

## RESEARCH ARTICLE

# Reliability and Validity of the Persian Version of the Body Image Disturbance Questionnaire-Scoliosis in Patients with Adolescent Idiopathic Scoliosis Who Did Not Have Surgical Indication

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## Abstract

**Background:** Adolescent Idiopathic Scoliosis (AIS) is the most common spinal deformity disorder associated with bad posture and reduced quality of life. The Body Image Disturbance Questionnaire-Scoliosis (BIDQ-S) is a self-report instrument that assesses the concerns of scoliotic patients. This study aimed to translate and evaluate the reproducibility and internal consistency of the BIDQ-S in the Persian-speaking population worldwide suffering from AIS.

**Methods:** The BIDQ-S was translated into Persian by two native-speaking Iranian translators and back-translated into English by two native-English translators. The resulting back-translated English BIDQ-S was then sent to the authors of the English BIDQ-S questionnaire for validation. After translation, it was provided for 41 AIS patients from those who referred to the outpatient clinics of Shafa Yahyaian Hospital from January 2020 to January 2021. Patients were asked to complete the Persian BIDQ-S and Persian Scoliosis Research Society-22 (SRS-22) inventories. Internal consistency and reproducibility were assessed using Cronbach's alpha and interclass correlation coefficients (ICC), respectively. The validity of the questionnaire was evaluated by comparing the scores obtained on the Persian BIDQ-S (P-BIDQ-S) inventory with those obtained on the SRS-22 subscales.

**Results:** The consistency and reliability of the P- BIDQ-S inventory were confirmed by Cronbach's alpha of 0.856 and interclass correlation coefficients of 0.882. The P-BIDQ-S scores directly correlated with the level of education of patients ( $r=0.21$ ,  $P=0.041$ ). The correlation coefficient between the P-BIDQ-S inventory and the SRS-22 questionnaire was  $-0.56$  ( $P=0.001$ ). A significant correlation was also observed between the P-BIDQ-S items and all of the SRS-22 subscales ( $P<0.05$ ).

**Conclusion:** The P-BIDQ-S inventory maintains adequate reliability, internal consistency, and reproducibility for the evaluation of Persian-speaking AIS patients.

**Level of evidence:** III

**Keywords:** Adolescent idiopathic scoliosis, Body image disturbance questionnaire-scoliosis (BIDQ-S), Persian, Reliability, Validity

## Introduction

Scoliosis is one of the most common forms of spinal deformity and encompasses congenital, neuromuscular, syndromic, and idiopathic

subgroups.<sup>1</sup> Adolescent idiopathic scoliosis (AIS) is responsible for 85% of all cases of scoliosis.<sup>2,3</sup> Based on the available literature, around 2-3% of children

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younger than 16 years have a coronal spinal deviation exceeding 10°. 4-6 In recent years, there has been a significant increase in the application of patient-oriented outcome measures as a supplementary investigation to the traditional methods and laboratory and clinical assessments in patients with musculoskeletal disorders.

Recent reports have revealed that AIS negatively influences the quality of life and numerous health-related parameters.<sup>7,8</sup> The Scoliosis Research Society has developed and standardized several inventories and questionnaires to better assess the treatment satisfaction rates in AIS patients.<sup>9,10</sup> These inventories have been designed in a way to be inclusive of different cultures and activity levels.<sup>11</sup>

The Body Image Disturbance Questionnaire-Scoliosis (BIDQ-S) is a 7-item self-report questionnaire that assesses the concerns of AIS patients regarding their body image from seven aspects, namely back shape, problems at school, work, and with friends and family as well as avoidance of practicing certain activities.<sup>12</sup> This questionnaire is scored based on a five-point Likert scale ranging from one (not worried at all) to five (very worried), and the average of all seven items is regarded as the final BIDQ-S score.<sup>13</sup> The BIDQ-S has been localized in various countries, including England, China, and Germany (Cronbach's Alpha: 0.82; 0.877; and 0.87, respectively).<sup>12,14,15</sup>

Several questionnaires in spinal practice have already been validated in the Persian language.<sup>16,17</sup> However, to our knowledge, the BIDQ-S has not yet been standardized in Persian. The BIDQ-S inventory is in Persian and derivative of the original BIDQ, which evaluates the concerns of AIS patients regarding their physical appearance and limitations in practicing specific day-to-day activities. The current study was designed to investigate the cross-cultural reliability and validity of the P-BIDQ-S in AIS patients by the American Academy of Orthopaedic Surgeons (AAOS) guidelines.

## Materials and Methods

### Study subjects

The Ethics Committee of the Iran University of Medical Sciences, Tehran, Iran approved this study with code IR.IUMS.REC.1400.767. Inclusion criteria were confirmed diagnosis of a single curve AIS (thoracic or lumbar), Cobb's angle of < 40°, and being a native Persian speaker. Patients with a previous history of scoliotic spine surgery, spondylolisthesis, L5 sacralization, S1 lumbarization, or developmental dysplasia of the hip were excluded from the study.

In total, 79 patients diagnosed with AIS referred to the orthopedic clinics of Shafa Yahyaean Hospital (Iran University of Medical Sciences) between January 2020 and January 2021 were eligible, 41 of whom completed the study and were included in the final analysis. Patient selection was performed using the convenience sampling method, and all patients had to provide written informed consent before enrollment.

### Basic data

At the time of enrollment, demographic data, including

age, gender, height, weight, body mass index (BMI), history of underlying diseases, history of surgical interventions in the past 6 months, level of education, and scoliotic Cobb's angle were obtained by the researchers and entered into a checklist. Cobb's angles were measured by two attending orthopedic spine surgeons; the validity of the Cobb's angle measurements was checked in a pilot study of 10 patients, which showed acceptable inter- and intra-observer validity (interclass correlation coefficients [ICC]: 0.93 and 0.91, respectively).

### Translation

The translation and equalization of the BIDQ-S questionnaire were performed in accordance with the AAOS guidelines.<sup>18</sup> In the first step, the original BIDQ-S questionnaire (in English) was translated into Persian by two native Persian speaker translators with sufficient knowledge and experience in translating English manuscripts (translators 1 and 2). After the preparation of the first draft of the questionnaire and due to several complexities, numerous meetings were held to further improve upon the translated questionnaire.

In the next step, the final draft prepared by translators 1 and 2 was discussed and revised with regard to simplicity and comprehension, the use of general language (avoidance of using technical-scientific and artificial phrases), and content compatibility (between the original and translated questionnaires). The overall quality of the translation was confirmed by two other independent translators that were fluent in both Persian and English (translators 3 and 4), one of whom was a native English speaker.

This draft was then back-translated into English by two native-English translators with adequate knowledge and experience in Persian-English translations. The resulting back-translated English BIDQ-S was then sent to the authors of the English BIDQ-S questionnaire for validation. The resulting draft was evaluated by translators, specialists, and the investigators committee. For quality control, a small pilot (n=41) of AIS patients was asked to complete the questionnaire. The final version of the questionnaire was compared with the Scoliosis Research Society-22 (SRS-22) questionnaire with regard to validity and reliability in the last committee. The BIDS-P questionnaire was scored based on a five-point Likert scale ranging from one (lowest) to five (highest).

### Validity

The validity of the translated BIDQ-S was assessed from two aspects: Face validity and content validity. To evaluate face validity, 25 AIS patients were asked to complete both questionnaires. To determine the effect score of the questions on both questionnaires, the participants were then asked to rate the importance of each question on a Likert scale ranging from one (not important at all) to five (highly important). Effect scores of  $\geq 1.5$  confirmed the face validity of each item. Content validity was also determined qualitatively: a group of 10 specialists was asked to provide their insights and

suggestions to improve the final draft upon completing the questionnaire.

### Reliability

The participants underwent an initial 10-min assessment, during which they were asked to complete a questionnaire to collect demographic data. The participants were asked to complete the P-BIDQ-S questionnaire twice: once at baseline and once one week after the initial assessment. To evaluate reproducibility, the standard error of measurement and ICC analysis was performed. The ICC values ranged from 0 (no reliability) to 1 (perfect reliability). The internal consistency of the items was assessed by determining Cronbach's Alpha coefficient. The ICC correlation coefficients of  $\geq 0.7$  were considered acceptable. Moreover, Cronbach's Alpha coefficients of  $\geq 0.7$  were considered as confirmation of internal consistency.

### Statistical analysis

Quantitative variables were expressed as mean $\pm$ SD, while qualitative variables were expressed as frequencies and percentages. Cronbach's Alpha analysis was employed to evaluate validity and reliability. In addition, retest reliability was assessed using the ICC analysis. The correlations between the various parameters were estimated using Pearson's correlation analysis. All statistical analyses were executed in the SPSS software package for Windows (version 16).

### Results

In total, 41 AIS patients completed the questionnaire. The mean age of the participants was 14.5 $\pm$ 2.8 years (range: 10-18 years), and the average Cobb angle was 33.2 $\pm$ 7.1 $^\circ$ . The majority of participants were female (75.6%) and had an educational level of high school degree or lower [Table 1].

The mean P-BIDQ-S score was 2.34 $\pm$ 0.92. The Cronbach's Alpha coefficient was determined to be 0.856, which confirmed the integrity and consistency of the relevance of items to each other. Further analysis revealed that items 5 and 6 had the lowest and highest Cronbach's alpha coefficient values. After the revision and removal of these items, Cronbach's alpha coefficient ranged from 0.832 to 0.868, further confirming the P-BIDQ-S.

**Table 1. Demographic characteristics of patients**

Variable	Mean $\pm$ SD/Number (percent)
Age (year)	14.5 $\pm$ 2.8
Gender	
Female	31 (75.6%)
Male	10 (24.4%)
Body mass index (Kg/m $^2$ )	21.88 $\pm$ 3.19
Cobb angle	33.2 $\pm$ 7.1
Educational level	
<Diploma	26 (63.4%)
Diploma	15 (36.5%)

**Table 2. Scores and internal consistency of Persian-Body Image Disturbance Questionnaire-Scoliosis**

Item	Mean $\pm$ SD	Corrected item-total correlation	Cronbach's alpha if item deleted
1	2.66 $\pm$ 1.21	0.66	0.832
2	2.54 $\pm$ 1.11	0.62	0.841
3	2.37 $\pm$ 1.14	0.74	0.851
4	2.17 $\pm$ 1.24	0.67	0.842
5	2.22 $\pm$ 1.15	0.57	0.868
6	2.15 $\pm$ 1.08	0.78	0.862
7	1.89 $\pm$ 1.12	0.725	0.863
Total	2.34 $\pm$ 0.92	-	-

Individual assessment of the items based on the item-total correlation analysis revealed that item five had the least correlation with the other items on the questionnaire. However, this incompetence was not so significant as to affect the validity of the entire questionnaire. Further assessments revealed that the removal of this item significantly increased the overall Cronbach's alpha coefficient [Table 2].

### Validity of the Persian Body Image Disturbance Questionnaire-Scoliosis scores

Overall, the P-IBDQ-S had an ICC of 0.882, ranging from 0.833 to 0.89 for items five and six, respectively. In addition, the questionnaire was also confirmed to retain significant reproducibility. The ICC values of the various items of the P-BIDQ-S questionnaire are summarized in Table 3.

### Evaluation of the correlation between demographic characteristics and Persian Body Image Disturbance Questionnaire-Scoliosis score

The overall P-BIDQ-S score showed a significant correlation with the level of education of the participants ( $r=0.21$ ,  $P=0.042$ ) and Cobb angle ( $r=0.653$ ,  $P<0.001$ ). No significant correlation was observed between the various

**Table 3. Test-Retest Reliability of the Scores of Persian Body Image Disturbance Questionnaire-Scoliosis**

Item	Infraclass correlation coefficient	95% Confidence interval
1	0.871	0.832
2	0.873	0.841
3	0.869	0.851
4	0.881	0.842
5	0.833	0.868
6	0.89	0.862
7	0.884	0.863
Total	0.882	-

**Table 4. Correlation of questionnaire score with demographic variables**

Variable	r	P
Age (Year)	0.12	0.28
Body mass index (Kg/m <sup>2</sup> )	0.056	0.85
Gender (Female)	0.13	0.11
Cobb angle	0.653	<0.001
Educational level	0.21	0.041

demographic parameters and the overall P-BIDQ-S score [Table 4].

The overall correlation score between the P-BIDQ-S score and SRS-22 was -0.56, which was statistically significant ( $P=0.001$ ). In addition, the correlations between the P-BIDQ-S and all of the SRS-22 subscales were significant. The highest and lowest correlation coefficients between the P-BIDQ-S and SRS-22 questionnaires were observed regarding the "self-image" and "satisfaction" items [Table 5].

**Table 5. Pearson correlation coefficients of the Persian Body Image Disturbance Questionnaire-Scoliosis (P-BIDQ-S) and the relevant subscales of the Scoliosis Research Society-22 (SRS-22)**

SRS-22 score	BIDQ-S score	
	r	P
Total	-0.56	0.001
Function	-0.49	0.001
Pain	-0.47	0.006
Self-image	-0.62	0.001
Mental health	-0.41	0.011
Satisfaction with management	-0.39	0.023

## Discussion

The mean P-BIDQ-S score of the studied population was 2.34, and this questionnaire retained acceptable reliability and validity. Furthermore, a Cronbach's Alpha coefficient of 0.856 was obtained for the P-BIDQ-S questionnaire, which is representative of the overall consistency and correlation of the questionnaire. Individual Cronbach's Alpha coefficients were also reported for each item, ranging from 0.832 to 0.868, which also confirms the validity of the questionnaire. Furthermore, the removal of items did not affect the coefficient. Individual assessment of the items using the item-total correlation analysis revealed that even though item number five was least correlated with the total questionnaire score compared to other items, the overall reliability of the questionnaire remained unaffected.

The ICC of the questionnaire was calculated at 0.882, which indicates the high reproducibility of the

P-BIDQ-S questionnaire. It should be mentioned that items five and six retained the highest and lowest ICC values. Analysis revealed that although the majority of the demographic parameters were not correlated with the overall P-BIDQ-S score, education levels and Cobb angle strongly correlated with higher scores. This suggests that higher education levels result in a better understanding of the items in the questionnaire. A statistically significant correlation between Cobb angle and P-BIDQ-S (increasing deformity correlating with a deteriorating P-BIDQ-S score) corresponds to patients with greater Cobb angles who tend to suffer more from a disturbed body image.

A significant correlation was observed between the SRS-22 and P-BIDQ-S questionnaires. In addition, we also observed a significant correlation between the P-BIDQ-S items and the various subscales of the SRS-22 questionnaire, the absolute values of which were lowest and highest for the "satisfaction" and "self-image" subscales. It is worth mentioning that the low correlation of the satisfaction parameter did not offset the overall correlation of the questionnaire ( $r=-0.39$ ). The higher prevalence of depression, anxiety, and psychosocial stresses may be the underlying cause of this reduced correlation.

Findings of the present research are in line with those of other studies performed in other countries.<sup>12-14</sup> Bae et al. evaluated the reliability and validity of the BIDQ-S questionnaire in Korean AIS patients. Similar to the present study, they also prepared a reverse-translated English version. The translated BIDQ-S questionnaire was compared with the K-SRS-22 questionnaire to evaluate validity and reliability. They reported that all of the items on the K-BIDQ-S questionnaire had an agreement coefficient of  $\geq 0.6$  with an overall Cronbach's alpha coefficient of 0.88, which indicates reasonable internal consistency.

Compared to the present study, the K-BIDQ-S questionnaire had a higher Cronbach's alpha coefficient, which may be attributed to the higher overall education level of the study participants.<sup>19</sup> We confirm this hypothesis since we also observed that those with higher levels of education obtained higher scores on the P-BIDQ-S questionnaire. However, since the questionnaire is localized for the general population, the P-BIDQ-S questionnaire retained a significant correlation in the AIS population.

In another study performed by Boa et al. on 100 Chinese AIS patients, the validity and reliability of the BIDQ-S questionnaire were evaluated. They reported that with a Cronbach's alpha coefficient of 0.877, the questionnaire had an acceptable internal consistency.<sup>14</sup> These findings were in line with those of a study conducted by Watterkamp et al. on 259 German patients with AIS, which evaluated the reliability of the BIDQ-S questionnaire. The results of the aforementioned study also exhibited agreement coefficients  $\geq 0.6$  for all items and ICC and internal consistency coefficients of 0.912 and 0.88, respectively.<sup>15</sup> The findings of the above-mentioned study confirmed the validity and reliability of the German-translated BIDQ-S questionnaire and are in

line with our results.

Kuzu et al. also evaluated the validity and reliability of the BIDQ-S questionnaire in their study carried out on the Turkish population. They reported that the questionnaire retained significantly high reliability and validity for the "body image" item.<sup>20</sup>

The Persian translation of the BIDQ-S questionnaire is a reliable tool for the identification of the physical and psychological concerns of AIS patients with regard to their appearance, which could facilitate and hasten psychological intervention.

Some limitations should be considered when interpreting results. First, the number of included participants was relatively small. Moreover, the participants were recruited at one orthopedic hospital. Besides, the interval between the first and second survey (1 week) was relatively short, which might have biased our results. Finally, this study did not include a postoperative P-BIDQ-S as the surgical candidates were excluded from the study.

It can be concluded that the Persian translation of the BIDQ-S questionnaire in AIS patients is a reliable tool with reproducible results for the evaluation and treatment of Iranian AIS patients.

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