Screening for anxiety in adolescents: Validation of the Generalized Anxiety Disorder Assessment-7 in a representative sample of adolescents

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A B S T R A C T

Background: Symptoms of emotional disorders, such as those related to anxiety disorders, are one of the main challenges for the young population.
Objectives: This study validated the Spanish Generalized Anxiety Disorder Assessment-7 (GAD-7) scores in a representative sample of adolescents.
Method: A total of 2235 students ($M = 14.49$ years; $SD = 1.76$; 52.9 % women), selected by stratified random sampling from 34 schools, participated in the survey.
Results: The unidimensional model of the GAD-7 showed adequate goodness-of-fit indices. Scalar measurement invariance was found by gender and age. The reliability of the total score was 0.90. The GAD-7 was positively associated with symptoms of depression, negative affect, and emotional and behavioral problems, and negatively associated with positive affect and quality of life.
Limitations: First, although the sample is large and representative, it is important to note that it belongs to a specific Spanish autonomous community (La Rioja), which may limit the generalizability of the results. Second, self-reports were used to assess all psychological indicators, with their known limitations. Third, the cross-sectional nature of this study means that it is impossible to draw conclusions about causal relationships.
Conclusions: The GAD-7 is a brief, easy, and reliable tool for assessing self-reported anxiety symptoms in educational contexts. The GAD-7 can be used as a screening tool for early detection and monitoring of anxiety symptoms during adolescence.

1. Introduction

Emotional symptoms and disorders, like depression and anxiety, are a major challenge for public health. Anxiety disorders remain the most prevalent mental illness worldwide and significantly contribute to the global burden of disease (Yang et al., 2021). About 4 % of people worldwide suffer from an anxiety disorder. In the past 12 months 9.8 % of individuals have been diagnosed with a DSM-IV anxiety disorder (Alonso et al., 2018). Recent studies suggest that the frequency of these symptoms has been on the rise in recent decades (Gage and Patalay, 2021; National Institute of Mental Health [NIMH], 2013; World Health Organization [WHO], 2021). According to the Global Burden of Diseases, Injuries, and Risk Factors Study [GBD], mental disorders remain among the top ten leading causes of burden worldwide, with no

significant reduction since 1990 (GBD, 2022).

Anxiety symptoms typically emerge during childhood and adolescence and, if left unaddressed, may progress into a clinical disorder (Solmi et al., 2022). Anxiety disorders during childhood and adolescence are associated with an increased likelihood of a future anxiety disorder or depression (Essau et al., 2014; Mangione et al., 2022). The WHO's report on mental health indicated that 3.6 % of adolescents aged between 10 and 14 years and 4.6 % of adolescents aged between 15 and 19 years experienced anxiety problems (WHO, 2021). The overall pooled 12-month prevalence of anxiety was 9.0 % (Biswas et al., 2020). Generalized anxiety disorder (GAD) is one of the most common subtypes of anxiety disorders. According to Canals et al. (2019), the prevalence of GAD in adolescents is close to 7 %. Sex and age are associated with the phenotypic expression of anxiety symptoms. For instance, previous

works (Thompson et al., 2021) have found that generalized anxiety symptoms varied by sex and age. Specifically, women reported greater symptomatology than men, while younger participants reported higher levels than older participants. Research conducted on adolescents has identified a greater prevalence of the issue among females aged 13 and above, as evidenced by a higher percentage of cases (McLaughlin and King, 2015).

Anxiety symptoms in adolescents are associated with impaired functioning, educational underachievement, emotional distress and low quality of life (Gorostiaga et al., 2024; de Lijster et al., 2018; Moreno et al., 2019; Viswanathan et al., 2022). Additionally, adolescents with anxiety-related problems commonly exhibit various physiological, cognitive, and behavioral changes (Galán-Luque et al., 2023; Sáiz et al., 2022). Anxiety symptoms and disorders during this developmental stage have a significant impact on psychosocial well-being and increase the likelihood of school dropout (Baker et al., 2021). These issues can adversely affect the public health context, both because of their prevalence and associated comorbidity, as well as the risk for several social and academic problems.

The use of screening tools with adequate psychometric properties are relevant to better understanding these phenomena as well as for the early and reliable detection of youths with anxiety symptoms. Improving screening procedures can help prevent and promote evidence-based psychological treatments. The identification of adolescents exhibiting anxiety symptoms in health or educational settings necessitates the use of proper tools for sound and informed decision-making based on data. The National Institute for Health and Care Excellence [NICE] (2013) guidelines, revised in 2017, identify effective psychological interventions for treating anxious symptomatology. Notwithstanding accessibility for the entire clinical population remains limited due to difficulties in recognizing the condition because of the restricted use of effective assessment tools (NICE, 2013). The Recommendation Statement from the US Preventive Services Task Force suggests screening for anxiety in children and adolescents aged 8 to 18 years (Mangione et al., 2022; Viswanathan et al., 2022).

There are plenty of anxiety screening tools for children and adolescents (Spence, 2018). In child and adolescent populations, some of the most used self-reports are the Screening for Childhood Anxiety-Related Disorders (SCARED) (Birmaher et al., 1997) and the Multidimensional Anxiety Scale for Children (MASC) (March et al., 1997). These instruments have been widely used in research and clinical settings to measure symptoms of GAD. However, clinical application of these tools presents problems such as their length, limited measurement of only one component of GAD, and failure to assess symptom severity. The Generalized Anxiety Disorder Assessment (GAD-7) (Spitzer et al., 2006) is one of the most commonly used instruments for measuring anxiety. The GAD-7 is a self-report consisting of seven items designed to assess generalized anxiety for epidemiological, preventive, and screening purposes (Spitzer et al., 2006). The psychometric properties of GAD-7 scores have been tested (Arroll et al., 2010; Kroenke, 2021; Löwe et al., 2008). Nevertheless, there is limited information available on the psychometric properties of the GAD-7 scores in general adolescent populations. Prior work has primarily analyzed clinical or subclinical populations (Mossman et al., 2017) or has focused on specific situations like those provoked by COVID-19 (Kiviruusu et al., 2023). To date, although the GAD-7 has been validated in previous studies, there is little evidence on the psychometric properties of the GAD-7 scores in large and representative samples of the general population. For instance, few studies have tested the measurement invariance by sex or age or gathered new sources of validity evidence using modern psychometric models like item response theory (IRT).

In this research context, the main objective of this study was to examine the psychometric properties of the GAD-7 scores in a representative sample of Spanish adolescents. The specific aims were to: a) analyze the prevalence of self-reported anxiety symptoms; b) explore the internal structure of GAD-7 scores and test the measurement invariance

of GAD-7 by sex and age; c) compare the latent means by sex and age; d) estimate the reliability of GAD-7 scores; and e) analyze the association of the GAD-7 scores with psychometric indicators of psychological adjustment. It was hypothesized that the one-factor model of the GAD-7 would have adequate goodness-of-fit indices. In addition, we further hypothesized that this dimensional model would be equal across sex and age groups. We also expected the reliability estimation of the GAD-7 scores to be adequate. Finally, we expected that symptoms of anxiety to be related to mental health difficulties, negative affect, and low quality of life.

2. Method

2.1. Participants

Stratified random sampling was conducted at the class level in the total student population of La Rioja (region in Northern Spain). The students belonged to different public and chartered educational centers, compulsory secondary education and vocational training. Strata were formed according to the public and chartered nature of the educational institutions, and the educational level. A total of 34 schools and 98 classrooms participated in the study.

The initial sample consisted of 2640 students. Participants who: a) scored high (>2 points) on the Oviedo Infrequency Response Scale ($n = 175$) and were older than 18 years ($n = 247$) were removed. This left a total of 2235 students, 1045 males (46.8 %), 1183 (52.9 %) females, and 7 (0.3 %) non-binary identities. The mean age was 14.49 years ($SD = 1.76$), ranging from 12 to 18 years. Age distribution was as follows: 12 years, $n = 280$; 13 years, $n = 387$; 14 years, $n = 396$; 15 years, $n = 408$; 16 years, $n = 371$; 17 years, $n = 240$; and 18 years, $n = 153$. 90.8 % of the sample were identified as Spanish.

2.2. Measures

2.2.1. Generalized Anxiety Disorder Assessment-7 (GAD-7)

The GAD-7 (Spitzer et al., 2006) is a seven-item instrument used to assess the severity of generalized anxiety disorder. Each item asks the person to rate the severity of their symptoms over the past two weeks. Response options include 0 = *not at all*, 1 = *several days*, 2 = *more than half the days*, 3 = *almost every day*. The reliability coefficient of the Spanish version of the GAD-7, validated by Muñoz-Navarro et al. (2017), was found to be ω = 0.84.

2.2.2. Patient Health Questionnaire-9 (PHQ-9)

The PHQ-9 (Kroenke et al., 2001; Spitzer et al., 1999) consists of nine questions designed to assess depressive symptomatology according to DSM criteria. The items are answered according to the frequency of symptoms (0 = *not at all*, 1 = *some days*, 2 = *more than half of the days*, 3 = *almost every day*). Fonseca-Pedrero et al. (2023a) validated the Spanish version of the PHQ-9. The omega coefficient was 0.86 in this study.

2.2.3. Strengths and Difficulties Questionnaire (SDQ) self-report version

The SDQ (Goodman, 1997) is a self-report questionnaire that is widely used for the assessment of different emotional and behavioral problems related to mental health in adolescents. The SDQ is made up of a total of 25 statements distributed across five subscales: Emotional symptoms, Conduct problems, Hyperactivity, Peer problems, and Prosocial behaviour. The first four subscales yield a Total difficulties score. In this study we used a Likert-type response format with three options (0 = *not true*, 1 = *somewhat true*, 2 = *certainly true*). In the present study, the validated Spanish version of the SDQ, as developed by Ortuño-Sierra et al. (2022), was utilized. The Total difficulty score demonstrated a reliability of 0.80.

2.2.4. Kidscreen-10 Index (KS-10)

The KS-10 (Ravens-Sieberer et al., 2010) is an instrument developed and validated to assess health-related quality of life in children and adolescents aged 8 to 18 years. It presents a total of 10 questions in a 5-choice Likert response format (ranging from 1 = *not at all* to 5 = *extremely*), with higher scores indicating higher quality of life. The KS-10 was validated in Spain by Aymerich et al. (2005), resulting in a Cronbach's $\alpha > 0.70$ in all dimensions. In the present study, a ω value of 0.87 was obtained.

2.2.5. Positive and Negative Affect Schedule for Children (PANAS-C) brief version

The PANAS-C brief version is a self-report questionnaire (Ebesutani et al., 2012) composed of 10 Likert-type items (ranging from 1 = *very little or not at all* to 5 = *extremely or very much*) that assess two factors: Positive Affect (PA) and Negative Affect (NA). Five items measuring PA with adjectives such as: cheerful, lively, joyful, energetic and proud; and five NA: depressed, angry, fearful, frightened and sad. The PANAS-C has shown adequate psychometric quality in previous studies with Spanish adolescents (Sanmartín et al., 2018), with PA $\alpha = 0.77$ and NA $\alpha = 0.78$. In the current, reliability values of PA $\omega = 0.93$ and NA $\omega = 0.84$ were obtained.

2.2.6. Oviedo Infrequency Scale-revisited (INF-OV-R)

The INF-OV-R (Fonseca-Pedrero et al., 2019) was administered to participants in order to detect those who responded in a random, pseudorandom or dishonest manner. The INF-OV-R is a self-report instrument consisting of 10 items in a dichotomous scale format (yes/no). Students with more than two incorrect responses on the INF-OV-R scale were excluded from the sample.

2.3. Procedure

The research was approved by the Ethical Committee for Clinical Research in La Rioja [CEImLAR]. The psychometric measures were administered collectively, through personal computers, in groups of 10 to 30 students, during school hours and in a classroom specially prepared for this purpose. Administration took place under the supervision of the researchers trained in a standard protocol. No incentive was provided for their participation. Parents of participants were asked to sign an informed consent form to allow their children to participate in the study. Participants were informed of the confidentiality of their responses and of the voluntary nature of the study. This work is part of a larger project called PSICE (Evidence-based Psychology in Educational Contexts) (Fonseca-Pedrero et al., 2023c).

2.4. Data analysis

First, descriptive statistics and prevalence of scores on the GAD-7 items were calculated. Scores of 0–5, 6–9, 10–14 and 15–21 cut-off points represent absent, mild, moderate and severe anxiety levels, respectively.

Second, several confirmatory factor analyses (CFAs) were conducted to examine the internal structure of the GAD-7. Based on previous studies (Kiviruusu et al., 2023; Mossman et al., 2017), a unidimensional model was tested. Diagonally Weighted Least Squares estimator was used. The following goodness-of-fit indices were used: Chi-square (χ^2), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA) and 90 % confidence interval, and Standardized Root Mean Square Residual (SRMR). Hu and Bentler (1999) suggested that RMSEA should be 0.06 or less for a good model fit and CFI and TLI should be 0.95 or greater, although any value above 0.90 is considered acceptable.

Third, successive multigroup CFAs were conducted to test measurement invariance across sex and age (Sireci and Benítez, 2023). Basically, a hierarchical set of steps are followed when testing measurement invariance, typically starting with the determination of a well-fitting multigroup and baseline model and continuing with the establishment of successive equivalence constraints in the model parameters across groups. The baseline model is called the configural model, which is the first and least restrictive model specified and is important because it represents the baseline model against which all subsequent specified invariance models are compared. The configural model is established by specifying and testing the CFA model for each group separately. Once the theoretical model has been validated in both groups, configural invariance is then examined, which requires that the same pattern of fixed and freely estimated model parameters be equivalent across groups; however, no equality constraints are imposed on the model parameters between groups. Configural invariance is tested by assessing the model fit. When configural invariance is met (i.e., the model fits the data), it suggests that at least the general factor structure is similar, but not necessarily equivalent, across groups. The next step is to impose equality constraints on the factor loadings across the groups to test metric or weak invariance. If the model fit with the constrained parameters is significantly and practically worse than the baseline or configural model, then weak invariance is not supported. When metric invariance is met, it suggests that the same unit of measurement is being used for the item across the groups and that the participants interpret and respond to the measure in a similar manner. The next step is to impose constraints on the item intercepts and factor loadings to test strong or scalar invariance across groups. Confirming the invariance of the intercepts allows comparison of the latent means between both groups. The analyzed models are nested, with constraints being progressively added. Due to the limitations of $\Delta\chi^2$ in terms of its sensitivity to sample size, Cheung and Rensvold (2002) proposed a more practical criterion, ΔCFI, to determine if nested models are practically equivalent. In this study, if ΔCFI is >0.01 between two nested models, the more constrained model is rejected because the additional constraints have produced a worse fit. However, if the change in CFI is less than or equal to 0.01, it is considered that all specified equal constraints are tenable. Therefore, we can proceed with the next step in the analysis of measurement invariance.

Fourth, reliability estimation of the GAD-7 scores were estimated using McDonald's Omega. In addition, from the IRT framework with the 2-PL Model, the test information function was computed. Classical test theory methods cannot give us direct guidance on the latent trait of a measure to accurately assess depressive experiences at various points along the continuum. IRT methods provide estimates of the position on the latent trait (i.e., the theta level) where the tool provides the most information. Test information function graphically depict the regions of the latent trait continuum most precisely assessed. Greater information reflects greater measurement accuracy, or reliability. Test information function is estimated on the same latent trait scale (standardized M = 0; SD = 1), yielding information that is comparable across tests.

Fifth, the associations between GAD-7 scores and other mental health indicators were calculated using structural equation modeling (SEM) and Pearson correlations. SPSS 28.0, MPLUS 7.2., and JASP 0.17.2.0 were used for data analyses.

3. Results

3.1. Descriptive statistics and prevalence

Descriptive statistics and item response rates are presented in Table 1. As can be seen, 19.61 % reported feeling nervous, anxious or very upset or unable to stop worrying, 21.36 % reported worrying excessively various things, and 18.58 % reported having difficulty relaxing more than half of the days in the past two weeks. Considering the standardized cut-off points of the GAD-7, the following levels of anxiety were found: 49.6 % absent, 20.7 % mild, 18.4 % moderate and 11.1 % severe.

Table 1
Descriptive statistics and prevalence (over the last 2 weeks) of the Generalized Anxiety Disorder Assessment-7 (GAD-7) items for the whole sample.

Items	*M*	*SD*	*Skewness*	*Kurtosis*	% Not at all	% Several days	% More than half the days	% Nearly every day
1. Feeling nervous, anxious or on edge	1.14	0.90	0.51	−0.45	24.86	45.78	19.61	9.75
2. Not being able to stop or control worrying	1.11	1.01	0.51	−0.86	33.80	34.16	19.61	12.43
3. Worrying too much about different things	1.18	1.03	0.42	−0.98	31.55	33.21	21.36	13.88
4. Trouble relaxing	0.95	1.00	0.68	−0.71	42.91	28.86	18.58	9.65
5. Being so restless that it is hard to sit still	0.69	0.91	1.19	0.43	55.29	27.38	10.73	6.60
6. Becoming easily annoyed or irritable	1.21	1.00	0.44	−0.84	27.06	39.18	19.57	14.19
7. Feeling afraid as if something awful might happen	0.60	0.90	1.37	0.85	61.58	22.49	9.78	6.15

Note. https://www.hiv.uw.edu/page/mental-health-screening/gad-7

3.2. Multigroup confirmatory factor analysis and measurement invariance as a function of sex and age

Goodness-of-fit indices for the unidimensional model in the total sample were adequate ($\chi^2 = 104.96$; df = 14; CFI = 0.998; TLI = 0.997; RMSEA (90 % CI) = 0.054 (0.045–0.064); SRMR = 0.028). The standardized factor loadings for the total sample and by sex and age are shown in Table 2. The analysis of measurement invariance across sex and age showed satisfactory fit indices for the scalar model. As shown in Table 3, the differences in the CFI value between the different models tested were <0.01.

After verifying the measurement invariance of the scores, we estimated the latent mean differences between sex and age groups. We set the latent mean values to zero for females and for the 15–18 year age groups (the reference groups). The intercepts obtained from the latent mean analysis were statistically significant for sex (−0.736; $p < .001$) and for age (−0.207; $p < .001$). On the anxiety dimension, the value of −0.736 indicated that boys scored on average 0.746 units lower than the mean score of girls. The value of −0.207 indicated that the 12–14 year old group scored on average 0.207 units below the mean score of the older group.

3.3. Reliability estimation of the GAD-7 scores

The internal consistency of the GAD-7 total frequency score, estimated with McDonald's Omega, was 0.90 (95 % CI: 0.89–0.91). Item discrimination indices were higher than 0.30. According to the IRT framework, the test information function provides an optimal estimation at the medium-high latent trait (see Fig. 1). The test provides the most information about the latent trait when it falls between approximately 0 and 2. However, for values of the latent trait between −2 and 0, the measurement error is greater.

3.4. Evidence based on relationships with external variables

The correlation between the GAD-7 total score and psychometric indicators of psychological adjustment were also examined. As shown in Table 4, scores on the GAD-7 were positively and statistically significantly correlated with depressive symptoms, negative affect, and

Table 2
Standardized factor loadings of the Generalized Anxiety Disorder Assessment-7 (GAD-7) for the total sample and by sex and age.

Items	Total sample	Male	Female	12–14 years	15–18 years
1	0.806	0.762	0.794	0.795	0.815
2	0.899	0.876	0.890	0.898	0.898
3	0.876	0.851	0.867	0.875	0.874
4	0.862	0.808	0.864	0.838	0.880
5	0.797	0.757	0.799	0.757	0.828
6	0.639	0.584	0.591	0.609	0.665
7	0.711	0.688	0.676	0.727	0.712

Note. All standardized factor loadings estimated were statistically significant (*p* < .01).

emotional and behavioral problems, and were negatively associated with positive affect and quality of life. Fig. 2 shows the SEM model of the latent dimension measured by GAD-7 and the indicators of psychological adjustment. It shows how emotional and behavioral difficulties, positive and negative affect, and quality of life predict 66.8 % of the variance of generalized anxiety disorder ($R^2 = 0.668$, $p < .001$).

4. Discussion

Mental health problems, such as anxiety symptoms, are a major cause of disability and disease burden in adolescents. A reliable and early detection of anxiety symptoms in adolescents is one of the main strategies for their prevention. Thus, considering the prevalence of anxiety symptoms and disorders during adolescence, the associated personal, family, educational and social impact, and the need for short and easy instruments to identify emotional difficulties, the main goal of the present study was to validate the GAD-7 scores in a representative sample of Spanish adolescents.

The prevalence of severe anxiety symptomatology found in the analyzed sample reached 11.1 %, being higher in girls (17.2 %) than in boys (4.3 %) and in the older group (12.5 %) than in the younger (9.6 %). The results found in the present study seem consistent with previous international reports (Canals et al., 2019; WHO, 2021; Biswas et al., 2020). For instance, Biswas et al. (2020) using a sample of 275,057 adolescents aged 12–17 years found that the overall 12-month prevalence of anxiety was 9.0 %. Several other studies conducted with adolescents discovered that the prevalence rate of anxious symptomatology ranged from 10 % to 29.9 % (Garcia et al., 2021; Kasturi et al., 2023). Nonetheless, since we used internationally defined cut-off scores but not tested in Spain, these results should be considered as preliminary. In the latent mean analysis carried out, it was found that females had higher mean scores than males and that adolescents aged 15–18 years also had higher mean scores than those aged 12–14 years. These results are congruent with those obtained in previous studies with Spanish adolescents (Canals et al., 2019; Fonseca-Pedrero et al., 2023b; Gorostiaga et al., 2024) and follow the same trend as international studies that take into account the sex and age of adolescents (Caputi and Bosacki, 2023; McLaughlin and King, 2015; Ohannessian et al., 2017; Thompson et al., 2021). In the study conducted by Todorović et al. (2023) with adolescents, girls scored higher than boys on 5 of the 7 items of the GAD. In the research by Piqueras et al. (2021), girls also scored higher on the GAD than boys, and adolescents scored higher than children, although effect sizes were small to medium in all comparisons.

When analyzing the internal structure of the GAD-7 scores, the unidimensional factor model showed satisfactory goodness of fit indices. Similar results were found in previous research conducted with samples of adolescents (Adjorlolo, 2019; Crockett et al., 2022; Mossman et al., 2017; Osborn et al., 2022; Tiirikainen et al., 2019; Todorović et al., 2023). In the study conducted by Ip et al. (2022) with Hong Kong adolescents, the one-dimensionality of the GAD-7 scores was tested using the item response theory (IRT) approach. With regards to the factorial invariance analyses, the results showed factor structure equivalence across age and gender, implying that the latent variable is measured

Table 3

Goodness-of-fit indices for measuring the invariance of Generalized Anxiety Disorder Assessment-7 (GAD-7) by sex and age.

Model	χ^2	gl	CFI	TLI	RMSEA (90 % IC)	SRMR	ΔCFI*
Sex							
Male (*n* = 1045)	35.340	14	0.998	0.997	0.038 (0.023–0.054)	0.030	
Female (*n* = 1183)	86.193	14	0.997	0.995	0.066 (0.053–0.080)	0.034	
Configural invariance	121.533	28	0.997	0.996	0.055 (0.045–0.065)	0.033	
Metric Invariance	129.098	34	0.997	0.997	0.050 (0.041–0.059)	0.034	<0.01
Scalar Invariance	169.912	47	0.996	0.997	0.048 (0.041–0.056)	0.033	<0.01
Age							
12–14 years	54.164	14	0.998	0.997	0.052 (0.038–0.067)	0.032	
15–18 years	61.176	14	0.998	0.997	0.054 (0.040–0.068)	0.029	
Configural invariance	115.340	28	0.998	0.997	0.053 (0.043–0.063)	0.031	
Metric Invariance	139.425	34	0.998	0.997	0.053 (0.044–0.062)	0.034	<0.01
Scalar Invariance	150.825	47	0.998	0.998	0.045 (0.037–0.053)	0.032	<0.01

Note. χ^2 = Chi square; *df* = degrees of freedom; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; RMSEA = Root Mean Square Error of Approximation; IC = Interval Confidence; SRMR = Standardized Root Mean Square Residual; ΔCFI = Change in Comparative Fix Index.

* ΔCFI < 0.01 indicates measurement invariance across sex or age.
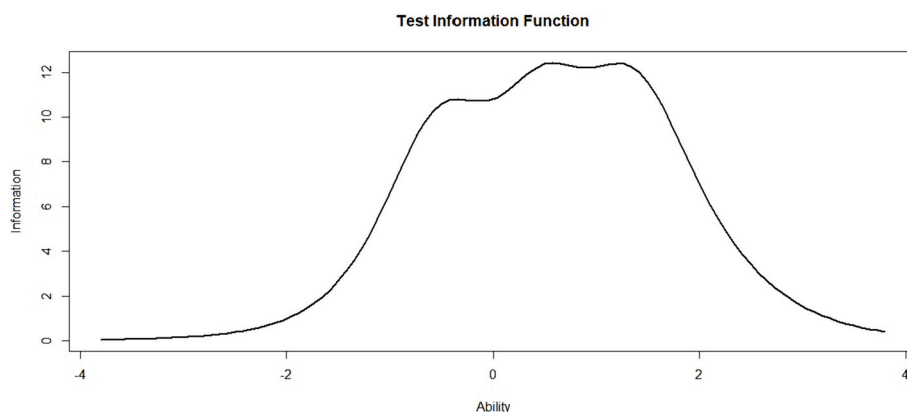
Fig. 1. Test information function of the Generalized Anxiety Disorder Assessment-7 (GAD-7). *Note.* F1 = latent trait. Test information function graphically depict the regions of the latent trait continuum most precisely assessed. Greater information reflects greater measurement accuracy, or reliability.

Table 4

Pearson correlations between the Generalized Anxiety Disorder Assessment-7 (GAD-7) and psychometric indicators of psychological adjustment.
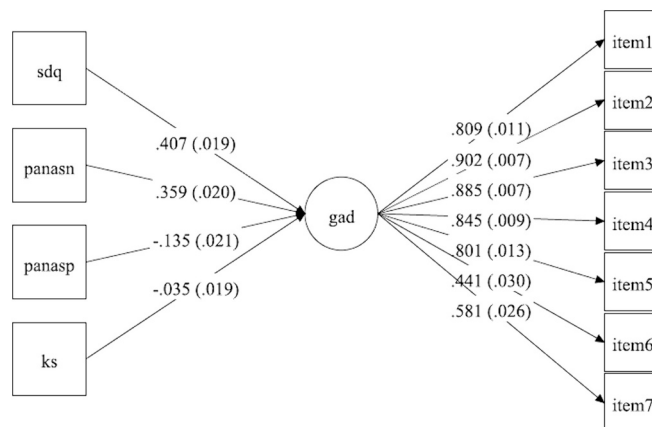
	GAD-7	PHQ-9	SDQ	PANAS-C Negative affect	PANAS-C Positive affect
PHQ-9	.766**				
SDQ	.734**	.735**			
Negative affect	.739**	.708**	.684**		
Positive affect	−.595**	−.666**	−.568**	−.616**	
Kidscreen-10	−.471**	−.552**	−.496**	−.460**	.655**

Note. GAD-7 = Generalized Anxiety Disorder Assessment-7; PHQ-9 = Patient Health Questionnaire-9; SDQ = Strengths and Difficulties Questionnaire, Total score; PANAS-C = Positive and Negative Affect Schedule for Children.

** *p* < .01.

Fig. 2. Structural equation modeling: psychological adjustment factors as predictors of Generalized Anxiety Disorder. *Note.* GAD = Generalized Anxiety Disorder; SDQ = Strengths and Difficulties Questionnaire, total difficulties score; PANAS-P = Positive and Negative Affect Schedule for Children, positive affect; PANAS-N = Positive and Negative Affect Schedule for Children, negative affect; KS = Kidscreen-10; Significant effects shown as standardized coefficients (*β*). Only statistically significant values (*p* < .001) are shown.

equivalently across all groups (Shorey et al., 2019). It should be emphasized that if measurement invariance is not met, the validity of these scores should be questioned. Given the differences found between anxious symptomatology as a function of sex and age (Davies et al., 2019; Thompson et al., 2021), it is important to keep in mind that comparability between different groups is only meaningful if it can be ensured that participants interpret and understand the latent construct in a similar way. Scalar invariance is necessary for the clinical and practical use of assessment instruments (Rasmussen et al., 2015).

The internal consistency of the GAD-7 scores, estimated using the Omega coefficient, was 0.90. This result is consistent with those found in

previous studies conducted in adolescent populations (Sun et al., 2021; Tiirikainen et al., 2019). The test information function (TIF) was also calculated using a modern psychometric approach. The TIF provided a better estimate at high latent trait, namely, the GAD-7 provided more

information at higher levels of severity of anxious symptomatology. This is relevant in the context of the actual estimation ability of the score, since the TIF serves as an estimate of the accuracy of the latent trait (i.e., anxiety). These results are consistent with those obtained in previous studies (Todorović et al., 2023).

The GAD-7 scores were positively associated with self-reported depressive symptoms, negative affect, and emotional and behavioral problems, and negatively associated with positive affect and quality of life. Similar findings have been reported in prior research (Fernández-Sogorb et al., 2022; Gorostiaga et al., 2024; de Lijster et al., 2018; Moreno et al., 2019; Viswanathan et al., 2022). Furthermore, structural equation modelling indicates that anxiety levels can be predicted based on scores related to emotional and behavioral problems, as well as positive and negative affect. The study conducted by Sanmartín et al. (2020) showed that the combination of high levels of positive affect and low levels of negative affect were associated with high levels of life satisfaction and low levels of social anxiety and depression. In the study by Gorostiaga et al. (2024), anxiety symptoms were associated with depression and emotional, behavioral problems. Higher severity of anxiety symptoms were associated with poorer quality of life and depressive problems in both adult and adolescent samples (Raknes et al., 2017; Wilmer et al., 2021). On the other hand, anxiety is the most common emotional problem in young people with depressive, bipolar, or psychotic symptoms (Ratheesh et al., 2023).

The presence of depressive and anxious symptomatology, also referred to as internalizing spectra, appears to be increasing in the adolescent population in recent decades (Cucci et al., 2022; Gage and Patalay, 2021). Despite the increasing evidence of the effectiveness of early intervention, adolescents are the age group with the lowest access to mental health services (McGorry and Mei, 2018). New psychopathology models as the Hierarchical Taxonomy of Psychopathology [HiTOP] (Kotov et al., 2017) or transdiagnostic dimensional approaches (Brown and Barlow, 2009) may provide us new insight into the undestanding of emotional problems during childhood and adolescence. In addition, these new approaches may have significant implications for conceptualization, assessment, diagnosis, prevention and intervention. By adopting a dimensional perspective, these approaches explore the underlying psychological constructs that are common across different mental disorders (Eaton et al., 2023). Early identification of clinical or subclinical anxiety symptoms during adolescence is essential for the design and implementation of socioemotional education programs in educational contexts to prevent and reduce their consequences in all areas of young people's lives (Durlak et al., 2022; Fonseca-Pedrero et al., 2023b).

The following limitations should be kept in mind when interpreting the results of the present study. First, although the sample is large and representative, it is important to note that it belongs to a specific Spanish autonomous community (La Rioja), which may limit the generalizability of the results. Second, self-reports were used to assess all psychological indicators, with their known limitations. Finally, the cross-sectional nature of this study means that it is impossible to draw conclusions about causal relationships.

The GAD-7 is a brief, easy, and reliable tool for assessing self-reported anxiety symptoms during adolescence. This tool may be used as a screening tool for universal early detection of anxiety symptoms during adolescence in clinical and school settings. Future studies could use new psychometric models, such as network theory, or assessment methods such as ecological momentary assessment (Elosua et al., 2023). In addition, anxiety screening and prevention programs for young people need to go beyond the clinic walls. The protection and care of young people's mental health requires the promotion of psychological well-being and the prevention of psychological problems.

Role of funding

CRediT authorship contribution statement

María Ángeles Casares: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing, Supervision, Validation. **Adriana Díez-Gómez:** Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Supervision, Writing – original draft, Writing – review & editing. **Alicia Pérez-Albéniz:** Conceptualization, Data curation, Funding acquisition, Investigation, Methodology, Supervision, Writing – original draft, Writing – review & editing. **Beatriz Lucas-Molina:** Resources, Supervision, Validation, Writing – review & editing. **Eduardo Fonseca-Pedrero:** Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Supervision, Writing – original draft, Writing – review & editing.

Declaration of competing interest

The Authors declare that there are no competing interests in relation to this study.

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