

# Reliability and convergent validity of the Childhood Anxiety Sensitivity Index in children and adolescents

*Confiabilidade em validade convergente da Childhood Anxiety Sensitivity Index em crianças e adolescentes*

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## ABSTRACT

**Objective:** The purpose of this study was to examine the reliability and the convergent validity of the Children Anxiety Sensitivity Index (CASI) with DSM-IV anxiety disorder symptoms, by comparison with the Screen for Child Anxiety Related Emotional Disorders (SCARED), in a community sample of Brazilian children and adolescents. **Methods:** Children and adolescents from five schools were selected from a larger study that aimed to assess different aspects of childhood anxiety disorders. All participants completed the CASI and the SCARED. **Results:** This study supported the reliability of the CASI total score. Girls reported higher total anxiety sensitivity scores than boys and there were no differences in total anxiety sensitivity scores between children and adolescents. This study showed moderate to high correlations between the CASI scores with SCARED scores, all correlations coefficients being positive and significant. **Conclusions:** Our findings demonstrate an appropriate reliability and evidence of convergent validity in the CASI in a sample of Brazilian children and adolescents.

## Keywords

Anxiety, anxiety sensitivity, children, adolescents.

## RESUMO

**Objetivo:** O objetivo deste estudo foi examinar a confiabilidade e a validade convergente da *Children Anxiety Sensitivity Index* (CASI) com sintomas de transtornos de ansiedade de acordo com o DSM-IV, por meio da comparação com a *Screen for Child Anxiety Related Emotional Disorders* (SCARED). **Métodos:** Crianças e adolescentes provenientes de cinco escolas foram selecionados de uma amostra de um estudo maior que avaliava diferentes aspectos dos transtornos de ansiedade. Todos os participantes completaram a CASI e a SCARED. **Resultados:** Esse estudo demonstrou a confiabilidade do escore total da CASI. Meninas apresentaram escores de sensibilidade à ansiedade mais altos do que meninos e não houve diferença nos escores totais de sensibilidade de ansiedade entre crianças e adolescentes. Esse estudo encontrou correlações de moderada a alta entre os escores da CASI e os escores da SCARED, sendo todas as correlações positivas e significativas. **Conclusões:** Nossos achados demonstraram uma confiabilidade apropriada e evidência de validade convergente da CASI em uma amostra de crianças e adolescentes brasileiros.

## Palavras-chave

Ansiedade, sensibilidade à ansiedade, crianças, adolescentes.

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## INTRODUCTION

Anxiety sensitivity (AS) refers to the tendency to fear anxiety-related sensations and is thought to arise from beliefs about their harmful physical, cognitive, or social consequences<sup>1</sup>. Individuals with elevated AS might, for example, fear palpitations because of concerns about a heart attack or fear sweating in public based on concerns about negative social evaluation, whereas those with low AS perceive such sensations as harmless and transient. According to AS theory, individuals with elevated AS experience amplified fear in response to stimuli that elicit anxiety and find their own anxiety symptoms to be particularly aversive<sup>2</sup>. Evidence suggests that AS emerge from genetic-environment interactions, resulting in the development of maladaptive beliefs about potential harmful effects of autonomic arousal<sup>3</sup>. AS is not a clinical disorder, but AS appears to play an important role in the development and maintenance of anxiety related disorders particularly panic disorder and posttraumatic stress disorder<sup>3</sup>.

The Anxiety Sensitivity Index (ASI) is the main instrument used to assess AS in adults<sup>4</sup>. The Childhood Anxiety Sensitivity Index (CASI) is a widely version of the ASI for children with the addition of two items<sup>5</sup>. This modification was made to facilitate understanding of the questionnaire by children and adolescents. Previous studies have consistently demonstrated that the CASI is a reliable and valid instrument for measuring anxiety sensitivity in both clinical and nonclinical samples of children and adolescents<sup>5,6</sup>. Furthermore, studies have shown that AS in children and adolescents correlates in a theoretically meaningful way with other anxiety measures, mainly those measuring panic symptoms, and that AS may be a risk factor for the development of anxious symptomatology and anxiety disorders in youth<sup>7-10</sup>.

It is very important to examine the applicability and the psychometric properties of the CASI in different cultures and countries. The prevalence rates of anxiety disorders in Brazilian youth are significant<sup>11-13</sup>. A study in the Southeast region, comprising 1251 school children aged 7-14 years old described a total prevalence rate of 12.7% for any psychiatric disorder and 5.2% for any anxiety disorder using DSM-IV criteria<sup>12</sup>. However, there is a lack of instruments to assess anxiety symptoms and related constructs in Brazilian children and adolescents<sup>14</sup>. In relation to the CASI, no psychometrical investigation has so far been conducted in Brazil to evaluate its use and measurement properties.

Therefore, the main purpose of the present study is to assess the psychometric properties of the Brazilian-Portuguese version of the CASI in a sample of Brazilian children and adolescents. Specifically, the aims of this study are: (1) to evaluate the reliability of the CASI; (2) to examine sex (boys and girls) and age groups (children and adolescents) effects on the CASI scores; and (3) to calculate and examine correlations between the CASI and the Screen for Child Anxiety Related Emotional Disorders (SCARED).

## METHOD

### Participants

Participants in this study were Brazilian children and adolescents enrolled in grades 3 to 9 from five schools located in the catchment area of the Primary Care Unit of the *Hospital de Clínicas de Porto Alegre*, in the city of Porto Alegre, located in the South of Brazil. The 140 participants had a mean age of 12.76 years (SD = 1.94; range = 9-18) including 78 girls (55% of total sample) with a mean age of 12.78 (SD = 1.97) organized into 22 children with a mean age of 10.36 years (SD = .79; range = 9-11) and 52 adolescents with a mean age of 13.75 years (SD = 1.37; range = 12-18). There were 62 boys with a mean age of 11.5 (SD = 2.12), organized into 15 children with a mean age of 10.33 years (SD = .72) and 47 adolescents with a mean age of 13.57 (SD = 1.45; range = 12-18).

### Procedures

Participants were selected from a sample of children and adolescents from a larger study that aimed to assess different aspects of childhood anxiety disorders<sup>15</sup>. The CASI was completed as part of a larger set of self-report assessments, examining symptoms of anxiety, depression, bullying and related constructs. Children and adolescents completed the questionnaires during school hours. Students who were absent on the day of testing were assessed one week later. In order to ensure that the same procedure was used throughout the study, the research assistants were asked to read and follow the research guideline manual, which contained research objectives, instruction and collection procedures, and contact information. Instructions were as follow: (1) this study does not count for or against grades; (2) you should not imitate or consult with friends because there are no right or wrong answers to this questionnaire, and (3) your teachers, parents, friends, or anyone else who knows you will never see your questionnaire, so please answer honestly. The same procedure was used in each school.

After obtaining initial consent from the principal of each participating school, both students and their parents received written information and the parents were required to provide written informed dissent. Parents who did not give permission for their child to participate were asked to return a signed dissent form. The study protocol was reviewed and approved by the Ethics Committee of the Hospital de Clínicas de Porto Alegre.

### Instruments

The Childhood Anxiety Sensitivity Index<sup>5</sup> is an 18-item self-report tool designed to measure the fear of different symptoms of anxiety in children and adolescents. Anxiety sensitivity has a hierarchical structure, consisting of multiple lower order factors, loading on a single high order factor<sup>10</sup>. Models with two factors, three factors, and four factors have been proposed for the factor structure of the CASI<sup>10</sup>. A reassessment of the factor structure of the CASI

has revealed a significantly better fit of the model with four factors<sup>16</sup>. These factors describe: Disease Concerns (*e.g.*, "When my stomach hurts, I worry I might be really sick") that measures the fear of autonomic arousal symptoms and worry that symptoms are indicative of a serious health problem; Unsteady Concerns (*e.g.*, "It scares me when I feel like I am going to faint") that measures the fear associated with the anticipation of fainting, vomiting, and having difficulty breathing; Mental Concerns (*e.g.*, "It scares me when I cannot keep my mind on my schoolwork") that measures fears of loss of cognitive control; and Social Concerns (*e.g.*, "I don't want other people to know when I feel afraid") that measures the subjective importance of staying in control and hiding one's fears and feelings from others. The best fitting model was obtained using 13 items and addition of the remaining 5 items resulted in some decrease of the model fit, although the four factors were still reliably discriminable<sup>16</sup>. Accordingly, data for CASI total scores included all 18 items whereas data for the CASI factors include 13 items. Respondents rate each question using a 3-point scale (1 = none; 2 = some, and 3 = a lot). Total scores range from 18 to 54 and higher scores reflect higher levels of AS. The CASI has demonstrated high internal consistency in both clinical and nonclinical samples, good test-retest reliability and good construct validity<sup>5</sup>.

The English version of the CASI was translated and adapted for Brazilian-Portuguese, with the permission of the original author of the scale, according to guidelines for the successful translation of instruments in cross-cultural research<sup>17</sup>. One bilingual translator who was a native speaker blindly translated the questionnaire from the original language to Brazilian-Portuguese, and another bilingual individual independently translated it back to English. To ensure that items in both versions had achieved grammatical and colloquial appropriateness, differences in the original and the back-translated versions were discussed and resolved by agreement of both translators (see Appendix 1).

The SCARED<sup>18,19</sup> is a 41-item self-report measure of child and adolescent anxiety based on DSM-IV constructs. The SCARED includes five subscales: panic/somatic (*e.g.*, "When I feel frightened, it is hard to breathe"); generalized anxiety (*e.g.*, "I worry about things working out for me"); separation anxiety (*e.g.*, "I get scared if I sleep away from home"); social phobia (*e.g.*, "I feel nervous with people I don't know well"), and school phobia (*e.g.*, "I get stomach aches at school"). For each item, respondents should choose the response that best describes how they have been feeling during the past 3 months. Items are scored using a 3-point scale (0 = not true or hardly ever true; 1 = sometimes true, and 2 = true or often true). Scores range from 0 to 82 and higher scores reflect higher levels of anxiety. The SCARED has appropriate psychometric properties and is a useful and reliable instrument to assess anxiety symptoms in Brazilian children and adolescents<sup>20</sup>.

## Data analysis

Internal consistency was calculated by Cronbach's alpha coefficient estimation for CASI total score and for each specific factor score. Sex and age group differences for CASI and its subscales were calculated by Student t-tests for independent samples and effect sizes (*d*) were estimated. Parametric correlations were used to estimate the degree of association between the CASI total and its factor scores with age and SCARED scale scores. Skewness and kurtosis were used as normality tests. All tests were two-tailed, and the level of significance was set at  $p < .05$ . Numerical values are presented as means and standard deviations (SD). All statistical procedures were performed using the Statistical Package for Social Sciences (SPSS) version 17.0 for Windows.

## RESULTS

### Internal consistency analysis

Cronbach's alpha was .89 for the CASI total score. Cronbach's alpha coefficients for the four CASI factors scores ranged from .57 to .72 (Disease Concerns: .72; Unsteady Concerns: .64; Mental Illness Concerns: .57; Social Concerns: .57). Cronbach's alpha coefficients for the CASI total and CASI factors were generally comparable for boys and girls and for children and adolescents.

### Age and sex effects

The mean score on the CASI total was 25.56 (S.D. = 6.57). The mean score for the CASI factors were 5.73 (S.D. = 1.87) for Disease Concerns, 4.25 (S.D. = 1.46) for Unsteady Concerns, 3.95 (S.D. = 1.16) for Mental Illness Concerns, and 5.01 (S.D. = 1.67) for Social Concerns. Girls displayed significantly higher mean scores than boys on the CASI total ( $t = 2.17$ ,  $p = .031$ ,  $d = .37$ ); Disease Concerns factor ( $t = 1.99$ ,  $p = .048$ ,  $d = .35$ ); Unsteady Concerns factor ( $t = 2.19$ ,  $p = .037$ ,  $d = .36$ ), and Social Concern factor ( $t = 2.1$ ,  $p = .038$ ,  $d = .36$ ). Correlations between age and CASI score failed to produce significant coefficients at the  $p$  value of .05. Correlations magnitude ranged from -.01 to -.13. Consistently, no significant mean difference was encountered between children and adolescent subsamples. Table 1 shows CASI descriptive statistics according to age group and sex.

### Concurrent validity

In an effort to determine convergent validity, Pearson correlations between the CASI total and its factors and SCARED total and its subscales were examined. As shown in table 2, correlations analyses showed moderate to high correlations (ranging from 0.261 to 0.705) between the CASI scores and SCARED scores, with all correlations coefficients being positive and significant ( $p < .01$ ). The SCARED total score and the panic/somatic subscale had especially strong correlations with CASI total score and Disease Concern factor. Correlations were also examined by sex (boys and girls) and age groups (children and adolescents) and were all positive and significant.

**Table 1.** Descriptive statistics of CASI scores per age group and sex

	Age group		Sex	
	Children (9-11)	Adolescents (12-18)	Boys	Girls
Scale	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Disease Concern	5.87 (1.73)	5.68 (1.93)	5.38 (1.59)	6.01 (2.05)*
Unsteady Concern	4.58 (1.51)	4.13 (1.43)	3.95 (1.39)	4.46 (1.45)*
Mental Illness Concern	4.15 (1.28)	3.87 (1.11)	3.81 (1.08)	4.05 (1.23)
Social Concern	5.26 (1.67)	4.92 (1.66)	4.68 (1.68)	5.28 (1.66)*
CASI Total	27.18 (6.07)	24.96 (6.67)	24.19 (6.0)	26.62 (6.87)*

Statistical significant differences at  $p$  value  $\leq 0.05$  are indicated by \*.

**Table 2.** Bivariate correlations among CASI and SCARED scores (Controlling for Sex and Age)

	1	2	3	4	5	6	7	8	9	10
1. Disease concern										
2. Unsteady concern	.634									
3. Mental concern	.645	.498								
4. Social concern	.397	.373	.403							
5. CASI total	.850	.768	.795	.676						
6. Panic/Somatic	.517	.518	.466	.435	.646					
7. Generalized anxiety	.397	.387	.374	.512	.533	.530				
8. Separation anxiety	.423	.412	.355	.341	.502	.489	.399			
9. Social phobia	.443	.275	.296	.361	.469	.518	.487	.419		
10. School phobia	.409	.398	.494	.261	.517	.564	.407	.530	.402	
11. SCARED total	.577	.527	.507	.528	.705	.846	.784	.717	.745	.680

Note: All correlations are significant at  $p$  value of 0.01.

## DISCUSSION

The current study examined the reliability and the convergent validity of the CASI with DSM-IV anxiety disorder symptoms in a school sample of Brazilian children and adolescents. Our results indicate that, similarly to other clinical and community studies across the worldwide<sup>21</sup>, the CASI has appropriate psychometric properties and could be a useful instrument to assess anxiety sensitivity in Brazilian youth.

This study supported the reliability of the CASI total score, although estimates of internal consistency for its four factors ranged from low to good. Our study found a high Cronbach's alpha for the CASI total score that is highly similar to those obtained in previous studies<sup>5,21,22</sup>. Factors such as Mental Illness Concerns and Social Concerns performed more poorly than the other factors. These coefficients are similar to those found in previous research<sup>21,23</sup>. As in these studies, the low alpha values for these factors in our study may be partly due to the fact that these factors contained an insufficient number of items each. Although the number of items may have contributed to the low alpha values, adding more items to a subscale possibly results in redundancy and may compromise the respondents attitude toward the whole instrument<sup>21</sup>.

Results of this study, which indicate that girls report higher total anxiety sensitivity scores than boys, are consistent with both the adult<sup>3</sup> and the child literature<sup>5,10,16,22</sup>. On examining the factor scores as a function of sex, significant sex differences emerged. Girls displayed significantly higher scores

than boys on Disease Concern factor, Unsteady Concerns factor, and Social Concern factor. These differences may be accounted by different culturally based learning experiences<sup>24</sup>, gender role orientation<sup>25</sup>, and genetic factors<sup>26</sup>. It has been suggested that girls may have experienced greater rewards in their learning histories for expressing more somatic complaints than boys<sup>22</sup>. Similarly, boys may be more likely to underreport fears and concerns that may threaten their masculinity image, due to greater social sanctions against the reporting of fear among boys<sup>24</sup>. A behavioral-genetic study with twin pairs showed that the factors of AS arise from a mix of dimension-specific and non-specific etiologic factors, which vary as a function of sex and as a function of the severity of AS<sup>26</sup>. For girls, AS factors have been influenced by a combination of genetic and environmental factors. Furthermore heritability in women significantly increased with AS scores. For men, factors were influenced by environmental but not genetic factors<sup>26</sup>.

In our study, although children displayed higher scores in CASI total and in all CASI factors, we found no significant differences in the mean CASI and factor scores between children and adolescents. This finding is in contrast with other studies demonstrating higher levels of AS in children compared to adolescents<sup>16</sup>. It should be mentioned, however, that in our sample the age range of child group was slightly older than the age range in child group of other studies. Possibly the inclusion of younger children in our study could increase these differences to a significant level.

This study provided evidence that the CASI has a good convergent validity when compared to the SCARED, a DSM-IV measure of anxiety disorder symptoms, in Brazilian children and adolescents. The SCARED total score and the panic/somatic subscale had especially strong correlations with CASI, indicating that anxiety sensitivity may be a significant correlate of these symptoms. It is in agreement with previous studies in children and in adults reporting that AS is related to a broad range of DSM-IV anxiety disorder and anxiety symptomatology but most specifically to symptoms of panic disorder<sup>3,10,16</sup>. Similarly, studies have shown that children with panic disorder have displayed higher levels of AS than those diagnosed with other anxiety disorders<sup>27</sup>. For example, a recent meta-analytic review found a significant small effect size suggesting that youth diagnosed with panic disorder have higher levels of AS when compared to children with other anxiety disorders<sup>10</sup>. AS scores are also associated with total number of panic symptoms, number of panic attacks in the past year and month, amount of distress caused by the attacks and perceived seriousness of the attacks<sup>9</sup>, and predict panic symptoms after controlling for trait anxiety and depression<sup>7</sup>. Moreover, as in adults<sup>28,29</sup>, a study<sup>30</sup> showed that children with good heart-beat perception had significantly more panic/somatic symptoms and AS scores than those with poorer heart-beat perception, and there were no significant differences between those with good and poor heart-beat perception for general anxiety, social phobia or school phobia symptoms, suggesting a specific association between anxiety related to physiological cues and heart-beat perception as compared to anxiety related to others focus.

The results of this study must be considered in the light of some limitations. First, all children and adolescents in this study are derived from a nonclinical sample and this study evaluated only students who were recruited from urban schools. The generalizability of our results needs to be demonstrated through replication in more representative samples among children and adolescents in other settings and from the general population. Second, the findings were exclusively based on the children and adolescents' self-reports. Although anxiety is an internal and subjective experience, behavioral observations and a multi-informant approach using parents, teachers, and peers as sources of information can be useful in the evaluation of AS in youth. Third, temporal associations among variables cannot be made because of the correlational and cross-sectional nature of our study. Although some studies support the causal role of AS in the development of anxiety in youth<sup>8,13,14</sup>, we are unable to conclude that AS predict particular sets of anxiety symptoms in our sample. Future longitudinal studies are needed to determine the nature and direction of these relations. Although the measures used are well established in several studies and most exhibited good psychometric properties, the Mental Illness Concerns factor and the Social Concerns factor of the CASI showed low internal consistency and the results concerning these factors should

be interpreted with caution. Finally, further studies expanding the psychometrics properties of the CASI are warranted to improve the usefulness of the CASI in Brazilian youth.

## CONCLUSIONS

Our findings demonstrate an appropriate reliability and evidence of convergent validity in the CASI with a sample of Brazilian school-age children and adolescents suggesting that the CASI could be a suitable tool for evaluating AS in this population. Moreover it could be of great value to figure out different endophenotypes evaluated by rating scales that could be specific to a certain anxiety disorder like the described association between AS and Panic/Somatic symptomatology. Since AS is theoretically related to the development of anxiety disorders and given the limited mental health resources, and the paucity of clinical attention to childhood anxiety disorders in Brazil, the CASI may be a valuable tool for evaluating this important construct in Brazilian children and adolescents who may warrant further assessment and treatment. In addition, it will help understand the commonalities and differences in the nature and presentation of the AS across different cultures.

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## CONFLICTS OF INTEREST

All authors declare they have no conflicts of interest to disclose.

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## Appendix 1

### Children Anxiety Sensitivity Index (CASI)

INSTRUÇÕES: Abaixo há uma série de afirmações que meninos e meninas usam para descrever como eles são. Leia cada frase cuidadosamente e preencha o círculo com a melhor alternativa.

Não há respostas certas ou erradas. Lembre-se: encontre as palavras que melhor descrevem você.

	Nada	Um pouco	Muito
1. Eu não quero que outras pessoas percebam quando eu sinto medo.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Quando eu não consigo me concentrar nas tarefas da escola, eu tenho medo de estar ficando louco.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Fico assustado quando tremo de medo.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Fico assustado quando me sinto como se fosse desmaiar.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Manter o controle das sensações é importante para mim.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Fico assustado quando meu coração bate rápido.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. Fico envergonhado quando a minha barriga ronca (faz barulhos).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. Fico assustado quando me sinto como se eu fosse vomitar.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. Quando eu percebo que meu coração está batendo rápido, eu fico preocupado que alguma coisa de errado possa estar acontecendo comigo.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. Fico assustado quando eu tenho dificuldade para respirar.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. Quando o meu estômago dói, eu me preocupo que eu possa estar muito doente.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. Fico assustado quando eu não consigo me concentrar nas minhas tarefas da escola.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13. Outras crianças percebem quando eu estou tremendo de medo.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14. Sensações diferentes (fora do comum) no meu corpo me assustam.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15. Quando estou com medo, eu me preocupo que eu possa estar louco.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16. Fico assustado quando eu me sinto nervoso.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17. Não gosto que as pessoas percebam o que eu estou sentindo.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18. Sensações esquisitas (estranhas) do meu corpo me assustam.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>