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Factor Structure, Reliability and Validity of the European Portuguese Version of the Revised Childhood Anxiety Sensitivity index (CASI-R) in a Clinical Sample of School-Aged Children

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Abstract: The present study explored the factor structure, reliability and convergent validity of the Portuguese version of the Childhood Anxiety Sensitivity Index – Revised (PT-CASI-R) in a clinical sample of school-aged children. A clinical sample of 153 children with emotional disorder symptomatology (i.e., anxiety or depressive disorder; 6-13 years) completed the CASI-R and the Revised Child Anxiety and Depression Scale (RCADS). A confirmatory factor analysis was performed and the psychometric properties of the CASI-R were assessed. The PT-CASI-R revealed good internal consistency, with a four-factor hierarchical structure. Moderate and strong correlations were found between the CASI-R and RCADS subscales, specifically the "panic disorder" RCADS subscale. Our findings suggest that the PT-CASI-R is a psychometrically valid measure for assessing anxiety sensitivity in Portuguese children with clinical emotional symptoms, between 6 and 13 years old.

Keywords: *Anxiety sensitivity; Children; Clinical sample; Psychometric properties.*

Anxiety and depressive disorders are among the most common mental health conditions in children and adolescents (Melton et al., 2016), and their prevalence has recently increased both globally (Lebrun-Harris et al., 2022) and in Portugal (Augusto, 2014). The rising prevalence of mental disorders highlights the importance of conducting research on children's mental health, particularly on the variables that contribute to the development and persistence of such disorders.

Anxiety Sensitivity and Children's Mental Health

Anxiety sensitivity is one important etiological and maintenance factor of children's anxiety disorders. It can be defined as a fear of anxiety-related bodily sensations due to their perceived potential harmful consequences at physical, cognitive and social levels (e.g., physical illness, loss of control, and social embarrassment, respectively; Reiss & McNally 1985; Taylor et al., 2007). Several studies with children and adolescents have found an association between anxiety sensitivity and the development and maintenance of anxiety-related disorders, such as social phobia (Alkozei, et al., 2014), obsessive-compulsive disorder (Krebs et al., 2020), posttraumatic stress disorder (Chiu et al., 2024), panic disorder, and agoraphobia (Muris et al., 2001; Noël & Francis, 2011). Children with anxiety disorders were also shown to have higher levels of anxiety sensitivity than children without an anxiety disorder (Muris et al., 2001). For instance, a study by Weems et al. (2007) found significant relationships between children's anxiety disorder symptoms and anxiety sensitivity, negative cognitive errors, and anxiety control beliefs. Higher scores of anxiety sensitivity were also associated with mood disorders, particularly depression.

Several studies have suggested gender differences in anxiety sensitivity (e.g., Deacon et al., 2002; Muris, 2002; Walsh et al., 2004), with girls reporting significantly higher levels of anxiety sensitivity than boys, particularly fear of publicly observable anxiety reactions. It has been hypothesized that girls are generally more encouraged than boys to express and experience their emotions, which may explain these differences (Golombok & Fivush, 1994). Given previous research demonstrating age differences in children's understanding of anxiety sensitivity construct, some authors have suggested that younger children may not have acquired the cognitive skills required to understand the attributions that underlie the expression of the anxiety sensitivity (Nelles & Barlow, 1988). Mattis and Ollendick (1997), on the other hand, claimed that younger children generate more positive attributions in response to panic and anxiety symptomatology than older children. However, in addition to these findings, Francis et al. (2019) observed

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no significant differences between children aged between 8 and 11 years and those aged between 12 and 14 years on self-reported anxiety sensitivity.

Assessing Anxiety Sensitivity: The Childhood Anxiety Sensitivity Index

The main self-report instrument used to assess anxiety sensitivity in children and adolescents is the Childhood Anxiety Sensitivity Index (CASI; Silverman et al., 1991). This scale is derived from the Anxiety Sensitivity Index (ASI; Reiss et al., 1986), which was developed for adults. The CASI comprises 18 items and has proven to be a valid and reliable instrument for measuring anxiety sensitivity in both clinical (e.g., attention deficit hyperactivity disorder, enuresis, dysthymic disorder, overanxious disorder, conduct disorder, oppositional disorder, and adjustment disorder) and nonclinical samples of children and adolescents (Muris, 2002; Silverman et al., 1991; Silverman et al., 1999).

The factor structure of the CASI has been extensively investigated. Although there is a general agreement on the existence of a hierarchical structure with three or four lower-order factors loading on one higher-order factor (anxiety sensitivity; e.g., Muris et al., 2001; Silverman et al., 1999; Silverman et al., 2003), the number and nature of these lower-order factors remain unclear. Difficulty in reaching consensus on the number of CASI factors is due to a variety of factors, including the origin of the sample, methods of analysis, and issues with scale translation (Stassart & Etienne, 2014). However, it is critical to understand the components that comprise this construct because they appear to correspond to many of the mechanisms that underlie the emergence of various types of anxiety or fears (Cox, 1996). Some authors have argued that anxiety sensitivity can be conceptualized as a hierarchical construct with three lower-order factors: (1) fear of physical symptoms, (2) fear of mental incapacitation, and (3) fear of social evaluation (Muris et al., 2001; Silverman et al., 1999). Nevertheless, the studies conducted by Muris et al. (2001) and Silverman et al. (1999), reported evidence of a four-factor solution, with a distinction between the factors "fear of losing control of anxiety symptoms" and "fear of social evaluation".

One of the major challenges in defining the main dimensions of anxiety sensitivity derived from the fact that the original CASI had few items (Muris, 2002; Silverman et al., 1999). Therefore, an expanded measure of anxiety sensitivity, with 31 items, was developed to address this issue: the Childhood Anxiety Sensitivity Index – Revised (CASI-R; Muris, 2002). In the original validation study of the CASI-R (Muris, 2002), conducted in a non-clinical sample of children aged between 12 and 18 years old, two hierarchical models with three and four lower-order factors loading on one higher-order factor were tested. The hierarchical model with four factors (fear of cardiovascular symptoms, fear of publicly observable anxiety reactions, fear of cognitive dyscontrol, and fear of respiratory symptoms) loading on one higher-order factor (anxiety sensitivity) provided a significantly better fit to the data. All subscales presented good internal consistency, with Cronbach's alpha values ranging between .81 and .88. The total score had a Cronbach's alpha of .93. In terms of convergent and discriminant validity, this study found a strong relationship between CASI-R and anxiety sensitivity as measured by the original index (CASI; Silverman et al., 1991), as well as a positive correlation between CASI-R and trait anxiety, anxiety disorder symptoms, and depression.

Although the CASI-R was initially developed in Dutch (Muris, 2002), it has been translated into different languages, including French (Stassart et al., 2013) and English (Francis et al., 2019). French and American validation studies, conducted in non-clinical samples of children aged between 12 and 13 years old and between 8 and 14 years old, respectively, showed that the CASI-R had satisfactory reliability and validity. Both studies examined the convergent and discriminant validity of the CASI-R with other measures of anxiety and depression. In both cases, positive correlations were found between anxiety sensitivity as measured by the CASI-R and anxiety and depression symptomatology. With regard to factor structure in each of these studies, Stassart et al. (2013) tested five models with different factor structures (a one-factor model; a model with four correlated factors; a model with four lower-order factors and one higher-order factor; a four-factor model with Item 15 moved from "fear of cardiovascular symptoms" to "fear of publicly observable anxiety reactions"; and a model with four lower-order factors and one higher-order factor, with Item 15 moved from "fear of cardiovascular symptoms" to "fear of publicly observable anxiety reactions").

The results indicated that the model with four lower-order factors and one higher-order factor was the structure with the best fit to the data, presenting adequate internal consistency, with Cronbach's alphas of 87 for the total score and between .62 and .75 for the subscale scores. The validation study of the American version of CASI-R (Francis et al., 2019) only tested a model with four correlated factors, which had a good fit to the data. Cronbach's alpha coefficients ranged between .67 (cognitive dyscontrol subscale) and .89 (total score). To date, a factor structure of the CASI-R including four factors has provided the best fit to the data in all studies analyzing its psychometric properties.

The present study

Considering the high prevalence of anxiety disorders during childhood in Portugal (Augusto, 2014), it is crucial to have valid instruments for measuring anxiety sensitivity in clinical and research contexts. In addition, the psychometric properties of the CASI-R have only been studied in nonclinical samples of children and adolescents. Studies exploring the psychometric properties of this scale, including its factor structure, in samples of children and adolescents with anxiety or other related disorders are critical to support the use of the CASI-R in assessing anxiety sensitivity among clinical populations.

Therefore, the present study aimed to explore the psychometric properties of the Portuguese version of the CASI-R (the PT-CASI-R) in a clinical sample of Portuguese children between 6 and 13 years. Similarly to previous CASI-R validation studies and taking into account the strong correlation between anxiety sensitivity and mood disorders, particularly depression, we chose to include in our sample not only children with anxiety symptoms but also children with depressive symptoms.

One of the main goals of this study was to analyze the PT-CASI-R factor structure. Four competing models were tested: a hierarchical factor structure with four (Model 1) or three (Model 2) lower-order factors, as tested in the original validation study (Muris, 2002); a factor structure with four correlated factors (Model 3), as tested in French and American validation studies (Francis et al., 2019; Stassart et al. 2013); and a factor structure with three correlated factors (Model 4). According with previous validation studies of this measure, we expected to demonstrate that the four-factor model had an adequate fit the data in our sample adequately.

This study also sought to analyze the PT-CASI-R reliability and the invariance of this measure across gender and age groups. Finally, we also intended to analyze the construct validity of the PT-CASI-R, by exploring its association with scores on the Revised Child Anxiety and Depression Scale (RCADS). According to previous studies (Muris et al., 2001; Weems et al., 1997) we expected the CASI-R to be positively associated with the RCADS anxiety and depression subscales.

METHOD

Participants

The present study was developed within a broader research project aiming to test the efficacy of the Unified Protocol for Transdiagnostic Treatment of Emotional Disorders in Children (UP-C; Ehrenreich-May et al., 2018) in the Portuguese population. The sample of the present study comprised 153 children (58.8% girls) with a mean age of 9.44 years (SD = 1.81). The majority of children presented an anxiety disorder (82.4%), with only 7.8% of children presenting depressive symptomatology and 9.8% of children presenting an anxiety-related disorder as their main difficulty. The majority of children (61.4%) presented at least one comorbid diagnosis. Of these, the majority presented another emotional disorder as comorbid diagnosis (52.3%). The complete sample characterization is presented in Table 1.

Table 1. Children's Sociodemographic and Clinical Characteristics

	N = 153
Sociodemographic characteristics	
Age (years), *M* (SD); range	9.44 (1.81); 6-13
Children's age category *n* (%)	
6-9 years	74 (48.4%)
10-13 years	79 (51.6%)
Gender, *n* (%)	
Feminine	90 (58.8%)
Masculine	63 (41.2%)
Education level, *n* (%)	
Kindergarten	1 (0.7%)
Primary school	77 (50.3%)
Middle school	75 (49.1%)
Household monthly income *n* (%)	
Less than 800€	16 (10.5%)
800€-2000€	89 (58.2%)
2000€-3500€	30 (19.6%)
More than 3500€	8 (5.2%)
Residence *n* (%)	
Rural	59 (38.6%)
Urban	94 (91.4%)
Clinical characteristics	
Principal diagnosis, *n* (%)	
Anxiety disorder	126 (82.4%)
Anxiety-related disorder	15 (9.8%)
Depression	12 (7.8%)
Specific principal diagnosis *n* (%)	
Social phobia/performance anxiety	42 (27.5%)
Generalized anxiety disorder	29 (19%)
Specific phobia	27 (17.6%)
Separation anxiety disorder	16 (10.5%)
Obsessive-compulsive disorder	9 (5.9%)
Illness anxiety disorder	4 (2.6%)
Anxiety disorder not otherwise specified	6 (3.9%)
Agoraphobia	1 (0.7%)
Panic disorder	4 (2.6%)
Depression	12 (7,8%)
Posttraumatic stress disorder	2 (1.3%)
Selective Mutism	1 (0.7%)
Comorbid diagnosis, *n* (%)	
Yes	94 (61.4%)
No	59 (38.6%)
Comorbid emotional diagnosis, *n* (%)	
Yes	80 (52.3%)
No	73 (47.7%)
Current medication, *n* (%)	
Yes	17 (11.1%)
No	136 (88.9%)

Procedure

Translation Process

The Portuguese version of the CASI-R was developed through a translation and back-translation procedure with the permission of the author. Two Portuguese researchers fluent in English independently translated the items of the CASI-R. A preliminary Portuguese version was obtained after comparing and discussing the similarities and differences between these two versions. The preliminary Portuguese version of the CASI-R was then translated back into English by an independent researcher who was fluent in English and who was not familiar with the questionnaire to ensure grammatical appropriateness and conceptual consistency with the original version. Discrepancies and translation difficulties between the original and translated versions were analyzed, discussed and resolved by agreement between the researchers.

Data Collection

The sample was collected between March 2021 and May 2022. Participants were referred by mental health professionals of a public hospital in central Portugal , by school psychologists from six public schools in central Portugal and by parents' self-registration on the project website indicating their willingness to participate in the study. Approval from the Ethics Committee of the BLIND FOR REVIEW and from the Board of Directors of the public schools was obtained.

Furthermore, 331 parents expressed an interest in participating in the study. All families were contacted by one clinical psychologist from the research team, who provided more information about the project and the inclusion and exclusion criteria. The inclusion criteria were as follows: aged between 6 and 13 years and a primary diagnosis of an emotional disorder (i.e., an anxiety disorder, an anxiety-related disorder, or a depressive disorder). The exclusion criteria were as follows: a diagnosis of schizophrenia or bipolar disorder, a diagnosis of cognitive disability and/or pervasive developmental disorder, severe current suicidal ideation, changes in psychopharmacological intervention over the previous month, other psychological treatment during the UP-C, inability of at least one caregiver to attend the assessment and treatment sessions or inability to speak and understand Portuguese.

After that 212 participants were interested in participating and scheduled an initial eligibility interview. In this eligibility interview, two clinical psychologists assessed the inclusion and exclusion criteria through a structured clinical interview aimed at assessing the presence of several mental disorders (e.g., anxiety and related disorders, depressive disorders), over the past 6 months, according to the Diagnostic and Statistical Manual of Mental Disorders - 5 (DSM-5) and the International Statistical Classification of Diseases and Related Health Problems - 10 (ICD-10). This interview took between 30 and 90 minutes to be administered. Children who met the eligibility criteria completed a battery of self-report measures, in which the Portuguese version of CASI-R was included. Of the 212 participants, 153 met inclusion criteria for the study and completed a battery of self-response questionnaires at pretreatment, which were used in this present study.

Measures

Childhood Anxiety Sensitivity Index - Revised (CASI-R; Muris, 2002)

The CASI-R is a 31-item index used to assess anxiety sensitivity in children. Items are rated on a 3-point Likert scale (0 = not true to 2 = very true) and comprise four subscales: (1) fear of cardiovascular symptoms (10 items; e.g., "When my head is pounding, I worry that I could have a stroke"), (2) Fear of Publicly Observable Anxiety Reactions (8 items; e.g., "I think it would be horrible to faint in public"); (3) Fear of Cognitive Dyscontrol (6 items; e.g., "It scares me when I cannot keep my mind on the task"); and (4) Fear of Respiratory Symptoms (7 items; e.g., "When my breathing is irregular, I fear that something bad will happen"). The total score of anxiety sensitivity can be calculated by summing the ratings for all items. The CASI-R total score ranges from 0 to 62, with higher scores indicating higher levels of anxiety sensitivity.

The Revised Child Anxiety and Depression Scale (RCADS; Chorpita et al., 2000; Pereira & Pedro, 2019)

The RCADS was used to assess children's anxiety and depression symptoms. The RCADS has 47 items that are rated on a 4-point Likert scale (0 = never to 3 = always). It has one subscale assessing depression (10 items; e.g., "I feel sad or empty") and five subscales assessing anxiety disorders (37 items), including separation anxiety disorder (e.g., "I worry about being away from my parents"), generalized anxiety disorder (e.g., "I worry about what is going to happen"), panic disorder (e.g., "I suddenly feel as if I can't breathe, without a good reason"), social phobia (e.g., "I worry that I might look foolish"), and obsessive-compulsive disorder (e.g., "I get bothered by bad or silly thoughts or pictures in my mind"). It also provides a total anxiety score (sum of the five anxiety subscales) and a total internalizing score (sum of all subscales). Higher scores on the anxiety and depression subscales indicate more severe symptoms. In the current study, Cronbach's alpha coefficients were .94 for the total scale, .85 for the depression scale, .93 for the total

anxiety scale, .72 for the separation anxiety disorder subscale, .85 for the generalized anxiety disorder subscale, .88 for the panic disorder subscale, .87 for the social phobia subscale and .75 for the obsessive-compulsive disorder subscale.

Data analysis

The Statistical Package for the Social Sciences (SPSS, version 27.0; IBM SPSS, Chicago, IL) was used to determine descriptive statistics and perform t tests and correlation analyses. Preliminary analyses were performed to assess whether the data followed a normal distribution. In accordance with Kline's (2015) recommendations, each item's skewness and kurtosis were examined. If the skewness and kurtosis values were greater than 3 and 10, respectively, the data distribution was deemed nonnormal.

For confirmatory factor analysis, the software AMOS (IBM SPSS AMOS Version 24.0; IBM Corporation, Meadville, PA, USA) was employed. The maximum likelihood estimation method (Brown, 2015; Kline, 2015) was applied to the covariance matrices. Model fit adequacy was determined using the comparative fit index (CFI; Bentler, 1990), the root mean square error of approximation (RMSEA; Steiger & Lind, 1980), and the square root mean residual (SRMR; Hu & Bentler, 1999). Cutoff values of > 0.90 (CFI), < 0.08 (RMSEA) and < 0.06 (SRMR) were used as reference threshold values for model acceptability. According to Hu and Bentler (1999), the model was considered to have a good fit when CFI was ≥ 0.95, the RMSEA was ≤ 0.06 and the SRMR was ≤ 0.08. According to the same authors, the SRMR should be supplemented by another index (e.g., the CFI or RMSEA) to determine model fit. The Akaike Information Criterion (AIC; Akaike 1987) was used to compare models. The model with the lowest AIC value can be considered the best model (Kline, 2015). Item errors that belonged to the same factor were allowed to correlate (Byrne, 2010). Four models were tested: a model with four lower-order factors loading on one higher-order factor (Model 1), a model with three lower-order factors loading on one higher-order factor (Model 2), a model with four correlated factors (Model 3), and a model with three correlated factors (Model 4).

The internal consistency of the PT-CASI-R subscales and total scale were determined using Cronbach's alpha and omega coefficients. Coefficients of .70 or greater were regarded as acceptable (Kline, 2015). Pearson correlation analyses were performed to examine the associations among the PT-CASI-R subscales, total score, and RCADS scores. Correlation coefficients of approximately .10 were considered small or negligible, those of approximately .30 were considered moderate, and those above .50 were considered large (Cohen, 1988).

We tested measurement invariance across gender and age groups by assessing configural invariance, allowing all parameters to be freely estimated for each group. When configural variance is assumed, we proceed to test two additional models: (2) the second model, assessing metric invariance, nested within the configural model and introducing the constraint of equal factor loadings across groups, and (3) the third model, testing scalar invariance, nested within the metric invariance model and introducing the additional constraint of equal item intercepts across groups. A difference in CFI, RMSEA and SRMR values greater than 0.010 indicated a lack of measurement invariance (Cheung & Rensvold, 2002).

The age groups were determined based on previous research showing that there are important developmental differences in the most common concerns and symptoms of anxiety in middle childhood (Weems & Costa, 2005). Previous research (e.g., Weems & Costa, 2005; Westenberg et al., 2001) indicates that between the ages of 6 and 9, the main concerns arise from the development of a sense of self as separate from parents, with symptoms of separation anxiety being frequent. Children between the ages of 10 and 13 are known to develop an understanding of mortality and global issues (Westenberg et al., 2001), which may contribute to children in this age group experience fears related to danger and death, typical of generalized anxiety disorder (Weems & Costa, 2005). Effect sizes (Cohen's d) were calculated.

RESULTS

Factor Structure of the PT-CASI-R

The results of the confirmatory factor analyses indicated that all fit indices for the four models tested were satisfactory. However, Model 3 (the model with four correlated factors) was the model that presented the best fit to the data, $\chi 2(421) = 642.22$, $p < .001$; SRMR = .07; RMSEA = .06; CFI = .90; AIC = 792.22, with a combination of the lowest RMSEA and AIC values and the highest CFI value (see Table 2). Therefore, the remaining psychometric characteristics examined in this study were analyzed in relation to Model 3. As presented in Figure 1, the completely standardized factor loadings of the PT-CASI-R items were all significant ($p < .05$) and equal to or greater than .31 (see also Table 3).

In the final model, Factor 1 (Fear of cognitive dyscontrol) accounted for 18% of the explained variance, Factor 2 (Fear of publicly observable anxiety reactions) explained 15%, Factor 3 (Fear of respiratory symptoms) accounted for 27%, and Factor 4 (Fear of cardiovascular symptoms) explained 15%.

Reliability Analysis

The normality (univariate and multivariate) was assessed by the values of skewness and kurtosis. Skewness values ranged from -0.41 to 1.82 and kurtosis values ranged from -1.55 to 2.29, which indicated that there was no severe violation of normal distribution (Sk < 3; Ku < 10; Kline (2015)).

As presented in Table 4, omega coefficient values ranged from .76 (fear of publicly observable anxiety reactions) to .90 (fear of cardiovascular symptoms). Similar values were found for Cronbach's alpha values, which ranged from .77 (fear of publicly observable anxiety reactions) to .90 (fear of cardiovascular symptoms). The corrected item-total correlations ranged from .30 (Item 28) to .74 (Items 8 and 13). Cronbach's alpha values with items deleted one by one showed that the majority of the items significantly contributed to the internal consistency of the scale.

Measurement Invariance for Gender and Age

Table 5 presents the outcomes of the measurement invariance tests for both gender and age groups. Despite good RMSEA (≤ 0.06) values, both in gender and age group the configural model analysis showed poor fit across groups with low CFI values (0.810-0.830) and high SRMR values (0.089-0.099). In addition, the existence of differences above 0.010 in the CFI, RMSEA and SRMR values, between the original model (model 3) and the configural model, in both age and gender groups, did not allow configural invariance to be established. Therefore, further testing for metric and scalar invariance was not pursued.

The factor loadings for the configural invariance model were examined separately for each group. Overall, most items demonstrated loadings above the practical significance threshold of 0.31, indicating that they were meaningful indicators of the latent constructs. However, a few items exhibited loadings below 0.31, suggesting weaker relationships with their respective factors. Specifically regarding gender groups, for the male group, Item 2 and Item 10 showed a loading of 0.27 and 0.30, respectively, which falls below the commonly accepted threshold of practical significance. Similarly, Item 6, Item 10 and Item 28 in female group had a factor loading of 0.25, 0.30 and 0.29 respectively, suggesting that this items may not be a strong indicator of the underlying construct for this group.

Concerning age, for the 10-13 years old group, Item 6 demonstrated a loading of 0.29, which fall below the threshold generally considered indicative of practical significance

These low loadings suggest that certain items may not function equivalently across groups, potentially affecting the configural invariance of the model.

That indicate that the basic factor structure was not consistent across gender or age groups, not allowing inferences to be drawn as to the presence of gender and age differences.

Convergent validity

Pearson correlation analyses were conducted to examine the relationships of the PT-CASI-R with the RCADS total and subscale scores (controlling for gender). As presented in Table 6, moderate to high correlations were found, ranging from .26 to .58. All correlations were positive and significant ($p < .001$).

Table 2. Goodness-of-fit indices for the four models tested.

Model	χ^2	df	RMSEA	CFI	SRMR	AIC
Model 1: Hierarchical structure, four lower-order factors and one higher-order factor	666.82*	427	.07	.90	.07	804.82
Model 2: Hierarchical structure, three lower-order factors and one higher-order factor	668.59*	424	.06	.89	.07	812.59
Model 3: Four correlated factors	642.22*	421	.06	.90	.07	792.22
Model 4: Three correlated factors	656.39*	422	.07	.90	.07	804.39

Note 1. Model 1: Lower-order factors include (1) Fear of cognitive dyscontrol; (2) Fear of publicly observable anxiety reactions; (3) Fear of respiratory symptoms; and (4) Fear of cardiovascular symptoms; Higher-order factor: Anxiety sensitivity. Model 2: Lower-order factors include (1) Fear of physical symptoms; (2) Fear of mental incapacitation; and (3) Fear of social evaluation; Higher-order factor: Anxiety Sensitivity; Model 3: Correlated factors include (1) Fear of cognitive dyscontrol,; (2) Fear of publicly observable anxiety reactions; (3) Fear of respiratory symptoms; (4) Fear of cardiovascular symptoms; Model 4: Correlated factors include (1) Fear of physical symptoms; (2) Fear of mental incapacitation; and (3) fear of social evaluation.

Note 2. *$p < .001$

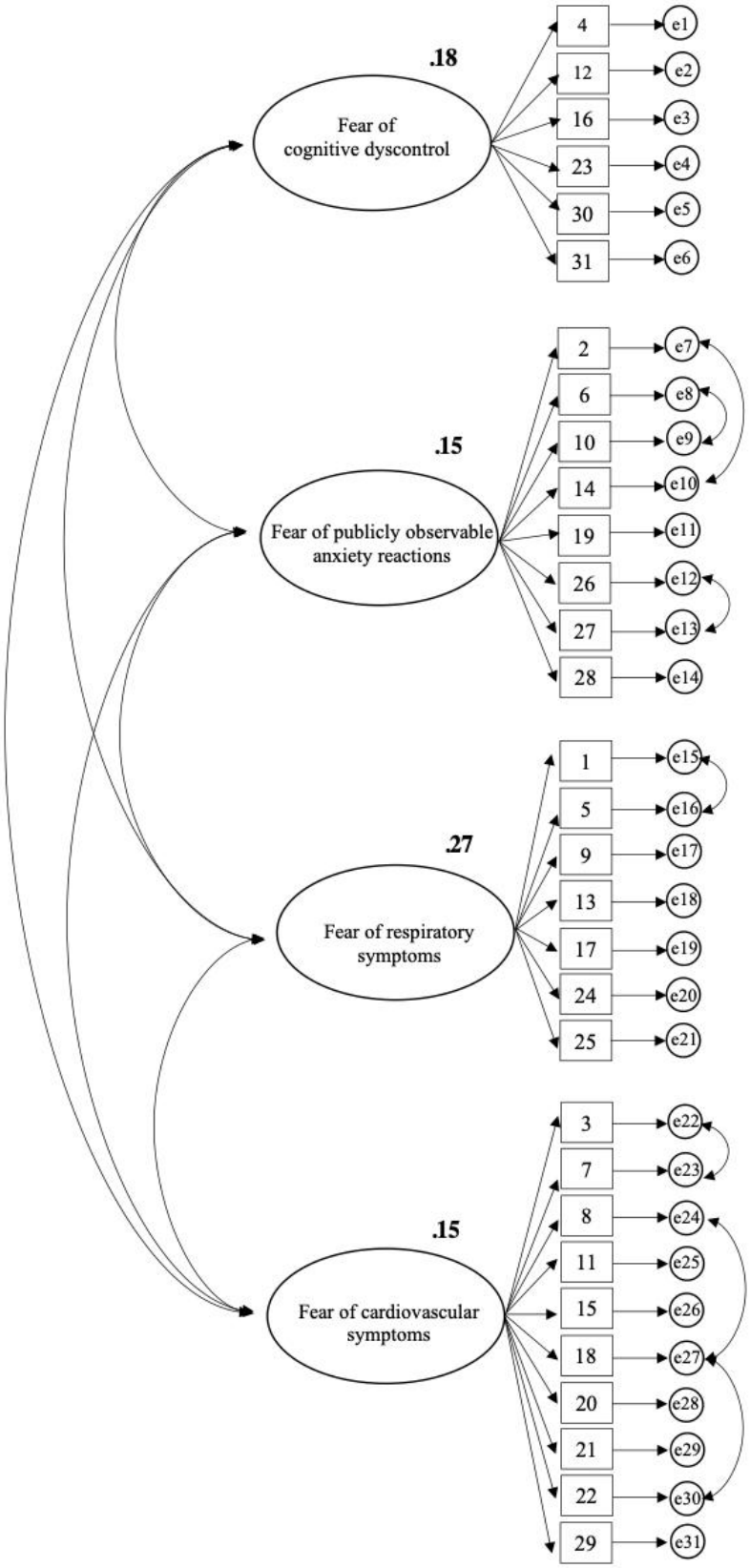

Figure 1. *Structural Model of the PT-CASI-R*

Table 3. Completely standardized factor loadings of PT-CASI-R Items.

Items	Factor 1	Factor 2	Factor 3	Factor 4
Factor 1: Fear of cognitive dyscontrol				
12. When thoughts speed up, worry might go crazy	.81			
16. When trouble thinking clearly, worry something wrong with me	.73			
23. When cannot keep mind on schoolwork, worry might go crazy	.70			
4. When feel strange, worry might go crazy	.69			
30. Scares me when cannot keep mind on task	.57			
31. When mind goes blank, worry something terribly wrong with me	.54			
Factor 2: Fear of publicly observable anxiety reactions				
19. When tremble in the presence of others, fear what people think of me		.77		
14. Worry other people notice my anxiety		.74		
26. When sweat in the presence of others, people think negatively of me		.66		
27. Scares me when blush in front of people		.54		
2. Important not to appear nervous		.50		
28. Scares me when feel like throwing up		.34		
6. Believe would be awful to vomit in public		.33		
10. Think would be horrible to faint in public		.31		
Factor 3: Fear of respiratory symptoms				
13. When chest feels tight, scared cannot breathe properly			.80	
24. When breathing irregular, fear something bad will happen			.78	
9. Scares me when short of breath			.74	
5. Scares me when have feeling of choking			.70	
17. When throat feels tight, scared could choke to death			.70	
1. When feel like not getting enough air, scared might suffocate			.68	
25. When trouble swallowing, worry could choke			.52	
Factor 4: Fear of cardiovascular symptoms				
8. When heart beats fast, worry something wrong				.79
15. When pain in chest, worry going to have heart attack				.75
22. When heart skips a beat, worry something seriously wrong				.75
18. Scares me when heart beats fast				.71
20. When dizzy, worry something wrong with brain				.71
11. When face feels numb, worry might be stroke				.69
21. When stomach upset, worry might be seriously ill				.68
7. When head pounding, worry could have a stroke				.66
3. When strong pain in stomach, worry could be cancer				.55
29. Scares me when feel tingling or prickling sensations in hands				.46

Notes. $N = 153$. All factor loadings are significant at $p < .05$.

Table 4. Reliability and item analyses.

Items	*M (SD)*	Range	Skewness	Kurtosis	ω	Cronbach's α	Corrected item-total correlation	Cronbach's α when item deleted
Factor 1: Fear of cognitive dyscontrol	3.22 (3.20)	0.00–12.00	1.21	0.91	.83	.83		
12. When my thoughts speed up, I worry that I might go crazy	.48 (.72)	0.00–2.00	1.14	-0.12			.71	.78
16. When I have trouble thinking clearly, I worry that something is wrong with me	.54 (.73)	0.00–2.00	0.96	-0.50			.64	.79
23. When I cannot keep my mind on schoolwork, I worry that I might go crazy	.43 (.71)	0.00–2.00	1.34	0.29			.62	.80
4. When I feel strange, I worry that I might go crazy	.32 (.63)	0.00–2.00	1.78	1.87			.62	.80
30. It scares me when I cannot keep mind on task	.78 (.78)	0.00–2.00	0.41	-1.24			.54	.82
31. When my mind goes blank, I worry that something is terribly wrong with me	.67 (.74)	0.00–2.00	0.63	-0.94			.51	.82
Factor 2: Fear of publicly observable anxiety reactions	6.84 (3.9)	0.00–16.00	0.19	-0.79	.76	.77		
19. When I tremble in the presence of others, I fear what people think of me	.73 (.83)	0.00–2.00	0.55	-1.33			.61	.72
14. I worry that other people notice my anxiety	.88 (.75)	0.00–2.00	0.20	-1.20			.60	.72
26. When I sweat in the presence of others, I fear that people think negatively of me	.54 (.76)	0.00–2.00	0.99	-0.56			.60	.72
27. It scares me to blush in front of people	.57 (.75)	0.00–2.00	0.90	-0.65			.52	.74
2. It is important not to appear nervous	.92 (.76)	0.00–2.00	0.14	-1.25			.43	.75
28. It scares me when I feel like throwing up	.97 (.80)	0.00–2.00	0.05	-1.44			.30	.78
6. I think it would be awful to vomit in public	1.21 (.82)	0.00–2.00	-0.41	-1.41			.38	.76
10. I think it would be horrible to faint in public	1.02 (.83)	0.00–2.00	-0.04	-1.55			.35	.77
Factor 3: Fear of respiratory symptoms	5.09 (4.04)	0.00–14.00	0.45	-0.80	.88	.87		
13. When my chest feels tight, I am scared that I cannot breathe properly	.69 (.77)	0.00–2.00	0.60	-1.05			.74	.84
24. When my breathing is irregular, I fear that something bad will happen	.65 (.74)	0.00–2.00	0.65	-0.89			.72	.85
9. It scares me when I am short of breath	.94 (.76)	0.00–2.00	0.10	-1.27			.71	.85
5. It scares me when I have a feeling of choking	.73 (.80)	0.00–2.00	0.54	-1. 22			.69	.85
17. When my throat feels tight, I am scared that I could choke to death	.54 (.76)	0.00–2.00	1.01	-0.53			.57	.87
1. When I feel like I am not getting enough air, I am scared that I might suffocate	.74 (.77)	0.00–2.00	0.49	-1.15			.69	.85
25. When I have trouble swallowing, I worry that I could choke	.81 (.77)	0.00–2.00	0.34	-1.23			.45	.88
Factor 4: Fear of cardiovascular symptoms	5.00 (4.99)	0.00–19.00	0.82	-0.32	.90	.90		
8. When my heart beats fast, I worry that something is wrong	.67 (.74)	0.00–2.00	0.61	-0.95			.74	.88
15. When I have pain in my chest, I worry that I am going to have heart attack	.44 (.68)	0.00–2.00	1.26	0.28			.70	.88
22. When my heart skips a beat, I worry that something seriously wrong	.60 (.73)	0.00–2.00	0.78	-0.72			.71	.88
18. It scares me when my heart beats fast	.65 (.74)	0.00–2.00	0.67	-0.88			.67	.88

Table 4. Continued.

Items	*M (SD)*	Range	Skewness	Kurtosis	ω	Cronbach's α	Corrected item-total correlation	Cronbach's α when item deleted
20. When I am dizzy, I worry that something is wrong with my brain	.46 (.67)	0.00–2.00	1.16	0.11			.65	.88
11. When my face feels numb, I worry that it might be stroke	.29 (.57)	0.00–2.00	1.82	2.29			.65	.88
21. When my stomach is upset, I worry that I might be seriously ill	.46 (.68)	0.00–2.00	1.18	0.11			.66	.88
7. When my heart is pounding, I worry that I could have a stroke	.43 (.68)	0.00–2.00	1.29	0.34			.68	.88
3. When I feel a strong pain in my stomach, I worry that it could be cancer	.45 (.72)	0.00–2.00	1.27	0.12			.55	.89
29. It scares me when I feel tingling or prickling sensations in my hands	.57 (.74)	0.00–2.00	0.89	-0.63			.41	.90

Table 5. Measurement invariance models of the PT-CASI-R scores by gender and age groups.

Gender						
Model	**χ^2**	**df**	**CFI**	**RMSEA**	**RMSEA 90% CI**	**SRMR**
Configural	1270.165	842	0.830	0.058	0.051, 0.064	0.089
Age						
Model	**χ^2**	**df**	**CFI**	**RMSEA**	**RMSEA 90% CI**	**SRMR**
Configural	1331.706	842	0.810	0.062	0.056, 0.068	0.099

Notes. χ^2 = chi-square; df = degrees of freedom; CFI = comparative fit index; RMSEA = root mean square error of approximation; SRMR = Standardized Root Mean Square Residual

Table 6. Correlations between PT-CASI-R and RCADS scores (controlling for gender).

	1	2	3	4
PT-CASI-R				
1. Fear of cognitive dyscontrol	-			
2. Fear of publicly observable anxiety reactions	.57	-		
3. Fear of respiratory symptoms	.61	.51	-	
4. Fear of cardiovascular symptoms	.73	.56	.75	-
RCADS				
Total score	.57	.50	.56	.54
Depression	.58	.43	.52	.51
Anxiety total score	.53	.49	.54	.53
Separation anxiety disorder	.26	.29	.36	.28
Generalized anxiety disorder	.35	.33	.42	.37
Panic disorder	.54	.43	.56	.54
Social phobia	.43	.43	.37	.40
Obsessive-compulsive disorder	.47	.40	.39	.42

Note. All correlations were significant at $p < .001$.

DISCUSSION

The present study examined the factor structure and psychometric properties of the Portuguese version of the CASI-R in a clinical sample of children with a diagnosis of anxiety, anxiety-related, or depressive disorder aged between 6 and 13 years. The results of this study suggest that the PT-CASI-R is a reliable and

valid measure of four important dimensions of anxiety sensitivity: fear of cognitive dyscontrol, fear of publicly observable anxiety reactions, fear of respiratory symptoms and fear of cardiovascular symptoms. The confirmatory factor analysis confirmed the hypothesized four-factor structure of the CASI-R. Although the hierarchical four-factor model also presented an adequate fit to the data, the correlated model was the best-fitting model. These findings are similar to those reported by Francis et al. (2019), largely confirming the four-factor structure that has emerged from theoretical conceptualization of the anxiety sensitivity construct in previous studies with this instrument (Francis et al., 2019; Silverman et al., 1999; Stassart et al., 2013). Nevertheless, these results do not exclude the adequacy of computing an anxiety sensitivity total score. Both the total score and subscale scores had adequate internal consistency, with Cronbach's alpha values above .70.

Regarding the construct validity of the scale, as expected, anxiety sensitivity was significantly positively associated with symptoms of several anxiety disorders and with symptoms of depression. These results are consistent with previous studies (Joiner et al., 2002; Stassart et al., 2013) showing that anxiety sensitivity may be a vulnerability factor for the development of various anxiety disorders in children. Particularly strong correlations were found between the PT-CASI-R and the RCADS total score, anxiety subscale score and panic disorder subscale score. These results suggest that anxiety sensitivity in children is related to a wide range of DSM-5 anxiety disorders and anxiety symptomatology, particularly to symptoms of panic disorder (Muris et al., 2001; Noël & Francis, 2011; Silverman et al., 2003). Previous studies have found that children with panic symptoms tend to report higher levels of anxiety sensitivity than children with other anxiety disorders (Noël & Francis, 2011). The results of this study indicate that the panic disorder subscale score consistently exhibited the strongest correlations with all CASI-R subscale scores. The present data do not support the pattern of correlations reported by Muris (2002), who found that panic disorder and agoraphobia were most strongly correlated with the fear of cardiovascular symptoms, fear of cognitive dyscontrol, and fear of respiratory symptoms factors and that social phobia was most strongly correlated with the fear of publicly observable anxiety reactions.

The results of this study also showed a significant correlation between anxiety sensitivity and the RCADS depression subscale score, especially with regard to the fear of cognitive dyscontrol subscale. Several authors have suggested that anxiety sensitivity may also be involved in depression (Otto et al., 1995; Taylor et al., 1996; Wauthia, et al., 2019). For instance, Taylor and Cox (1998) reported that the association between anxiety sensitivity and depression is related to a particular component of anxiety sensitivity (i.e., fear of loss of cognitive control), which is associated with the CASI-R fear of cognitive dyscontrol subscale. More specifically, it has been hypothesized that depressive symptomatology contributes to the maintenance of anxiety sensitivity by biasing the interpretation of anxious symptomatology in a negative direction (Otto et al., 1995).

Finally, it is also important to consider that the study sample exhibited a relatively low level of anxiety sensitivity (M = 20.2). One possible explanation for this finding could relate to the specific characteristics of the sample. Although participants are children with clinical emotional disorders, the lower anxiety sensitivity levels may suggest that other transdiagnostic factors—such as negative affect, cognitive distortions, or experiential avoidance—play a more prominent role in their symptomatology.

Contributions and Limitations

The present study has some limitations that should be addressed. First, all children in this study were from the central region of Portugal. Therefore, generalization of the results is limited, and future studies should replicate the study with a more representative sample of Portuguese children. More specifically, it is also important to consider the low level of anxiety sensitivity present in the study sample (M = 20.2). Consequently, further research is warranted to determine whether lower anxiety sensitivity in clinical samples represents a generalizable pattern or is specific to particular subgroups. Examining the interaction between anxiety sensitivity and other key factors, such as mindfulness skills and experiential avoidance, may offer deeper insights into the mechanisms underlying emotional disorders within this population.

In addition, it would be important to collect a larger sample that is more diverse and includes a greater number of children. Second, the validity assessment was limited in terms of the number and type of measures. Future studies should include other measures (e.g., State-Trait Anxiety Inventory for Children (STAIC); Spielberger et al., 1973) to further analyze the construct and divergent validity of the CASI-R. Third, the exclusive use of self-report measures may compromise the validity of our results. Thus, future studies should include a multimethod assessment strategy to corroborate these study conclusions.

Additionally, the model of PT-CASI-R failed to demonstrate invariance across gender and age groups (with low CFI values and high SRMR values), preventing any conclusions about potential differences based on gender or age. Thus, taking into account that the CFI value can be sensitive to small (< 100 participants) and moderate (100-200 participants) samples (Kline, 2015), it is suggested that future studies could

replicate this model using a larger sample of subjects. Additionally, the low factor loadings (below 0.31) in specific items highlights potential areas where the measurement model may not perform equivalently across groups. To address this limitation, future research could explore alternative items or refine the current ones to improve their performance across diverse groups.

Last, since this study included a psychological intervention phase, in which changes in the children's anxiety symptomatology are expected, it was not possible to determine the test-retest reliability of the CASI-R. Despite its limitations, this study enhances current knowledge regarding the factor structure and psychometric properties of the CASI-R in a clinical sample of children. To the best of our knowledge, this is the first study to validate the CASI-R in a clinical sample of children, supporting its use in clinical contexts and in research with children with anxiety or depressive disorders.

In summary, the results of the present study support the reliability and validity of the PT-CASI-R and suggest that it is a psychometrically sound measure for assessing anxiety sensitivity in Portuguese children with a diagnosed emotional disorder aged between 6 and 13 years. This measure might be particularly useful in clinical settings because it is simple to administer and evaluates a construct that seems to be strongly associated with several anxiety disorders in childhood. Thus, this study provides clinicians and researchers in Portugal with good psychometric quality measure that allows for the comprehensive but rapid assessment of anxiety sensitivity in children and encourages the development of further studies aimed at understanding the role of anxiety sensitivity in the development, maintenance, and treatment of emotional disorders.

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