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ORIGINAL ARTICLE

Body image disturbance in patients with adolescent idiopathic scoliosis: correlation with deformity perception, trunk aesthetic, and quality of life

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Purpose: In adolescents with idiopathic scoliosis, a disturbance in body image is the one of main complaint. Hence, concerns related-body image perceptions may be related to the deformity perception, trunk aesthetics and daily functioning. The aim of this study was to evaluate the body image disturbance and its association among deformity perception, trunk aesthetic, and quality of life in patients with adolescent idiopathic scoliosis (AIS).
Methods: A total of 105 patients with AIS were included in the study. Body Image Disturbance Questionnaire-Scoliosis (BIDQ-S) for body image disturbance, Walter Reed Visual Assessment Scale (WRVAS) and Trunk Appearance Perception Scale (TAPS) for perception of patient's deformity, Trunk Aesthetic Clinical Evaluation (TRACE) for trunk aesthetic and Scoliosis Research Society-22 (SRS-22) for quality of life were used. Pearson Correlation test were used to compare the data obtained in the study.
Results: The mean age of patients was 14.05±2.29 years, and the mean Cobb angles were 25.1±9.2° (ranged from 10° to 52°) for primary curve. The BIDQ-S demonstrated very good correlated to the SRS-22 total (r=-0.672, p<0.001) and pain domain (r=-0.631, p<0.001), the WRVAS (r=0.713, p<0.001), TAPS (r=0.672, p<0.001) and TRACE (r=0.614, p<0.001). There was a good correlation between BIDQ-S and other SRS-22 activity, image, and mental domains (r=-0.520; r=-0.518; r=-0.572, p<0.001). No correlation was found between BIDQ-S and the SRS-22 satisfaction domain (r=-0.102; p=0.296).
Conclusion: Body image disturbances strongly related with the patients' perception of deformity, trunk aesthetic, and quality of life.
Keywords: Scoliosis, Body image, Quality of life.

Adölesan idiyopatik skolyozda beden imajı rahatsızlığı: deformite algısı, gövde estetiği ve yaşam kalitesi ile ilişkisi

Amaç: İdiyopatik skolyozlu adölesanlarda beden imajındaki bozukluk ana şikayetlerden biridir. Bu nedenle, beden imajı algıları ile ilgili endişeler, deformite algısı, gövde estetiği ve günlük fonksiyonlar ile ilişkili olabilir. Bu çalışmanın amacı adölesan idiyopatik skolyozlu (AİS) hastalarda beden imajı rahatsızlığı ile deformite algısı, gövde estetiği ve yaşam kalitesi arasındaki ilişkiyi değerlendirmektir.
Yöntem: Çalışmaya AİS tanılı 105 hasta dahil edildi. AİS'li hastalarda beden imajı ile ilişkili endişelerin ve fonksiyonel yetersizliklerin değerlendirilmesinde Body Image Disturbance Questionnaire-Scoliosis (BIDQ-S), hastaların deformite algılamasının değerlendirilmesinde Walter Reed Görsel Değerlendirme Skalası (WRVAS) ve Gövde Görünüm Algılama Ölçeği (TAPS), gövde estetiğininin değerlendirilmesinde Trunk Aesthetic Clinical Evaluation (TRACE) ve yaşam kalitesinin değerlendirmesinde Scoliosis Research Society-22 (SRS-22) kullanıldı. Ölçekler arasında ilişkinin incelenmesinde Pearson Korelasyon testi kullanıldı.
Bulgular: Hastaların ortalama yaşı 14,05±2,29 yıl ve primer eğrilik için ortalama Cobb açıları 25,1±9,2° (10°- 52°) idi. BIDQ-S, SRS-22 total skoru (r=-0,672, p<0,001), SRS-22 ağrı alt parametresi (r=-0.631, p<0.001), WRVAS (r=0,713, p<0,001) puanı, TAPS (r=0,672, p<0,001) ve TRACE (r=0,614, p<0,001) puanı ile çok iyi korelasyon gösterdi. BIDQ-S ile SRS-22 fonksiyon, SRS-22 görünüm ve SRS-22 mental sağlık alt parametreleri arasında iyi bir korelasyon vardı (r=-0,520; r=-0,518; r=-0.572, p<0,001). BIDQ-S ile SRS-22 tedaviden tatmin alt parametresi arasında herhangi korelasyon bulunmadı (r=-0,102; p=0,296).
Sonuç: Beden imajı bozuklukları, hastaların deformite algısı, gövde estetiği ve yaşam kalitesi ile güçlü bir şekilde ilişkilidir.
Anahtar kelimeler: Skolyoz, Beden imajı, Yaşam kalitesi.

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Idiopathic scoliosis is a 3-dimensional deformity of the spine with an increasing prevalence of puberty.[1] Abnormal changes in the spine produce a significant deterioration of body appearance. The cosmetic deterioration of the external appearance causes the patients to be adversely affected both physically and psychologically.[2] Changes in body image and perception create a constant dissatisfaction, anxiety and distress about the external appearance; to some degree, it causes deterioration in social relations, social activities and professional functions. It is reported that deformities which occur during adolescence and cause changes in body appearance, may affect the self-esteem and body image perception of the patients more than the childhood or adulthood.[3,4] It is emphasized that psychosocial problems, caused by deformity, increase the concerns about body image.[5] It is also undeniable that the quality of life of the patients with idiopathic scoliosis is negatively affected by the deformity.[6] Therefore, it is important to evaluate the changes in body image caused by deformity and their effects on quality of life in young individuals with idiopathic scoliosis.

Body Image Disturbance Questionnaire-Scoliosis (BIDQ-S) was developed to evaluate the concerns related-body image perceptions in individuals with scoliosis.[7] The BIDQ-S consists of seven items that analyze the anxiety of individuals in body perception, the effect of these concerns on functionalities in school, work and social life, and the degree to which these concerns engage the mind. It is a reporting tool that evaluates the deterioration of body perception of individuals with idiopathic scoliosis and their effects on daily functioning. The original language of BIDQ-S is in English, and its validity and reliability studies have been conducted in other languages (Turkish, Chinese, Korean, German).[7-11]

Questionnaires and scales are used to examine the body appearance perception, perception of patients' deformity, self-image, mental health, and trunk aesthetic individuals with idiopathic scoliosis. The most commonly used questionnaires and scales in the evaluation of individuals with idiopathic scoliosis: Scoliosis Research Society-22 (SRS-22)[12] instrument for evaluation of changes pain, self-image, function and mental health; the Walter Reed Visual Assessment Scale (WRVAS)[13] for evaluation of changes spinal deformity, rib prominence, lumbar prominence, thoracic deformity, trunk imbalance, shoulder asymmetry and scapular asymmetry; the Trunk Appearance Perception Scale (TAPS)[14] for evaluation of changes a back view and deformity perception; the Trunk Aesthetic Clinical Examination Scale (TRACE)[15] for evaluation of changes trunk aesthetic in the patients with scoliosis. The patient-reported outcome measures provide to evaluate body image disturbance, perception of deformity, trunk aesthetic and quality of life in patients with scoliosis. The effects of the relationship between these variables in terms of patient-reported outcome measures have not been clearly demonstrated. Although studies comparing the validity and reliability of these questionnaires,[12-15] there is no clear evidence that the body-image disturbance correlates with the perception of patient's deformity, trunk aesthetic.

This study hypothesized whether the concerns related-body image perceptions or body image disturbance may be related to the deformity perception, trunk aesthetics and quality of life. Hence, the aim of this study was to evaluate the body image disturbance and its association among deformity perception, trunk aesthetic, and quality of life in patients with adolescent idiopathic scoliosis (AIS).

METHODS

Participants and study design

This cross-sectional study was approved by the Hacettepe University Non-Interventional Clinical Research Ethics Committee (No. GO 19/698; date 2019/20-09) and all patients signed a written informed consent form. The data were collected via face-to-face interview. To determine sample sizes, a power analysis was performed using GPower, version 3.1.9.2. As the primary outcome measures, the body image disturbance score and quality of life were determined with correlation coefficient between two points in agreement with the study by Bao et al.[8] (r value=0.3). A sample size of at least 84 was identified, providing a power of 80% and a = 0.05 (two-tailed).

A total of 105 patients who had been diagnosed with AIS were included in the study (Figure 1). The following criteria were used to

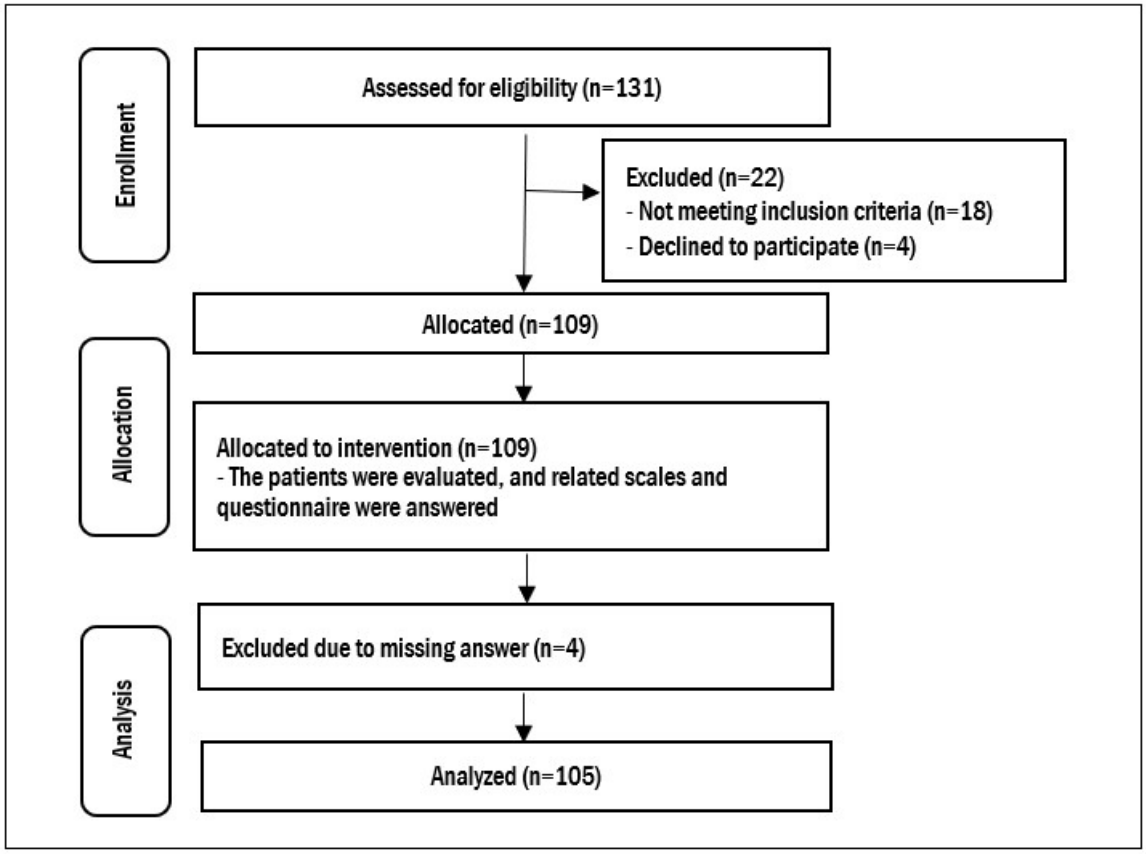

Figure 1. Flow chart of the study.

determine eligibility: (1) age between 10 and 18 years, (2) Cobb angle>10º (3) diagnosed with AIS and (4) native Turkish speakers. The patients who had undergone spine surgery, had a neuromuscular or rheumatological disease, had a congenital malformation of the spine, spina bifida aperta, or spondylolisthesis, spinal cord anomalies, malignity, had an obstetric brachial plexus lesion, and had a cooperative or mental impairment were excluded from this study.

Outcome measures

Demographic characteristics (age, height, weight, gender), scoliosis-specific characteristics (curve pattern, cobb angle, axial trunk rotation), treatment history and Risser sign were recorded. The curve patterns were classified as single curve (thoracic, thoracolumbar, or lumbar regions) or double curve (double thoracic or thoracic- thoracolumbar/lumbar regions) according to King types. In addition, all the patients completed the following questionnaire and scales, which are already available and validated in Turkish: BIDQ-S,[7] SRS-22,[12] WRVAS,[13] TAPS,[14] TRACE.[15] The BIDQ-S for body image disturbance, the WRVAS and the TAPS for perception of patient's deformity, the TRACE for trunk aesthetic and SRS-22 for quality of life were used.

Body Image Disturbance Questionnaire-Scoliosis (BIDQ-S)

The BIDQ-S is a scoliosis-specific questionnaire used to evaluate body image disturbance. The questionnaire has seven item and each of items is rated on a five-point Likert scale. The total score ranges from 1 to 5 and represents body image disturbance level. Increasing total score is show severity of body image disturbance. In addition, except of seven items, there are qualitative questions about the patient's concerns of body shape which are not considered into the average score.[7] Turkish validity and reliability study was performed by Kuzu et al.[10]

Scoliosis Research Society-22 Instrument (SRS-22)

The SRS-22 is a disease-specific, standardized questionnaire used to assess pain, self-image, function, and mental health in patients with idiopathic scoliosis.[12,16-19] It comprises of 22 items, each of which is rated from 1 to 5, with 1 being the worst and 5 being the best condition. The total score is calculated as the sum of these five domains.

The Walter Reed Visual Assessment Scale (WRVAS)

The WRVAS is an instrument that includes a group of images presenting seven item such as spinal deformity, rib prominence, lumbar prominence, thoracic deformity, trunk imbalance, shoulder asymmetry and scapular asymmetry. Each item is scored from 1 (minimum deformity) to 5 (maximum deformity). The total score ranges from 7 to 35 point. It evaluates individual's subjective perception of the deformity in patient with scoliosis.[13]

The Trunk Appearance Perception Scale (TAPS)

The TAPS is a questionnaire includes 3 sets of figures that representing the 3 views of the trunk. The viewpoints include a back view, a view of the patient in a forward bending position seen from the front (Adam's test), and a view from the front. Each figure is scored from 1 (worst deformity) to 5 (minimum deformity). The average score ranges from 1 to 5.[14]

The Trunk Aesthetic Clinical Examination Scale (TRACE)

The TRACE is a visual scale used to evaluate self-perception of cosmetic deformities in the patients with scoliosis. It is a 12-point scale based on 4 domains which are shoulders, scapulae, waist, and the hemi-thorax. The scoring of shoulders, waist, scapulae, and hemi-thorax ranged from 0–3; 0–4; 0–2; and 0–2, respectively. The total score is obtained by adding 1 point to all domains, and ranges from 1 to 12, and the higher score means worse trunk aesthetic.[15]

Statistical analysis

All statistical analysis was conducted with SPSS version 22 (SPSS Inc, Chicago, IL). The normality of the distribution of the data was assessed using a histogram and probability graphics, and an analytical method (the Kolmogorov-Smirnov test). The data were determined normally distributed. The correlation between the questionnaire and scales was assessed with Pearson correlation test. The Pearson correlation test was considered as follows: $r \geq 0.81–1.0$ was excellent, 0.61–0.80 was very good, 0.41–0.60 was good, 0.21–0.40 was fair, and 0.00–0.20 was poor.[20] The level of statistical significance was determined at 0.05.

RESULTS

A total of 105 patients with AIS (95 female, 10 male, mean age 14.05±2.29 years; BMI: 19.6±2.9 kg/m^2) included in the study. The mean Cobb angle of the patients was 25.1±9.2° (ranged from 10° to 52°). Their curve patterns were single-nature (thoracic, n = 33, 25.2% and lumbar, n = 37, 28.2%) or double-nature (n = 35; 26.7%). Treatment history was no treatment (47.6%), exercise treatment (23.8%), brace (18.1%) and surgery (10.5%). The demographic and clinical characteristics of the patients were shown in Table 1.

BIDQ-S, WRVAS, TAPS and TRACE score of the patients were presented in Table 2. The BIDQ-S was very good or good correlated to all parameters of SRS-22 (except satisfaction domain), WRVAS, TAPS, and TRACE. The BIDQ-S demonstrated very good correlated to the SRS-22 total (r=-0.672) and pain domain (r=-0.631, p<0.001) and the WRVAS (r=0.713, p<0.001), TAPS (r=0.672, p<0.001) and TRACE (r=0.614, p<0.001). There was a good correlation between T-BIDQ-S and other SRS-22 activity, image and mental domains (r=-0.520; r=-0.518; r=-0.572, p<0.001). No correlation was found between BIDQ-S and the SRS-22 satisfaction domain (r=-0.102; p=0.296) (Table 3).

DISCUSSION

The present study's results demonstrated that body image disturbances or concerns related-body image perceptions related to the patients' perception of deformity, trunk aesthetic, and quality of life. The BIDQ-S scores strongly correlated to WRVAS, TAPS, TRACE and SRS-22 scores. In the present study, the research hypothesis was accepted.

Scoliosis-related body image disturbance has a psychological importance in the well-being

of AIS population. Irrespective of the treatment option, both male and female scoliosis patients suffer from negative body image.[21] Cobb angle of more than 40 degrees has been identified as a risk factor for having a poor body image.[19] In the present study, the mean cobb angle of the patients was 25.1 degree, and due to the nature of AIS, most of the patients were female. Considering the cobb angles of the patients, it is seen that even the low-moderate curvature of most of them may lead to body image disturbance (mean score 1.8).

BIDQ-S reported satisfactory reliability and validity to evaluate scoliosis patients' worries about how scoliosis-related physical appearance affects daily functioning and emotional well-being in line with other versions.[7-11] Kuzu et al.[10] demonstrated the Turkish BIDQ-S and SRS-22 were correlated high or moderate, except for the mental factor. The BIDQ-S was found to be strongly correlated with each sub-domain of the SRS-22 by Auerbach et al.[7], demonstrating that higher body image disturbance was associated with lower SRS-22 sub-domain and total scores. Bao et al.[8] found good correlations between BIDQ-S score and all domains of SRS-22. Wetterkamp et al.[11] reported moderate to high negative correlations between BIDQ-S score and each domain of SRS-22. According to the present study's results, BIDQ-S strongly correlated to the SRS-22 total score and pain domain in Turkish population. Furthermore, there was a good correlation between the BIDQ-S and other SRS-22 activity, self-image, and mental domains. Additionally, the present study showed that increasing pain scores in SRS-22 correlated well with get worsening BIDQ-S values, corresponding to the results of Auerbach et al.[7], Bao et al.[8], and Wetterkamp.[11] No correlation was found between the BIDQ-S and the SRS-22 satisfaction domain. Therefore, as the BIDQ-S examines concerns about back shape, this result could be related to the differing contents of these domains. These results confirm that perceived body image disturbance is an important component of the quality of life of patients with scoliosis.

Schwieger et al.[22] showed poor self-image was significantly associated with poor quality of life in patients with large Cobb angles during follow-up. A review found that patients with AIS also had higher mood changes, particularly depression and anxiety. As these associations become more apparent, the authors stated that various factors beyond the patient's spinal deformity must be considered while treating scoliosis for the patient outcome.[23] Therefore, we think that the evaluation of body image disturbance may be useful regarding patient-reported outcomes when treating patients with adolescent scoliosis.

Wetterkamp et al.[11] found a strong correlation between the BIDQ-S and the Spinal Appearance Questionnaire (SAQ) score, as well as the BIDQ-S and the SRS-22 appearance domain score. Bao et al.[8] found moderate

Table 1. Demographic and clinical characteristics of participants (N=105).

	Mean±SD
Age (years)	13.9±2.3
Height (cm)	158±10.2
Body weight (kg)	49.7±10.6
Body mass index (kg/m^2)	19.6±2.9
Cobb angle (°)	25.1±9.2
Axial trunk rotation (°)	6.8±4.2
	n (%)
Gender	
Female	95 (90.5)
Male	10 (9.5)
Curve pattern n (%)	
Single curve	70 (66.7)
Double curve	35 (33.3)
Menarche n (%)	
Post-menarche	72 (68.6)
Pre-menarche	23 (21.9)
Missing	10 (9.5)
Risser sign n (%)	
Immature (0-3)	80 (76.2)
Mature (4-5)	24 (22.9)
Missing	1 (1.0)
Treatment history	
No treatment	50 (47.6)
Brace	25 (23.8)
Exercise	19 (18.1)
Surgery	11 (10.5)

Table 2. Body Image Disturbance Questionnaire (BIDQ-S), Scoliosis Research Society-22 (SRS-22), Walter Reed Visual Assessment Scale (WRVAS), Trunk Appearance Perception Scale (TAPS), and Trunk Aesthetic Clinical Evaluation (TRACE) scores.

	Mean (SD) (n=105)	min- max
Body Image Disturbance Questionnaire (BIDQ-S)		
Question-1	2.7±1.08	1- 5
Question-2	2.1±0.9	1- 4
Question-3	2.2±1.04	0- 5
Question-4	1.8±0.9	0- 4
Question-5	1.7±0.9	0- 4
Question-6	1.7±0.9	1- 4
Question-7	1.5±0.8	0- 4
Total score	1.8±0.8	0.9- 4
Scoliosis Research Society-22 (SRS-22) (1-5)		
Total score	3.99±0.53	2.2- 4.9
Function	4.47±0.60	2.6- 5
Pain	4.24±0.65	2.4- 5
Self-image	3.63±0.58	1.8- 5
Mental health	3.66±0.87	1- 5
Satisfaction	4.52±0.61	3- 5
Walter Reed Visual Assessment Scale (WRVAS) (7-35)	13.8±6.09	7- 28
Trunk Appearance Perception Scale (TAPS) (1-5)	2.45±0.99	1- 5
Trunk Aesthetic Clinical Evaluation TRACE (0-12)	4.66±2.30	1- 11

Table 3. Correlation between the Body Image Disturbance Questionnaire (BIDQ-S) and the other outcome measures (N=105).

	Body Image Disturbance Questionnaire (BIDQ-S)	
	r (95% CI)	p value
Scoliosis Research Society-22 (SRS-22) (1-5)		
Total score	-0.672 (-0.691/-0.650)	<0.001
Function	-0.520 (-0.540/-0.492)	<0.001
Pain	-0.631 (-0.642/-0.618)	<0.001
Self-image	-0.518 (-0.540/-0.494)	<0.001
Mental health	-0.572 (-0.605/-0.544)	<0.001
Satisfaction	-0.102 (-0.150/-0.041)	0.296
Walter Reed Visual Assessment Scale (WRVAS) (7-35)	0.713 (0.691-0.732)	<0.001
Trunk Appearance Perception Scale (TAPS) (1-5)	0.672 (0.643-0.704)	<0.001
Trunk Aesthetic Clinical Evaluation (TRACE) (0-12)	0.614 (0.610-0.635)	<0.001

CI: Confidential Interval.

relationships between the BIDQ-S score and the SAQ score, suggesting that the BIDQ-S instrument might reflect the body image disruption of AIS patients and the psychological impact. In another study, correlation between BIDQ-S and SAQ scores showed a good correlation.[9] To our knowledge, there are not enough studies evaluating the relationship

among TRACE, TAPS, WRVAS and BIDQ-S. The TAPS is a short scale, with only three pictorial items, while WRVAS has seven items which to assess spinal deformity, rib prominence, lumbar prominence, thoracic deformity, trunk imbalance, shoulder asymmetry and scapular asymmetry. These are two different scales that evaluate perception of patients' deformity. In the present study, we used these two questionnaires, frequently preferred in clinical practice, to see the relationship with BIDQ-S. Also, TRACE provides information about trunk aesthetics which to evaluate the asymmetries of shoulders, scapulae, waist and hemithorax. The current study shows that BIDQ-S is strongly correlated with WRVAS, TAPS and TRACE. The patient's perception of deformity and trunk aesthetics are closely related to body image disturbance. These scales may provide important information to clinicians about the patient's body image disturbance. In addition, increasing in appearance-related anxiety and impairment in functioning correlated strongly with deteriorating perception of patient's deformity, trunk aesthetic and quality of life. These findings show that patients' subjective perception of their deformity might be affected from their body shape worries or vice versa.

Limitations

The main difference of our study from the previous studies was to evaluate self-perception of cosmetic deformities and trunk aesthetic via the WRVAS, TAPS and TRACE scales. As expected, these scales showed strong correlations with the BIDQ-S scale. There were some limitations in our study. Our sample size mostly consisted of nonsurgical AIS patients with lower curve magnitude, and the number of the patients who undergone surgery was smaller (10.5%) compared to other studies. This might affect the results of the questions about the perception of the body image disturbance. In addition, the effect of treatment history could not be eliminated in the present study due to the insufficient and difference of sample size in each group. In this study, the relationship between body image perception and familial or environmental factors in patients with scoliosis was not examined. Future studies are needed to examine the effects of these factors.

Conclusion

In conclusion, BIDQ-S demonstrated very good or good correlation with WRVAS, TAPS, TRACE and SRS-22 (except satisfaction domain). Body image disturbances strongly related to the patients' perception of deformity, trunk aesthetic, and quality of life in term of these patient-reported outcome measures.

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Authors' Contributions: GİK: Study design, data analysis, writing; **ZB:** Data collection, processing, writing; **MGB:** Literature review, writing; **SB:** Literature review, study design; **HGD:** Study design, provision of equipment, critical review; **HGD:** Providing cases, critical review.

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Conflicts of Interest: *None*

Ethical Approval: The protocol of the present study was approved by the Ethics Committee of Hacettepe University (issue: GO 19/698 date: 20.09.2019).

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