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# Investigation of the psychometric properties of children's somatization inventory in Iranian adolescents

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## Abstract:

**BACKGROUND:** This study aimed to investigate the psychometric properties of children's somatization inventory (CSI-24) in a sample of Iranian school adolescents.

**MATERIALS AND METHODS:** In this study, after translating and back-translating CSI-24, comparisons were made with the original version. The study population consisted of 394 school adolescents. Cronbach's alpha method was used to examine the reliability of the scale. Furthermore, the correlation of the scale with the Symptom Checklist-90-Revised was evaluated to determine its criterion validity, using Pearson's correlation coefficient. Exploratory and confirmatory factor analysis methods were applied for construct validity.

**RESULTS:** Investigation of the psychometric properties of the Iranian version of CSI-24 showed its high reliability and confirmatory factor analysis results show the model's satisfactory fitting.

**CONCLUSION:** The Persian version of CSI-24 is a useful self-report tool for evaluating the physical complaints of Iranian school adolescents aged between 12 and 18 years.

## Keywords:

Adolescent, reliability, somatization disorder, validity

## Introduction

Somatiform disorders in children and adolescents have been neglected for many years. However, in recent decades, there has been a growing awareness of the symptoms in children and adolescents,<sup>[1]</sup> and major efforts have been made to identify and classify these disorders. In general, somatic symptom disorder is a heterogeneous term, and its definition has evolved over the years.<sup>[2]</sup> In the Diagnostic and Statistical Manual of Mental Disorders-Third Edition (DSM-III), somatization disorders are characterized by a range of somatic symptoms, which affect different organs of the body, assuming that psychological distress is expressed in the form of physical symptoms.<sup>[3]</sup> This issue is particularly important, as it is more difficult

for children and adolescents to express their emotions through language. In DSM-IV, a category of somatoform disorders and related disorders was described, and any major disorder in thoughts, perceptions, and behaviors due to somatic disorders was highlighted. The criteria of DSM-IV do not require the absence of an adequate medical explanation for a somatic symptom.<sup>[4]</sup>

In the general population, children and adolescents often report numerous somatic complaints.<sup>[5,6]</sup> The most common physical complaints of children and adolescents with somatoform disorders include pain, fatigue, faintness, and nausea.<sup>[7]</sup> These complaints have been growing substantially in these populations, increasing from 17.6% and 5% in 1988 to 24.5% and 9.1% in 2011 among boys and girls, respectively.<sup>[8]</sup>

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There are also a high number of referrals to children's emergency centers for somatoform pain.<sup>[9]</sup> In this regard, Cerruti *et al.*<sup>[10]</sup> reported that somatic disorders are associated with major impairments in the functioning of school-aged children.

A recent study by Agnafors *et al.*,<sup>[11]</sup> which examined children and adolescents aged 3–18 years, suggested that anxiety and behavioral disorders are comorbid with different somatic complaints in all age groups. Evidence shows that somatic symptom disorder is comorbid with substance use disorder in children aged 9–18 years. Mood disorders are also comorbid with all types of somatic complaints in 8- to 12-year-old children. Moreover, psychotic disorders are associated with the somatic symptoms of adolescents with asthma and gastrointestinal problems. These results indicate the high level of comorbidity between somatic symptom disorders and other psychiatric disorders and highlight the need for careful appraisal of these somatic symptoms and complaints in children and adolescents; therefore, it is necessary to take effective clinical and therapeutic measures.

One of the important tools for the assessment of somatic disorders is the Children's Somatization Inventory (CSI).<sup>[12]</sup> The initial version of this questionnaire consisted of 35 items, while later, a 24-item version was developed. To assess the validity of this questionnaire, Walker *et al.*<sup>[13]</sup>, after identifying and eliminating 11 weak items, reduced the number of items to 24. Using three statistical models, they found that the 24-item version of the questionnaire had good psychometric properties, and its correlation with the 35-item model was high (99%). This questionnaire showed good reliability, and Cronbach's alpha coefficient was estimated at 0.87. Moreover, the results suggested that CSI has one dominant general factor, which represents the range of somatic complaints.<sup>[13]</sup>

To re-evaluate the factor structure of the 24-item version of CSI (CSI-24), Lavigne *et al.*<sup>[14]</sup> performed confirmatory factor analysis and found that a general factor model is more suitable than a multifactor model for somatization. Based on their results, the six-factor model was the closest multifactor model to the general factor model.

Eventually, the high prevalence and importance of somatic symptoms in children and adolescents, the need for early detection and treatment of these symptoms, and the lack of a valid tool to measure it in our country indicate the need for access to such a tool. CSI-24 is a scale for measuring somatic symptoms in children and adolescents. The strength point of this scale is the specific measurement of these symptoms in the population of children and adolescents and its validation in various

studies and different populations of children and adolescents. Furthermore, access to valid and specific tools for measuring psychopathological symptoms in children and adolescents allows for more detailed studies so that researches that evaluate mental health or psychopathology in general<sup>[15,16]</sup> can achieve more accurate results by distinguishing between types of symptoms.

With this background in mind, the present study aimed to investigate the psychometric properties of CSI-24 in a sample of Iranian adolescents.

## Materials and Methods

### Study design and setting

In terms of data collection and methodology, it is considered a research study with a descriptive design. Correlational methods, goodness of fit, factor analysis, and reliability analysis were performed to study the relationships of variables in the questionnaire and to evaluate the theoretical framework and standardization of the questionnaire. In addition to the factor analysis method, convergent and divergent validity methods were used to determine the validity of the questionnaire. According to our literature review and theoretical framework of most previous studies, anxiety and depression were considered to be related to CSI. Therefore, we decided to use the subscales of somatization, anxiety, and depression of Symptom Checklist-90-Revised (SCL-90-R) to investigate convergent validity; also, other subscales were used to investigate divergent validity.

### Study participants and sampling

The study population included all male and female students (age range: 12–18 years) in Tehran, Iran, who were attending school in the academic year 2018/2019, as well as their parents. It is generally accepted that factor analysis is a statistical technique applicable to large samples.<sup>[17]</sup> In this regard, Boomsma in 1983, quoting Tabachnick and Fidel,<sup>[17]</sup> claimed that at least 200 people are sufficient to fit the model. Considering the expected effect size, distribution of variables, and test power, at least 15 people are sufficient for each parameter, provided that the estimated effect size is large and the measured variables have a normal distribution.<sup>[17]</sup>

Since the present study aimed to validate SCI-24 based on the factor analysis method, the minimum sample size was 360 people. However, considering the possible sample attrition, 400 people were selected via cluster sampling. Three districts (south, north, and center), representing different economic and cultural levels, were selected among 22 districts of Tehran. Next, several schools were randomly selected, and classes with

students in the age range of 12–18 years were randomly selected and evaluated.

### Data collection tool and technique

#### Translation

First, SCI-24 was translated from English into Persian by two Persian-speaking translators (with MA and PhD degrees in clinical psychology), who were fluent in English. The two versions of the questionnaire were then compared by an examiner (with a PhD degree in clinical psychology). After editing and revision, a PhD student, fluent in Persian and English, was asked to back-translate the Persian version into English. The back-translated version was then compared with the original version. There was no statistically significant difference between the translated and original versions.

#### Children's somatization inventory-24

The CSI-24 was developed by Walker *et al.* in 1991 and revised in 2009. The original version of the questionnaire contained 35 questions, which were later reduced to 24 questions. This questionnaire asks the child to describe the symptoms he/she experienced in the past 2 weeks. The questions are rated on a Likert scale (0: none, 1: low, 2: some, 3: high, and 4: very high). Walker *et al.* reported the Cronbach's alpha coefficient of this questionnaire to be 0.87.<sup>[13]</sup> In addition, in a study conducted in Turkey, the Cronbach's alpha coefficient for the children's version was 0.90.<sup>[18]</sup>

#### Symptom checklist-90-revised

The SCL-90-R was developed by Durgatis in 1994. It consists of 90 descriptive statements about mental illness, scored on a Likert scale ranging from 0 (none) to 4 (severe). There are 90 subscales in this checklist. In the present study, the three subscales of somatization, depression, and anxiety were used to assess convergent validity, while the rest of the subscales were used to determine divergent validity. The somatization subscale contains 12 questions, the anxiety subscale contains 10 questions, and the depression subscale contains 13 questions. The validity coefficient of SCL-90-R ranged from 0.79 for paranoid thoughts to 0.90 for depression.<sup>[19]</sup> Its validity and reliability were also studied among students in Iran. The Cronbach's alpha coefficient was 0.82 for the somatic complaint subscale, 0.84 for the depression subscale, and 0.81 for the anxiety subscale, all of which were considered acceptable.<sup>[20]</sup>

### Data analysis

Data were analyzed in 24, SPSS Inc, Chicago, IL, USA, Software. Cronbach's alpha method was used to examine reliability. In terms of validity, the correlation between SCL-90-R and CSI-24 was evaluated to assess criterion validity, using Pearson's correlation coefficient. Exploratory factor analysis was also used for construct validity.

### Ethical consideration

The study was performed according to the Declaration of Helsinki ethical standards.

### Results

The analysis of demographic data showed that 31.4% of the study population were 11–13 years old, 14.16% were 14–16 years old, and 22.5% were 17–18 years old. Furthermore, most of the participants were female.

In order to investigate the construct validity of CSI-24, exploratory and confirmatory factor analysis methods were applied. First, Kaiser–Meyer–Olkin (KMO) test was performed for factor analysis of 24 items of CSI-24, the results of which indicated an acceptable coefficient (KMO = 0.89). In addition, the result of Bartlett's test of sphericity was significant at  $P < 0.0001$  ( $\chi^2 = 2035.72$ ). Table 1 presents the extracted information.

The present results indicated one general factor, which explained 45.89% of the variance in children's somatization. The factor loadings of questions on the general factor (or more) are presented in Table 2.

Considering the correlation coefficient of 0.30 as the minimum acceptable factor loading for each question, the loadings of 24 questions on one general factor are reported in Table 2.

As seen in Figure 1, in order to investigate the construct validity of the questionnaire, the first-order confirmatory factor analysis was performed. AMOS software Chicago, IL, USA was used for the confirmatory factor analysis.

Based on the results presented in Table 3, it can be stated that the model was well fitting. Furthermore, the researcher's hypothesis about the single-factor structure of CSI-24 was approved. The results of confirmatory factor analysis also indicated that no question had a factor loading below 0.4. Moreover, to investigate the convergent and divergent validity of CSI-24, the somatization, depression, and anxiety subscales of SCL-90 were evaluated. The correlation coefficients between the variables are presented in Table 4.

Our findings are in line with previous studies, which indicated the positive correlation of children's somatization with anxiety and depression ( $P < 0.01$ ). The score of CSI-24 had a significant positive correlation with the score of the somatization subscale of SCL-90 ( $P < 0.01$ ). Therefore, the convergent and divergent validity of the questionnaire was confirmed. The internal consistency method (Cronbach's alpha) was also used to assess the reliability of CSI-24. The results are presented in Table 5.

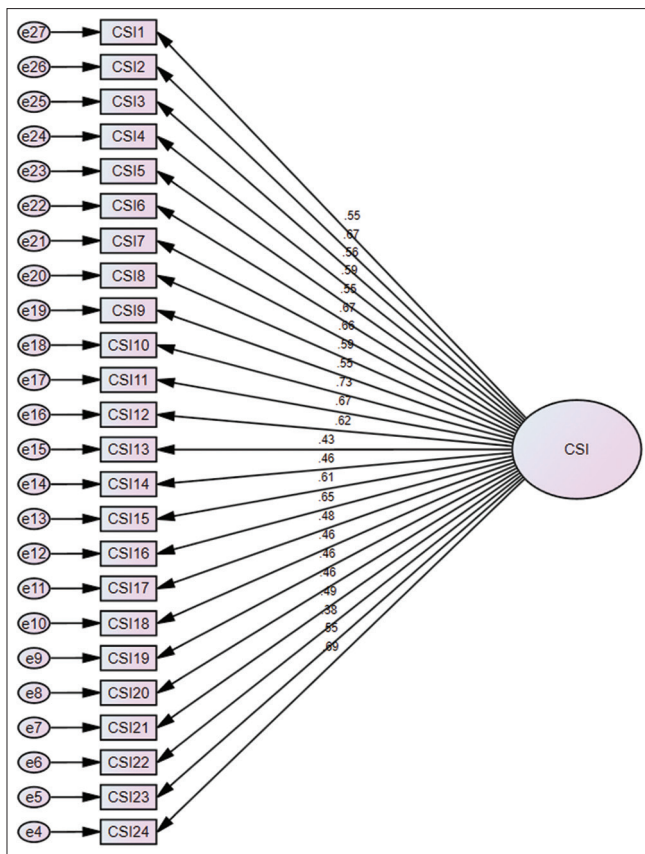


Figure 1: Standardized estimation of the first-order confirmatory factor analysis model

As can be seen in Table 5, the reliability coefficient of the total scale was acceptable ( $\alpha = 0.7$ ).

### Discussion

The DSM-5 incorporated the category of quasi-somatic disorders and other related disorders and focused on major deficits in thoughts, perceptions, and behaviors due to physical problems. The criteria of this manual do not require the absence of an adequate medical explanation for a somatic symptom.<sup>[4]</sup> By studying the available literature, effective variables were identified. The somatization questionnaire,<sup>[13]</sup> which has been shown to be the most widely used tool in many studies, was then translated and completed for 300 students in Tehran, Iran. Although there are disagreements regarding the sample size of studies with correlational research methods, such as factor analysis, it is generally accepted that factor analysis is applicable to large samples. Overall, a sample size of 50 is considered very low, 100 is considered low, 200 is considered fair, 300 is considered good, 500 is considered very good, and 1000 or above is considered excellent. There should be at least ten observations per variable to avoid computational problems.<sup>[17]</sup>

Table 1: The eigenvalues and percentages of variance explained by factors extracted from CSI-24

|  |       |
|--|-------|
| Statistic                                  | 1     |
| Factor                                     |       |
| Eigenvalues                                | 9.61  |
| Percentage of explained variance           | 45.89 |
| Cumulative percentage of total of variance | 45.89 |

Table 2: Principal component analysis and factor loadings for 24 items of CSI-24

| Items  | Factor |
|--------|--------|
|        | 1      |
| CSI 10 | 0.744  |
| CSI 24 | 0.702  |
| CSI 11 | 0.699  |
| CSI 7  | 0.687  |
| CSI 6  | 0.682  |
| CSI 2  | 0.677  |
| CSI 16 | 0.672  |
| CSI 15 | 0.651  |
| CSI 12 | 0.641  |
| CSI 4  | 0.598  |
| CSI 8  | 0.597  |
| CSI 3  | 0.591  |
| CSI 23 | 0.587  |
| CSI 9  | 0.570  |
| CSI 5  | 0.564  |
| CSI 1  | 0.564  |
| CSI 20 | 0.535  |
| CSI 21 | 0.533  |
| CSI 18 | 0.525  |
| CSI 17 | 0.513  |
| CSI 14 | 0.512  |
| CSI 19 | 0.490  |
| CSI 13 | 0.465  |
| CSI 22 | 0.450  |

Table 3: Fit Indices of Confirmatory Factor Analysis (CFA)

|                | Corrected test data | Ideal value |
|----------------|---------------------|-------------|
| $\chi^2$<br>df | 2.02                | <3          |
| RMSEA          | 0.05                | <0.01       |
| CFI            | 0.96                | >0.9        |
| NFI            | 0.95                | >0.9        |
| GFI            | 0.97                | >0.9        |
| AGFI           | 0.95                | >0.9        |

DF=Degree of freedom, RMSEA=Root mean square error of approximation, CFI=Comparative fit index, NFI=Normed fit index, GFI=Goodness of fit index, AGFI=Adjusted GFI

Moreover, Cronbach's alpha coefficient was calculated to evaluate the reliability of the questionnaire. The results indicated a reliability coefficient of 0.918, which is acceptable. Consistent with this result, Cronbach's alpha was reported to be 0.87 in a study by Walker *et al.*,<sup>[13]</sup> these results show that the Persian version of CSI-24



**Table 4: Correlation coefficients between CSI-24 and somatization, depression, and anxiety subscales of SCL-90**

| Domain/Measure            | 1     | 2     | 3     | 4 |
|---------------------------|-------|-------|-------|---|
| 1.Children's Somatization | 1     |       |       |   |
| 2. depression             | *0.39 | 1     |       |   |
| 3. anxiety                | *0.51 | *0/47 | 1     |   |
| 4. somatization           | *0/69 | *0.43 | *0.62 | 1 |

\*P<0.01

**Table 5: The internal consistency of CSI-24**

| Measure/reliability             | Cronbach's alpha |
|---------------------------------|------------------|
| Children's Somatization (total) | 0.918            |

has good reliability, similar to the original version. Since our study sample was selected via cluster sampling, and there were no specific sampling categories to calculate the test-retest reliability, it was necessary to apply the internal consistency method. The results showed that the Cronbach's alpha coefficient of the total scale was satisfactory; other studies have also confirmed the high internal consistency of this scale.<sup>[13]</sup>

To assess the validity of CSI-24, confirmatory factor analysis was performed to investigate the structural validity. The ratio of Chi-square to the degree of freedom, root mean square error of approximation, goodness of fit index, comparative fit index, and normed fit index were 2.02, 0.05, 0.97, 0.95, and 0.96, respectively. According to the obtained values and their permissible limits, it can be concluded that confirmatory factor analysis is suitable for explaining and indicating the model fit. This finding has been supported by other studies on this scale in countries, including Turkey,<sup>[18]</sup> Poland<sup>[21]</sup> Ukraine,<sup>[22]</sup> Denmark, the USA, and the UK.<sup>[13]</sup>

As mentioned earlier, somatization is associated with a wide range of disorders, including anxiety and depression, and its precise appraisal can provide better insights into the association and interaction of psychological disorders. Since CSI-24 has been translated and applied in many countries, including Turkey, the USA, and Poland, the lack of an appropriate scale is strongly felt in Iran and the present study was an attempt to fill this research gap.

## Conclusion

Based on the present results, the Persian version of CSI-24 has good psychometric properties. One of the strengths of the present study was the great variety of ethnicities and cultures in Tehran. Therefore, this city is a suitable setting for sampling, and its population is a proper representation of the Iranian society; also, the diversity of populations in this city increases the generalizability of our results. On the other hand,

considering the importance of socioeconomic status, we tried to select the study sample from different urban areas. The sample group in the present study included only the age range of adolescents and this limited the generalization of its results to the children. Therefore, it is suggested that future researches examine the validity of this questionnaire in the children population. Therefore, it is recommended that researchers address the current lack of investigation in this area in future studies.

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Nil.

## Conflicts of interest

There are no conflicts of interest.

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