.754	.733		.821				.777
Q18	.427	.654	.532		.387				.721
Cronbach's alpha		.979	.979	.935	.966	.946	.970	.969	.967
H-Latent		.958	.959	.874	.932	.896	.949	.938	.935
H-Observed		.842	.832	.701	.772	.718	.816	.775	.788
Factor correlations									
F1-F2		---	.697		.602				
F1-F3					.824				
F2-F3					.765				

The two-factor solution suggested that 14 anxiety and depression items formed one factor, and four items formed the other factor (GADS5: *Have you been sleeping poorly?* GADS6: *Have you had headaches or neckaches?* GADS9: *Have you had difficulty falling asleep?* and GADS16: *Have you been waking early?*). The correlation between these two factors was high (see Table 4). The three-factor solution suggested that nine anxiety (and depression) items formed one factor, five depression (and anxiety) items formed a second factor, and the three sleep-related items (GADS5, GADS9, and GADS16) a third factor. There was a high correlation between the first two factors, and very high correlation between these two and the sleep-related factor.

All models fit the data very well. Improvements in fit from the one- to the two-factor, and from the two- to the three-factor solutions were not substantial and the high correlations between factors support the superiority of the one-factor solution.

**Confirmatory factor analysis**

The CFA was performed with the second sample ( $n = 370$ ). Results can see in Table 4 and Table 5. Although the structure of the original two subscales was not supported by the exploratory factor analysis, the confirmatory two-factor analysis was conducted to investigate whether the original anxiety and depression subscales are supported by the data. The confirmatory two-factor analysis allowed the loading of the nine Anxiety subscale items and nine Depression subscale items onto separate but correlated dimensions (all other loadings were constrained to be zero.) This solution (Model 2) fitted approximately as well as the one-factor exploratory analysis (Model 1). However, RMSEA was somewhat superior, and the high correlation between the two factors suggests there is little justification for the separation of the anxiety and depression subscales as originally devised by Goldberg et al. (1988).

**Table 5. CFA for the Catalan version of the GADS: Robust goodness-of-fit statistics**

	$\chi^2$	df	p	CMIN/df	WRMR	NFI	GFI	AGFI	CFI	RMSEA
Model 1	202.94	135	.000	1.503	.0460	.984	.970	.966	.986	.037
Model 2	205.14	113	.000	1.635	.0538	.921	.953	.939	.953	.079

**Reliability and construct replicability**

The one-factor solution showed good internal consistency, with an ordinal Cronbach’s  $\alpha$  of .979 for the total score. Good construct replicability was in evidence (H-Latent Index: .958 / H-Observed: .843), suggesting a well-defined latent variable, which is likely to be stable across studies. The other models also presented interpretable results.

**Concurrent and discriminant validity**

To determine the concurrent and discriminant validity, correlational analyses were carried out between the GADS scale, and against the DASS-21 scales and subscales. The data obtained (see Table 6) reveal that there were strong correlations between the concepts under analysis. The results confirmed the concurrent validity of the GADS with the DASS-21.

**Table 6. Correlations between the GADS total score and DASS-21 subscale scores (N=741)**

	GADS-Total
DASS21-anxiety	.737**
DASS21-depression	.759**
DASS21-stress	.822**
DASS21-total	.840**

\*\* The correlation is significant at the .01 level (two-tailed).

***Differential functioning***

The data analysis to determine the differential functioning capacity based on age, sex, and other demographic data (see Table 7) indicated that the scale under analysis has good sensitivity. Analysis suggested that the GADS total score can discriminate between subgroups based on sex (woman vs. man), marital status (single vs. coupled), or salary (lower vs. higher). These variables represent risk factors for anxiety and depression (e.g., Gancedo-Garcia, 2020; Reivan-Ortiz et al., 2019; Tolsa & Malas, 2021).

**Table 7. Sensitivity for the GADS Catalan version (N = 741)**

	GADS-total	
	$\chi^2/df$	<i>p</i>
Age (range)	0.960	.814
Gender	2.154	< .001
Marital status	2.682	< .001
Studies level	0.829	.842
Monthly income	2.235	< .001
Place of residence	0.988	.503

**DISCUSSION**

The adaptation of the GADS to Catalan was made to test potential cultural differences in structural validity, reliability, and internal consistency of the scale compared to the Castilian-Spanish version used in practice.

The study hypothesis, according to which a two-factor structure was expected to be obtained for the Catalan version of the GADS, was not confirmed. The data support a unifactorial structure, which was confirmed in a second sample. This supports the proposition that anxiety and depression, in the general healthy Catalan population, may be viewed as a unitary construct.

To obtain the Catalan version of the scale, a structured process was followed. In this case, as proposed by Beaton et al. (2000), the purpose was to obtain an instrument equivalent to the original but adapted to the Catalan culture, in which a lexical and conceptual equivalence was sought in the items of the scale. In this way, it would be possible to compare the results obtained when using the version adapted to the new context, with those obtained by other researchers with the original version of the scale. In this way it would be possible to identify differences attributable to the context and not to differences in the instrument used.

It should be noted that the first versions of the GADS, both in English (Goldberg et al., 1988) and in Spanish (Franco et al., 1993; Gallego et al., 1998), were carried out using clinical criteria as the gold standard, and analyzed using ROC curves (Receiver Operating Characteristic), a plot of the sensitivity versus specificity for a binary classifier system as the discrimination threshold is varied. In the present study, factorial analysis was applied as Koloski et al. (2008) and Mackinnon et al. (1994) for the English version, or Reivan-Ortiz et al. (2019)

and Lobos-Rivera and Gutiérrez-Quintanilla (2020) for the Castilian version did. It is a technique for reducing the dimensionality of data. In this case, all the variables of the analysis play the same role and there is no a priori conceptual dependence of some variables on others.

The results of our study agree with those obtained by Koloski et al. (2008) and MacKinnon et al. (1994), suggesting that the Catalan sample made an interpretation of the meaning of the GADS items very similar to that of the samples included in these two studies. Mackinnon et al. (1994) and Koloski et al. (2008) attributed their findings to having applied the scale to healthy elderly population. Mackinnon et al. (1994) applied the GADS in an older male and female Australian sample, and Koloski et al. (2008) in an older female Australian sample. Goldberg et al. (1988) found high sensitivity for both the anxiety and depression scales of the GADS in a much younger sample of medical patients in the United Kingdom. Franco et al. (1993) and Gallego et al. (1998) also applied the scale to clinical patients to validate the first Castilian-Spanish version.

It should be noted that our study analyzed a general population of healthy men and women, from 18 to 82 years of age, including students or people with different educational levels. As can be seen in Table 7, young people and students have higher scores on the anxiety subscale than the rest of the population. So, it could be assumed that the discrimination of the GADS between anxiety and depression is influenced by the age and level of anxiety present in the sample. The data are concordant with previous studies in showing that the distinctive features of anxiety and depression may become less pronounced with increasing age (Mackinnon et al., 1994).

Similarly to Mackinnon et al. (1994) and Koloski et al. (2008), in the EFA, the results indicated a good fit to the data for all analysed models (one-, two- and three-factor); in CFA the one-factor model and the two-factor theoretical models did not present substantial differences in the goodness of model fit, but the inter-factor correlations were so large that it was impossible to establish conceptual independence. The high correlations between the factors in the two- and three-factor model indicated that they had little divergence between them, and could be described as measuring a common underlying factor of psychological distress. In this way, as indicated by Mackinnon et al. (1994), high levels of anxiety or depression might be necessary for the scale to be able to differentiate them.

In any case, Reivan-Ortiz et al. (2019) applied the scale to university students, while Lobos-Rivera and Gutiérrez-Quintanilla (2020) applied it to the general population, similarly to this study, obtaining a solid two-factor factorial structure. Therefore, the age and anxiety and/or depression levels of the sample cannot be the only factor to consider to explain the different factorial structure of the GADS for the Castilian and Catalan version. Therefore, until a better explanation is found, it can be assumed that cultural differences may be behind these results.

### ***Limitations and conclusion***

The present study was based exclusively on self-report responses, which does not allow an objective evaluation of the associations between the study variables. In turn, self-reports can be affected by factors such as social desirability and other sources of bias. Specifically, in this study social networks were used for recruitment of participants, with the bias linked to ease of

use and access. It is recommended that subsequent studies continue to evaluate the psychometric properties of the scale to determine the level of stability and generality of the Catalan version of the GADS. Second, Lobos-Rivera and Gutiérrez-Quintanilla (2020) applied the Castilian version to a sample of the general Salvadoran population, similarly to the one in this study. However, taking into account the possible cultural differences between Spain and El Salvador, it might be appropriate to test the Castilian version of the GADS in a Spanish sample, similar to the one used in this study, to check the comparability between the two versions used in Spain.

The results indicate that the GADS has an adequate unifactorial structure with strong psychometric properties. Clinically, the obtained results support the use of the GADS as an acceptable instrument to measure anxiety and depression in the Catalan population, but not to distinguish between these two conditions. This, together with the short time required to complete it, makes it an optimal tool for screening in primary care units, and to facilitate research in this field.

## REFERENCES

- Bados, A., Solanas, A., & Andrés, R. (2005). Psychometric properties of the Spanish version of depression, anxiety, and stress scales (DASS). *Psicothema*, 679-683.  
<https://reunido.uniovi.es/index.php/PST/article/view/8331>
- Ballenger, J. C., Davidson, J. R., Lecrubier, Y., Nutt, D. J., Kirmayer, L. J., Lépine, J. P., Keh-Ming, T., & Ono, Y. (2001). Consensus statement on transcultural issues in depression and anxiety from the International Consensus Group on Depression and Anxiety. *Journal of Clinical Psychiatry*, 62, 47-55. <https://psycnet.apa.org/record/2001-07624-006>
- Beaton, D. E., Bombardier, C., Guillemin, F., & Ferraz, M. B. (2000). Guidelines for the process of cross-cultural adaptation of self-report measures. *Spine*, 25(24), 3186-3191.
- Beck, C. T., Bernal, H., & Froman, R. D. (2003). Methods to document semantic equivalence of a translated scale. *Research in Nursing & Health*, 26(1), 64-73.  
<https://doi.org/10.1002/nur.10066>
- Eboh, W. O., Pitchforth, E., & van Teijlingen, E. (2007). Lost words: Research via translation. *Midwives Magazine*, 10(8), 374-378.
- Ferrando, P. J., & Lorenzo-Seva, U. (2017). Program FACTOR at 10: Origins, development and future directions. *Psicothema*, 29(2), 236-240.  
<https://doi.org/10.7334/psicothema2016.304>
- Ferrando, P. J., & Lorenzo-Seva, U. (2018). Assessing the quality and appropriateness of factor solutions and factor score estimates in exploratory item factor analysis. *Educational and Psychological Measurement*, 78(5), 762-780.  
<https://psycnet.apa.org/doi/10.1177/0013164417719308>
- Franco, C. M., Echeverría, M. P., Campos, R., Campayo, J. G., & Lobo, A. (1993). Escalas de ansiedad y depresión de Goldberg: Una guía de entrevista eficaz para la detección del malestar psíquico [Goldberg anxiety and depression scales: An effective interview guide for the detection of psychological distress]. *Atención Primaria: Publicación Oficial de la Sociedad Española de Familia y Comunitaria*, 12(6), 345-349.

- Gallego, R. S., Gonfaus, M. S., Ramón, P. B., Mata, M. C., López, J. M., & Vilanova, M. P. B. (1998). Percepción de malestar psíquico por el médico en un área básica de salud [Perception of psychic discomfort by the doctor in a basic health area]. *Atención Primaria: Publicación Oficial de la Sociedad Española de Familia y Comunitaria*, 22(8), 491-496. [https://doi.org/10.1016/S0212-6567\(02\)70578-7](https://doi.org/10.1016/S0212-6567(02)70578-7)
- Gancedo-García, A., Suárez-Gil, P., Santos-Olmo Sánchez, M., & Asensio del Hoyo, P. (2020). Incidencia acumulada, comorbilidad e incapacidad por trastornos de ansiedad en pacientes de una mutua de accidentes de trabajo [Cumulative incidence, comorbidity and disability due to anxiety disorders in patients of a work accident insurance company]. *Revista Española de Salud Pública*, 93, e201910068. <https://www.scielosp.org/pdf/resp/2019.v93/e201910068/es>
- Goldberg, D., Bridges, K., Duncan-Jones, P., & Grayson, D. (1988). Detecting anxiety and depression in general medical settings. *British Medical Journal*, 297(6653), 897-899. <https://dx.doi.org/10.1136%2Fbmj.297.6653.897>
- Hu, L. T., & Bentler, P. M. (1999). Cut off criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, 6(1), 1-55. <https://psycnet.apa.org/doi/10.1080/10705519909540118>
- Institut Ramon Llull (2021). Què és el català i on es parla [What is Catalan and where is it spoken]. [online] Retrieved in September 2021. Available in: [https://www.llull.cat/catala/recursos/llengua\\_catala.cfm](https://www.llull.cat/catala/recursos/llengua_catala.cfm)
- ICS-Gencat (Institut Català de Salut de la Generalitat de Catalunya) (2022). Guías: Instrumentos de medidas de la ansiedad [Guidelines: Anxiety measurement instruments]. [online] Retrieved in January 2022. Available in: [www.ics.gencat.cat/3clics/guies/73/img/Doc4-Anexo2\\_Instrumentosdemedidadelansiedad\(HADyGoldberg\).pdf](http://www.ics.gencat.cat/3clics/guies/73/img/Doc4-Anexo2_Instrumentosdemedidadelansiedad(HADyGoldberg).pdf)
- Kline, R. B. (2015). *Principles and practice of structural equation modeling*. Guilford publications. <https://psycnet.apa.org/record/2010-18801-000>
- Koloski, N. A., Smith, N., Pachana, N. A., & Dobson, A. (2008). Performance of the Goldberg Anxiety and Depression Scale in older women. *Age and Ageing*, 37(4), 464-467. <https://doi.org/10.1093/ageing/afn091>
- Larkin, P. J., de Casterlé, B. D., & Schotsmans, P. (2007). Multilingual translation issues in qualitative research: Reflections on a metaphorical process. *Qualitative Health Research*, 17(4), 468-476. <https://psycnet.apa.org/doi/10.1177/1049732307299258>
- Lobos-Rivera, M. E., & Gutiérrez-Quintanilla, J. R. (2020). Adaptación psicométrica de la escala de ansiedad y depresión de Goldberg en una muestra salvadoreña [Psychometric adaptation of the Goldberg anxiety and depression scale in a salvadoran sample]. *Entorno*, 70, 87-98. <https://doi.org/10.5377/entorno.v0i69.9557>
- López, M., Gabarrón, E., & Ruiz, A. (2011). Depresión en atención primaria: Una aproximación a los trabajos realizados en España [Depression in primary care: An approach to the works carried out in Spain]. *Psiquiatria.com*, Vol.15. <http://psiqui.com/1-6808>
- Lorenzo-Seva, U. (2021). SOLOMON: A method for splitting a sample into equivalent subsamples in factor analysis. *Behavior Research Methods*, 1-13.

- <https://doi.org/10.3758/s13428-021-01750-y>
- Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behaviour Research and Therapy*, 33(3), 335-343.  
[https://doi.org/10.1016/0005-7967\(94\)00075-U](https://doi.org/10.1016/0005-7967(94)00075-U)
- Mackinnon, A., Christensen, H., Jorm, A. F., Henderson, A. S., Scott, R., & Korten, A. E. (1994). A latent trait analysis of an inventory designed to detect symptoms of anxiety and depression using an elderly community sample. *Psychological Medicine*, 24(4), 977-986.  
<https://psycnet.apa.org/doi/10.1017/S0033291700029068>
- Magnavita, N. (2007). Anxiety and depression at work. The A/D Goldberg Questionnaire. *Giornale Italiano di Medicina del Lavoro ed Ergonomia*, 29(3 Suppl), 670-671. <https://europepmc.org/article/med/18409897>
- Mergl, R., Seidscheck, I., Allgaier, A. K., Möller, H. J., Hegerl, U., & Henkel, V. (2007). Depressive, anxiety, and somatoform disorders in primary care: Prevalence and recognition. *Depression and Anxiety*, 24(3), 185-195. <https://doi.org/10.1002/da.20192>
- Norton, P. J. (2007). Depression Anxiety and Stress Scales (DASS-21): Psychometric analysis across four racial groups. *Anxiety, Stress, and Coping*, 20(3), 253-265.  
<https://doi.org/10.1080/10615800701309279>
- Oei, T. P., Sawang, S., Goh, Y. W., & Mukhtar, F. (2013). Using the Depression Anxiety Stress Scale 21 (DASS-21) across cultures. *International Journal of Psychology*, 48(6), 1018-1029. <https://doi.org/10.1080/00207594.2012.755535>
- Reivan-Ortiz, G., Pineda-Garcia, G., & León Parias, B. D. (2019). Psychometric properties of the Goldberg Anxiety and Depression Scale (GADS) in Ecuadorian population. *International Journal of Psychological Research*, 12(1), 41-48.  
<https://doi.org/10.21500/20112084.3745>
- Tabachnick, B. G., Fidell, L. S., & Ullman, J. B. (2007). *Using multivariate statistics* (Vol. 5). Pearson.
- Timmerman, M. E., & Lorenzo-Seva, U. (2011). Dimensionality assessment of ordered polytomous items with parallel analysis. *Psychological Methods*, 16(2), 209.  
<https://psycnet.apa.org/doi/10.1037/a0023353>
- Tolsa, M. D., & Malas, O. (2021). COVID-19: Impacto psicológico, factores de riesgo e intervenciones psicológicas en el personal sanitario. Una revisión sistemática [Psychological impact, risk factors, and psychological interventions in health personnel: A systematic review]. *Revista Iberoamericana de Psicología y Salud.*, 12(2), 58-75.  
<https://doi.org/10.23923/j.rips.2021.02.045>
- Van de Vijver, F., & Hambleton, R. K. (1996). Translating tests. *European Psychologist*, 1(2), 89-99. <https://doi.org/10.1027/1016-9040.1.2.89>
- Wallin, A. M., & Ahlström, G. (2006). Cross-cultural interview studies using interpreters: Systematic literature review. *Journal of Advanced Nursing*, 55(6), 723-735.  
<https://doi.org/10.1111/j.1365-2648.2006.03963.x>
- Yu, C. Y. (2002). *Evaluating cut off criteria of model fit indices for latent variable models with binary and continuous outcomes*. University of California, Los Angeles