RESEARCH ARTICLE

Psychometric Analysis of the Childhood Anxiety Sensitivity Index in Elementary School Students from Arequipa City

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ABSTRACT

Introduction: *The anxiety sensitivity is a few known theoretical construct, although it has a relevant clinical worth, because it is a powerful predictor of the anxiety disorders, so as in children, as in adolescents and adults. Moreover, in Peru there are few psychometric tests that assess children anxiety, and even fewer about anxiety sensitivity.* ***Objective:*** *In this research, it was made a psychometric analysis of the Childhood Anxiety Sensitivity Index (CASI) with the aim to estimate the validity and reliability of this test that has not been applied in Peruvian population. Method: A non-probabilistic sample of 568 students among 8 and 12 years old was assessed of five elementary school from Arequipa City, in Peru. The data was processed with multiple group confirmatory factor analysis by R program.* ***Results:*** *The results confirm a two factors structure: Fear of body sensations and Fear of mental and social symptoms, with acceptable reliability indexes calculated by McDonald's Omega Test.* ***Conclusion:*** *The conclusion is that the CASI is valid and reliable; perhaps it is suggested to investigate another psychometric properties of this test.*

Keywords: *Anxiety sensitivity, children, validity, reliability, psychometrical analysis.*

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INTRODUCTION

Anxiety is an adaptive response that allows us to anticipate threats and dangers in the environment, but it becomes pathological when it is frequent, intense or persistent, or is beyond the control of the affected person.1 Anxiety as a symptom has been studied by English, French and German psychiatrists during the 19th century, as a state of unease and restlessness, which was associated with melancholy, nervousness and various somatic manifestations[2].

Freud3 was one of the first authors to speak of "anxiety neurosis" in 1894, while in those years, Ribot4 and Janet5 considered it as an alteration of feelings. At the beginning of the 20th century, it was associated with shyness and social phobia, to later become part of the DSM in its second edition, distinguishing between phobic neurosis, anxiety neurosis, obsessive-compulsive neurosis and hyperanxiety reaction[1].

Only in the DSM-III are anxiety disorders classified into five categories: phobic disorders, anxiety, post-traumatic stress disorder, atypical anxiety disorder and includes the diagnostic of anxiety disorders that start in childhood or adolescence.1 Several theoretical models explaining anxiety from psychoanalytic, behavioral and cognitive approaches,6 have also been postulated and several specific treatments have been generated for each of the anxiety disorders, the most effective being those with a cognitive-behavioral orientation[7,8].

In the same way, anxiety is associated with stress and depression [9], and several negative emotions[10], therefore, it is a source of psychological discomfort[11]. Anxiety can manifest itself in people, regardless of their gender, age, socioeconomic level, or marital status[12]. But it has only begun to be studied in children and adolescents in recent decades[13]. Risk factors include family quarrels, worrying about the death of a loved one, physical abuse, poor school performance, parental alcoholism, frequent illnesses, psychopathological disorders in the mother, etc.[14]. In other words, family variables have proven to have an impact on children's anxiety manifestations[15,16], without forgetting other aspects of school life that interact with family risk factors[17].

It should be considered that the relationship between the context in which the child lives and anxiety is not linear. Economic factors, work and family conflicts between family members are strong generators of stress and anxiety[18]. In this sense, it is considered that many emotional disorders in childhood and adolescence are caused or related to stress[19].While females consider the loss of a loved one, health problems of relatives, family and socioeconomic problems as stressors; males stressors are related to material losses, personal health, the loss of a pet, and parental discipline[20].

In this sense, parenting styles are also considered sources of stress, anxiety, and disruptive behaviors[21,22]. Furhtermore, one way to mitigate stress and anxiety in children is through the promotion of the development of social skills. Through them, social support can be obtained allowing the effects of stress and anxiety to be mitigated[23]. Thus, assesing childhood stress has been very useful to understand other related disorders such as anxiety in children[24,25,26].

However, a new construct has been related to anxiety and stress leading to anxiety. This is the fear of anxiety symptoms and is a factor that predisposes the development of anxiety disorders[27]. In addition, it presents a hierarchical structure that comprises three factors: Physical Concerns, Mental Impairment Concerns, and Social Concerns[28], which are also known as Somatic Anxiety Sensitivity, Cognitive Anxiety Sensitivity, and Social Anxiety Sensitivity; and they have been strongly related with panic disorder, depression, and social phobia[29].

Regarding sensitivity to anxiety, it has been found that women achieve higher scores in each of the factors, compared to men[30]. Similar results have been reported in clinical and non-clinical populations31, where the Anxiety Sensitivity Index (ASI) test has been applied. It was originally

created by Reiss in 1986 with a one-dimensional structure of 16 items and modified by Taylor and Cox, who expanded it to 36 items with a three-factor structure. But soon a third version with six items for each dimension was available, and being shorter, promotes its application, and has good psychometric properties[32].

Different versions of this test have been applied to the clinical[33] and non-clinical population, with adequate goodness-of-fit and reliability indexes[32]. There is also a version for children and adolescents that has been applied for psychometric and evaluation purposes, in sports and educational contexts, in which it is shown that sensitivity to anxiety increases the effects of distraction and interferes with the physical and academic performance of the children and adolescents evaluated[34,35].

This version for children known as the Childhood Anxiety Sensitivity Index (CASI) and was developed by Silverman et al[36], and has been validated in Spain by Sandín et al[34], who applied it to 151 children between 9 and 11 years old. This version of Anxiety Sensitivity Index for Children was applied, consisting of 18 items, distributed in two factors: somatic and mental, which touches the dimensions of Sensitivity to somatic anxiety and Sensitivity to cognitive anxiety. Its psychometric properties have been estimated through exploratory and confirmatory factor analysis, reporting in the first case, that by the main components' method, four factors were obtained with a total explained variance of 53.6%, but almost all the items saturated in the first factor. Therefore, when applying confirmatory factor analysis, 10 models were tested. Out of these, the two-factor model obtained better goodness-of-fit indexes and adequate reliability indexes for each factor above 8, using Cronbach's alpha test.

The purpose of this research is to analyze the psychometric properties of the Spanish version of two factors of the Anxiety Sensitivity Index for Children, in a sample of Peruvian children who live in the city of Arequipa, located in southern Peru. The importance of the study is based on the fact that there are few validated instruments in Peru, and in Arequipa, it is even less probable for children to be evaluated in aspects such as anxiety or sensitivity to anxiety. In this regard, Dominguez et al[37] validated the Manifest Anxiety Scale in Children-CMASR, taking 435 children from the city of Lima as a sample, reporting reliability indixes higher than 82 for both; the total sample and for the sample of males and females separately, and a parsimonious and coherent structure of three factors that explained 41.139% of the total variance, through exploratory factor analysis.

More recently, Valencia[38] applied the Depression, Anxiety and Stress Scales (DASS-21) in a sample of 353 subjects, testing five psychometric models through confirmatory factor analysis. The results offered better fit indexes in the one-dimensional model, but with presence of some specific factors of a residual nature. Both studies were conducted in the city of Lima, so considering Peru is multicultural and has multiethnic population, it is necessary to use validated instruments for more specific populations, such as for the city of Arequipa.

METHODOLOGY

Design

Taking into account that it is intended to assess the psychometric properties of a psychological measurement instrument; this study is of an instrumental type[39].

Sample

The sample consisted of 568 primary level students from the city of Arequipa. 67.8% of the participants were female, between 8 and 12 years old (M= 9.99; DE= 1.114). The selection of the participants was carried out using non-probabilistic methods and the technique of intact groups[40] from five private (91%) and parish (9%) educational institutions in the city of Arequipa. Since they were minors, the parents signed an informed consent in order to authorize their children's participation in the study.

Instrument

The Anxiety Sensitivity Index for Children was

applied, consisting of 18 items, distributed in two factors. The first factor evaluates sensitivity to somatic anxiety and comprises items 4, 5, 6, 8, 9, 10, 11, 14 and 18; with a reliability index of α= 0.82. The second factor evaluates the sensitivity to mental anxiety and includes items 1, 2, 3, 7, 12, 13, 15, 16, 17; with a reliability index of α= 0.80.34 The test offers three response alternatives on a Likert-type scale: Not at all, Somewhat and A lot, and can be answered individually or collectively in children between 8 and 12 years of age.

Procedure

To carry out the research, the corresponding permits from different educational institutions in the city of Arequipa were requested. Five institutions were selected in which the use of the instruments was allowed. Authorization letters were then sent to all parents to allow children to participate in the study. Only minors whose parents signed the informed consent were considered. The data collection process was carried out during class hours, in coordination with the teachers who agreed to collaborate at all times. Two of the authors of the study were in charge of applying the tests and when necessary answered the questions the minors asked during the evaluation. The research was approved by the Ethics Committee of the Research Department of the Universidad Católica San Pablo.

Data Analysis

First, a descriptive analysis of the items was carried out by taking into account the response frequency. To evaluate the factorial structure of the CASI, the SEM (Structural Equation Modeling) methodology was applied, through the Multiple Group Confirmatory Factor Analysis using the R program version 3.6.1,41 specifically the lavaan packages version 0.6.542 and semTools version 0.5.2.43 Due to the categorical nature of the variables under study, the robust weighted least squares method with adjusted mean and variance (WLSMV) was used[44]. The analyzes were carried out on the matrix of polychoric correlations,45 which estimate the continuous variables underlying the items of an ordinal nature[46].

RESULTS

Table 1 shows the response frequency of each of the CASI items, most of the answers were are not at all or somewhat; although for item 5 “it is

Table 1. Response frequency of CASI items.

CASI items	Possible Answers		
	None	Somewhat	A lot
Item 1	28.9	51.5	19.6
Item 2	67.1	22.4	10.5
Item 3	44.9	35.6	19.5
Item 4	55.4	27.2	17.4
Item 5	10.8	16.5	62.7
Item 6	43.3	34.3	18.4
Item 7	76.8	17.6	5.6
Item 8	38.1	34.9	27.0
Item 9	42.5	35.5	22.0
Item 10	28.7	36.1	35.2
Item 11	34.1	44.6	21.3
Item 12	34.6	38.7	26.7
Item 13	56.2	32.4	11.4
Item 14	37.2	42.0	20.8
Item 15	73.5	18.9	7.6
Item 16	43.4	40.4	16.2
Item 17	33.9	41.0	25.1
Item 18	31.8	40.4	27.8

Note: Frequencies are shown as percentages

Table 2. Goodness-of-fit indixes of the different factorial models on the structure of the CASI.

Model	χ^2	df	χ2/gl	CFI	TLI	GFI	RMSEA	SRMR
M1	259.707***	133	1.95	.956	.950	.980	.041	.055
M2	216.646***	132	1.64	.971	.966	.984	.033	.050
M3	266.714***	133	2.01	.954	.947	.973	.042	.058
M4	166.596**	116	1.44	.983	.977	.988	.027	.042
M5	230.974***	130	1.78	.965	.959	.982	.037	.052
M6	276.017***	132	2.09	.950	.943	.972	.043	.060
M7	229.112***	117	1.95	.961	.950	.983	.041	.050

Note: M1= unifactorial model; M2= model of two correlated factors; M3= hierarchical model with two factors; M4= bifactor model with two factors; M5= model of three correlated factors; M6= hierarchical model of three factors; M7= bifactor model with three factors.

important for me to control my feelings" the option a lot was chosen 62.7% of the time.

When analyzing the factorial structure of the CASI, different models presented in previous studies were evaluated. Thus, in **Table 2**, unifactorial models, correlated factors, hierarchical and bifactorial models are contrasted. After analyzing the models presented, it was found that the M4 model: bifactor with two correlated factors (χ2/gl= 1.44; CFI= .983; TLI; .977; GFI= .988; RMSEA= .027; SRMR= .042) and the M2 model: of two correlated factors (χ2/gl= 1.64; CFI= .971; TLI; .966; GFI= .984; RMSEA= .033; SRMR= .050), are the ones that best reflect the factorial CASI structure . It should be noted that the unifactorial structure of the test (M1), the one with three correlated factors (M5) and the two-factor structure with three correlated factors (M7) also have adequate goodness-of-fit indexes.

Figure 1 shows the bifactorial model with two correlated factors (M4). It can be seen that the Fear of bodily sensations factor includes items: 4, 5, 6, 8, 9, 10, 11, 14 and 18; while the Fear of mental and social symptoms factor includes items: 1, 2, 3, 7, 12, 13, 15, 16 y 17. In addition, it can be observed that the items are also part of a general factor in which only item 17 has a low saturation (λ= .266).

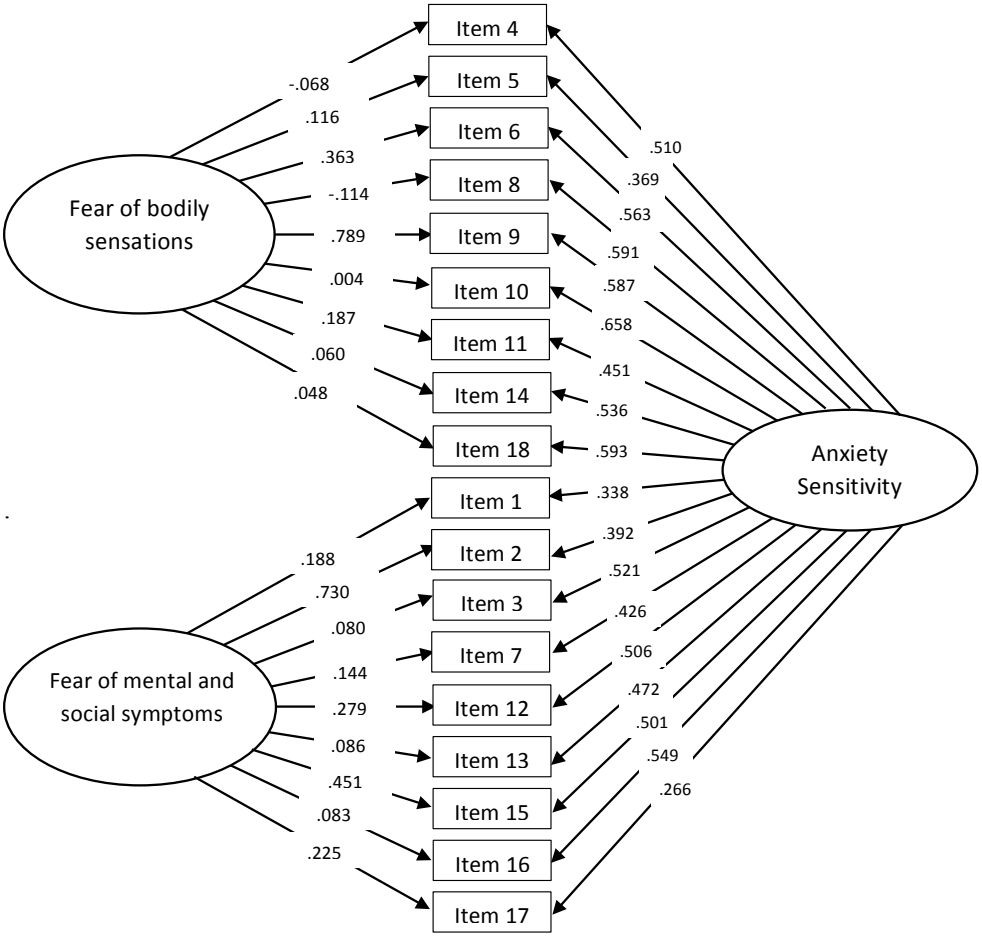
The instrument is shown to be reliable in its general factor (ω= .818). While there are heterogeneous results in its factors, and the Fear of bodily sensations factor is reliable (ω= .756); but the reliability of the Fear of mental and social symptoms factor is questionable, although it can be considered acceptable (ω= .676).

DISCUSSION

In the present study, the psychometric properties of the Anxiety Sensitivity Index for Children34 are analyzed in a sample of boys and girls from the city of Arequipa. 568 children were selected from five educational institutions, from where the corresponding permits were obtained.

The results obtained from the confirmatory factor analysis support a bifactorial structure, which is the one that has been reported as the most satisfactory among 10 models evaluated by Sandín et al[34] in Spanish-speaking children in Spain. In the case of the Peruvian sample, of the seven models tested, the fourth model is the most appropriate, but has lower reliability indexes for both factors.

Figure 1. CASI two-factor model.



While in the Spanish model the somatic and mental factors have reliability indexes higher than .8, in the bifactorial model of the Peruvian sample, indexes of .756 and .676 were obtained for each of them, accordingly. The reliability of the somatic factor is adequate, the one for mental factor is low but can be considered acceptable[47]. These differences in the reliability of the factor may be due to the fact that the Cronbach's Alpha test was used in the Spanish study, while the McDonald's Omega test was applied in the Peruvian study to estimate reliability. The decision to apply the McDonald Omega test is based on the fact that it is a more robust test than the Cronbach's Alpha test and because the Anxiety Sensitivity Index for Children presents a three-level ordinal response scale[48].

On the other hand, given that in the three-factor model of the Spanish sample[34] items 1, 3, 7 and 17 are located in the Fear of social evaluation or loss of control factor, and are also located in the mental factor as in the case of the present study, it was decided to name this factor as Fear of mental and social symptoms; while the first factor, which include items that refer to somatic symptoms of sensitivity to anxiety, has been called Fear of bodily sensations. In the opinion of the authors of this study, these denominations do more justice to the content of the items than the mere denomination of somatic and mental factor.

In addition, according to our results, although most of the items also configure a general factor, which would suggest a one-dimensional structure,

item 17 presented a low saturation (λ= .266), therefore a single factor structure is ruled out as in the original models of the first versions of the Anxiety Sensitivity Index,27 or in the estimates for the Spanish child sample[34].

From all that has been established above, there are some limitations that must be considered. The fact that the sample has not been selected by non-probabilistic methods means that the data cannot be generalized to the population of children of the city of Arequipa. In this sense, it would also be important to expand the sample to Peruvian adolescents, given that some studies have used sensitivity to anxiety as a predictor of physical and mental performance in this age group[35]. It is also necessary to carry out studies of convergent and divergent validity, or analysis of factorial invariance to determine further psychometric properties of the test. Therefore, future studies must overcome these limitations, in order to achieve more consistent results on the psychometric properties of the Anxiety Sensitivity Index for Children, in such a way that it can be used in the city of Arequipa for clinical purposes, considering that sensitivity to anxiety is a powerful predictor of anxiety disorders[32].

Despite the mentioned limitations, given that this is the first psychometric study carried out with this instrument in Peru, it represents a relevant research background that can be taken as a starting point for future psychometric studies, or in clinical, educational, sports and social events, with Peruvian children and adolescents; and related to other associated variables that are relevant in families and school[17]. In this sense, we can conclude that the Anxiety Sensitivity Index for Children displays a bifactorial structure that includes the factors Fear of bodily sensations and Fear of mental and social symptoms, with acceptable reliability indexes, which deserve further statistical refinement.

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