ORIGINAL ARTICLE

J Turk Spinal Surg 2026;37(2):76-81

76

DOI: 10.4274/jtss.galenos.2026.47965

CLINICAL RELATIONSHIP BETWEEN CURVE LOCATION AND BODY IMAGE, QUALITY OF LIFE, AND DEPRESSION LEVELS IN PATIENTS WITH ADOLESCENT IDIOPATIC SCOLIOSIS

Büşra Nur Özcan Erişgin[1], Bedirhan Albayrak[2], Altan Aksu[2], Ahmet Uzun[1], Hüseyin Sina Coşkun[3]

[1]*Ondokuz Mayıs University Faculty of Medicine, Department of Anatomy, Samsun, Türkiye*

[2]*University of Health Sciences Türkiye, Samsun Training and Research Hospital, Clinic of Orthopaedics and Traumatology, Samsun, Türkiye*

[3]*Ondokuz Mayıs University Faculty of Medicine, Department of Orthopaedics and Traumatology, Samsun, Türkiye*

ABSTRACT

Objective: Adolescent idiopathic scoliosis (AIS) is a three-dimensional spinal deformity that may negatively affect adolescents' psychosocial well-being. Increasing evidence suggests that radiographic severity alone does not fully explain the impact of scoliosis on health-related quality of life (HRQoL). However, the extent to which curve magnitude and location influence domain-specific HRQoL outcomes remains unclear.

Materials and Methods: This cross-sectional study included 65 adolescents with AIS who were evaluated at a university hospital outpatient clinic. Participants completed the validated Turkish version of the scoliosis research society-22 (SRS-22) questionnaire. Standing posteroanterior full-spine radiographs were used to determine Cobb angle, curve location (proximal thoracic, main thoracic, thoracolumbar/lumbar), and Risser stage. Differences among SRS-22 domains were assessed using the Friedman test, followed by Bonferroni-corrected Wilcoxon signed-rank tests. Comparisons between curve location groups were performed using the Kruskal-Wallis test. Associations between curve magnitude and SRS-22 domain scores were assessed using Spearman correlation.

Results: Self-image and mental health were the most adversely affected SRS-22 domains, whereas pain and functional activity scores were relatively preserved [Friedman $\chi^2(4)=78.18$, $p<0.001$]. No significant differences in SRS-22 total or domain scores were observed across curve location groups (all $p>0.05$). Spearman correlation analysis demonstrated no significant associations between Cobb angle magnitude and any SRS-22 domain.

Conclusion: Psychosocial domains, particularly self-image and mental health, constitute the primary burden in AIS and appear largely independent of radiographic severity and the curve pattern. These findings support a patient-centered approach to AIS management that incorporates psychosocial assessment alongside conventional radiographic evaluation.

Keywords: Adolescent idiopathic scoliosis, curve location, SRS-22

INTRODUCTION

Adolescent idiopathic scoliosis (AIS) is a complex three-dimensional spinal deformity that develops in otherwise healthy adolescents during the pubertal growth spurt and affects approximately 2-4% of the general adolescent population[1]. Although many cases remain mild and clinically stable, a subset of patients experience curve progression that may lead to functional limitations, cosmetic concern, psychosocial distress. As a result, AIS has multidimensional consequences extending beyond structural spinal deformity, affecting both physical health and psychosocial well-being.

Health-related quality of life (HRQoL) has become a central outcome in AIS research, driven by increasing recognition that radiographic severity alone does not fully capture the lived experience of the condition. Among available measurement tools, the scoliosis research society-22 (SRS-22) questionnaire is one of the most widely validated instruments, assessing pain, function/activity, self-image, mental health, and satisfaction with treatment[2]. Notably, the self-image and mental health domains have been shown to correlate closely with adolescents' subjective experience of scoliosis and often demonstrate greater impairment than physical domains, even in patients with relatively modest curve magnitudes[3].

Address for Correspondence: Büşra Nur Özcan Erişgin, Ondokuz Mayıs University Faculty of Medicine, Department of Anatomy, Samsun, Türkiye
E-mail: busranur.ozcan@omu.edu.tr
ORCID ID: orcid.org/0000-0002-1160-4542
Received: 30.01.2026 **Accepted:** 10.03.2026 **Publication Date:** 18.03.2026
Cite this article as: Özcan Erişgin BN, Albayrak B, Aksu A, Uzun A, Coşkun HS. Clinical relationship between curve location and body image, quality of life, and depression levels in patients with adolescent idiopatic scoliosis. J Turk Spinal Surg. 2026;37(2):76-81

Previous studies have examined potential determinants of HRQoL in AIS, but their findings remain inconsistent. Some investigations have reported that larger Cobb angles are associated with poorer self-image and psychological outcomes, whereas more recent evidence suggests that the association between radiographic severity and HRQoL is weak or absent[4,5]. Likewise, the influence of curve location whether proximal thoracic, main thoracic, or thoracolumbar/lumbar on HRQoL remains unclear. While thoracic curves have traditionally been considered more cosmetically deforming due to rib prominence and trunk asymmetry, empirical data on the relationship between curve topography and HRQoL have been inconclusive. These discrepancies highlight the need for further research examining the interplay between curve magnitude, curve location, and multidimensional HRQoL outcomes. In particular, clarifying whether radiological parameters predict psychosocial domains such as self-image and mental health is essential for guiding holistic clinical decision making and identifying adolescents who may require additional psychological support[6].

Therefore, the present study aims to analyze domain-specific SRS-22 scores in relation to curve magnitude and curve location in a cohort of adolescents with idiopathic scoliosis. Despite increasing attention to psychosocial outcomes in AIS, few studies have simultaneously evaluated the independent contributions of curve magnitude, curve location, and domain-specific HRQoL within a single, well-defined cohort. Existing reports commonly rely on heterogeneous severity groups, merge distinct curve patterns, or emphasize global SRS-22 scores rather than subdomain-level analysis.

The present study provides a novel contribution by isolating the effects of radiographic parameters on individual SRS-22 domains particularly self-image and mental health thereby enabling a more precise characterization of the psychosocial determinants of HRQoL in AIS. By evaluating both physical and psychosocial components of HRQoL concurrently, this study seeks to clarify whether radiographic characteristics meaningfully influence perceived health status and emotional well-being in adolescents with idiopathic scoliosis.

MATERIALS AND METHODS

This was a single-center cross-sectional observational study based on consecutively collected clinical data. Adolescents diagnosed with AIS were consecutively recruited and evaluated during routine visits to the orthopedic outpatient clinic of a university hospital. All clinical, radiographic, and patient-reported outcome data were collected at the time of presentation. This single-center, clinical study, patient data were prospectively evaluated after obtaining ethical committee approval from Ondokuz Mayıs University Clinical Research Ethics Committee (approval no: 2025/305, date: 11.06.2025). All patients and their legal guardians were informed about the study procedures, and both verbal and written consent were obtained in accordance with the Declaration of Helsinki.

Study Population

A total of 65 patients between 10 and 18 years of age were enrolled. Inclusion criteria were diagnosis of AIS with a structural curve of at least 10° measured by Cobb method; availabilty of standardized standing posteroanterior (PA) full-spine radiographs, and ability to independently complete the validated Turkish version of the SRS-22 questionnaire. Patients were excluded if they had non idiopathic scoliosis (congenital, neuromuscular, or syndromic), a history of spinal surgery or active brace treatment, incomplete radiographic data, or any cognitive/psychiatric condition that could interfere with questionnaire responses.

Radiographic Assessment

All participants underwent standardized standing PA full-spine radiography. Curve magnitude was measured using the Cobb method by two independent raters experienced in spinal deformity assessment. Based on the location of the apical vertebra, curves were classified into three categories: proximal thoracic (T1-T5), main thoracic (T6-T12; Figure 1A), and thoracolumbar/lumbar (T12-L4; Figure 1B). Double thoracic curve patterns are illustrated separately (Figure 1C). Skeletal maturity was assessed using the Risser staging system. Interobserver reliability for Cobb angle measurements was evaluated in a random subsample using intraclass correlation coefficients.

Patient-reported Outcomes

Participants completed the validated Turkish version of the SRS-22 questionnaire, which assesses HRQoL across five domains: pain, function/activity, self-image, mental health, and satisfaction with management. All questionnaires were administered and collected on the same day as the radiographic evaluation.

Statistical Analysis

All statistical analyses were performed using IBM SPSS Statistics (version 21; IBM Corp., Armonk, NY). Data were first examined for normality using the Shapiro-Wilk test. Because SRS-22 scores displayed non-normal distributions, non-parametric methods were employed for group comparisons.

The Kruskal-Wallis H test was used to compare SRS-22 scores across curve location groups. Within-subject differences among the five SRS-22 domains were evaluated using the Friedman test, followed by Bonferroni-corrected Wilcoxon signed-rank tests for pairwise comparisons. Relationships between curve magnitude and SRS-22 domain scores were assessed using Spearman's rank correlation coefficients. Statistical significance was set at $p<0.05$.

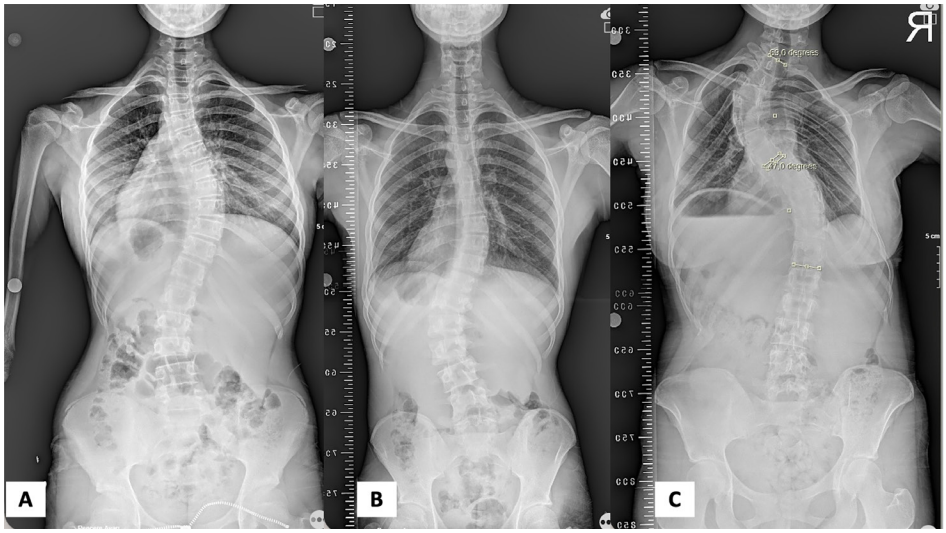

Figure 1. Representative radiographic patterns of scoliosis according to curve localization. **(A)** Main thoracic curve, **(B)** thoracolumbar curve, and **(C)** double thoracic curve

RESULTS

Participant Characteristics

The study included 65 adolescents with AIS. The mean age of the cohort was 15.01±3.47 years (range: 10-18 years). The mean Cobb angle was 24.6±17.2°. When categorized according to curve severity, 37 patients (56.9%), had mild curves (<25°), 25 patient (38.5%) had moderate curves (25-45°), and 3 patients (4.6%) had severe curves (>45°). Regarding skeletal maturity, Risser stage distribution was as follows: stage 1 in 1 patient (1.5%), stage 2 in 1 patient (1.5%), stage 3 in 9 patient (13.8%), stage 4 in 37 patient (56.9%), and stage 5 in 17 patients (26.2%). The most common curve type was thoracolumbar (n=33, 50.8%), followed by main thoracic curves (n=26, 40.0%) and proximal thoracic curves (n=6, 9.2%) (Table 1).

Table 1. Demographic and clinical characteristics of the study cohort

Variable	Value
Age, years (mean ± SD)	15.01±3.47
Gender	n (%)
Female	44 (67.7%)
Male	21 (32.3%)
Curve type	n (%)
Proximal thoracic	6 (10.8%)
Main thoracic	26 (38.5%)
Thoracolumbar/lumbar	33 (50.8%)
Risser stage	
0-1	1 (1.5%)
2-3	10 (15.4%)
4-5	54 (83.1%)

SD: Standard deviation

Differences Across SRS-22 Subscale Scores

The Friedman test demonstrated significant differences across the five SRS-22 subdomains [$\chi^2(4, n=65)=78.18$, $p<0.001$], indicating heterogeneous perceptions of HRQoL within the cohort.

Post-hoc pairwise analyses with Bonferroni correction showed that self-image scores were significantly lower than pain ($p<0.001$), function/activity ($p<0.001$), and satisfaction with treatment ($p=0.011$). Mental health scores were significantly lower than pain ($p=0.001$) and function/activity ($p<0.001$). Satisfaction with treatment was significantly lower compared with pain ($p=0.039$) and function/activity ($p=0.001$). No significant differences were found between pain and function/activity ($p=1$), or between self-image and mental health ($p=0.229$).

These results demonstrate that psychosocial domains (self-image and mental health) were more impaired than physical domains. Descriptive statistics for all subdomains are presented Table 2.

SRS-22 Scores by Curve Localization

Kruskal-Wallis tests revealed no significant differences across the three curve location groups for the SRS-22 scores or any of the subdomains (all $p>0.05$). This suggests that curve location (proximal thoracic vs. main thoracic vs. thoracolumbar/lumbar) did not significantly influence perceived HRQoL. Curve group comparisons are provided in Table 3.

Correlations Between Curve Magnitude and SRS-22 Subdomains

Spearman correlation analysis revealed no significant associations between Cobb angle magnitude and SRS-22 domain scores. Detailed correlation results are presented in Table 4.

Table 2. SRS-22 domain scores and descriptive statistics

	Mean ± SD	Median (minimum-maximum)	p-value
Pain	4.03±0.75	4.20 (1.60-5.00)	<0.001
Self-image	3.22±0.77	3.20 (1.00-4.80)	
Function/activity	4.13±0.74	4.20 (2.00-5.00)	
Mental health	3.50±0.71	3.40 (1.80-4.80)	
Treatment satisfaction	3.60±0.85	3.50 (1.50-5.00)	

Overall between-domain comparion was performed using the Friedman test, SD: Standard deviation

Table 3. Comparison of SRS-22 domain scores across curve location groups

Domain	Proximal thoracic (n=7)	Main thoracic (n=25)	Thoracolumbar (n=33)	p-value
Pain	22.07	31.32	36.59	0.149
Function	31.21	29.48	36.05	0.402
Self-image	27.86	29.88	36.45	0.313
Mental health	33.71	37.80	29.21	0.226
Satisfaction	36.29	29.38	35.05	0.456

Kruskall-Wallis test, SRS-22: Scoliosis research society-22

Table 4. Correlation between Cobb angle and SRS-22 domain scores

Variable	Spearman's ρ	p-value
Pain	-0.111	0.380
Function	-0.170	0.177
Self-image	-0.169	0.179
Mental health	-0.121	0.339
Treatment satisfaction	-0.225	0.071

Spearman rank correlation test (two-tailed), SRS-22: Scoliosis research society-22

Influence of Demographic Variables

Age and sex were not significantly associated with either SRS-22 total scores or with the psychosocial domains of self-image and mental health (all p>0.05). These findings indicate that HRQoL outcomes were largely independent of demographic characteristics in this cohort.

Clinical Interpretation and Implications

Overall, the lowest SRS-22 scores were observed in the self-image and mental health domains. Neither curve magnitude nor curve location significantly influenced HRQoL. Psychosocial factors, rather than radiographic severity or anatomical curve pattern, appear to play a stronger role in shaping adolescents' perceived well-being.

DISCUSSION

This study examined the extent to which radiographic parameters specifically curve magnitude and curve location are associated with HRQoL in AIS. Our results demonstrated that the psychosocial domains of the SRS-22, particularly self-image and mental health, were the most adversely affected components, whereas pain and function scores remained relatively preserved. Importantly, neither curve magnitude nor curve location emerged as significant determinants of HRQoL, and no demographic variables showed meaningful associations with patient-reported outcomes. These findings support the growing body of evidence suggesting that psychosocial morbidity in AIS is only modestly correlated with the underlying radiographic deformity.

Our findings are consistent with previous studies indicating that AIS disproportionately affects body image and emotional well-being. Torén and Diarbakerli[4] reported significantly lower SRS-22 self-image and mental health scores among adolescents with AIS compared with healthy controls, despite similar functional capacity. Similarly, Sanders et al.[7] demonstrated that adolescents with AIS frequently experience emotional distress and altered body perception independent of curve severity. Parent et al.[8] further reported that psychosocial domains, particularly self-image, show greater variability than physical domains across severity strata, suggesting that these outcomes are more strongly influenced by subjective perception than by radiographic metrics.

This relationship is further supported by studies directly evaluating body image disturbances in AIS. Auerbach et al.[9] validated the body image disturbance questionnaire-short form (BIDQ-S) as a sensitive instrument for detecting body image disturbance and reported strong correlations with psychological distress. Likewise, brace-related investigations by Pezham et al.[10] demonstrated that perceived deformity, rather than curve magnitude, was the primary determinant of stress levels during conservative management. Collectively, these studies indicate that the clinical burden of AIS is often mediated through psychosocial pathways rather than through biomechanical impairment alone.

Although thoracic curves may theoretically produce greater cosmetic deformity due to rib prominence and shoulder asymmetry, our findings demonstrated no significant differences in SRS-22 outcomes between proximal thoracic, main thoracic, and thoracolumbar/lumbar curve patterns. This observation aligns with recent research challenging the traditional assumption that curve topography directly influences psychosocial burden. Belli et al.[11] reported no significant effect of curve location on self-image or mental health after adjusting for demographic and psychological variables. Similarly, Horne et al.[12] concluded that curve pattern does not independently determine HRQoL once global trunk asymmetry is considered.

Evidence from aesthetic assessment instruments such as the Walter Reed visual assessment scale (WRVAS) and trunk appearance perception scale (TAPS) suggest that patients perceive spinal deformity holistic manner. Features such as trunk shift, waist asymmetry, and shoulder appear to correlate more strongly with patient-reported outcomes than with the anatomical apex of curvature[13,14]. This holistic perception of deformity may explain why curve location exerted minimal influence on HRQoL in our cohort.

Another central finding of this study was the absence of significant correlations between Cobb angle and domain-specific SRS-22 scores. This observation is consistent with several studies demonstrating that radiographic severity is a relatively poor predictor of psychosocial morbidity in AIS. Cheung et al.[15] reported that curve magnitude accounted for only a small proportion of variance in HRQoL scores, while Parent et al.'s[8] systematic review similarly concluded that radiographic indicators correlate only modestly with psychosocial outcomes. Berliner et al.[16] emphasized that psychosocial scores may vary widely among patients with comparable Cobb angles, highlighting the role of perceptual and contextual factors. Likewise, Hresko et al.[17] demonstrated that subjective deformity perception is a stronger determinant of body-image distress than objective radiographic severity.

Importantly, Belli et al.[11] showed that even mild scoliosis (<25°) can significantly impair self-image, and Turkish studies by Çolak et al.[18] and Çubukçu and Bilir[19] demonstrated stronger associations between perceived deformity and HRQoL than between Cobb angle and HRQoL. Taken together, these findings substantiate our conclusion that radiographic severity carries limited prognostic value for psychosocial outcomes.

Neither age nor sex demonstrated a significant relationship with HRQoL in our cohort. D'Agata et al.[20] similarly reported that emotional indicators in AIS reflect individual perception of deformity rather than chronological age. Sanders et al.[7] found that approximately one-third of AIS patients exhibit clinically significant psychological distress, primarily associated with perceived deformity rather than demographic characteristics.

These findings have several implications for clinical practice. First, radiographic parameters alone should not be used to infer psychosocial burden, as adolescents with relatively mild curves may experience substantial emotional distress, whereas others with more pronounced deformities may demonstrate adequate coping. Second, incorporating routine psychosocial screening into AIS assessment using instruments such as the SRS-22, BIDQ-S, WRVAS, or TAPS may facilitate earlier identification of vulnerable patients. Third, multidisciplinary management strategies, including psychological counseling, body-image interventions, and peer support programs, may be beneficial for patients experiencing significant emotional distress. Finally, clinical decision-making should integrate both objective radiographic risk and patient-reported outcomes, acknowledging that these domains do not always align.

Study Limitations

This study has several limitations. First, the cross-sectional design does not allow conclusions regarding causal relationships between radiographic parameters and HRQoL outcomes. Second, the sample size was moderate and derived from a single center, which may limit the generalizability of the findings. Third, AIS is a three-dimensional deformity; however, only the coronal Cobb angle was evaluated in this study, while other deformity parameters such as axial rotation, thoracic kyphosis, and trunk balance were not analyzed. Finally, most patients in our cohort were in Risser stages 4-5, indicating skeletal maturity. Therefore, the findings may not fully represent psychosocial outcomes in skeletally immature AIS patients.

CONCLUSION

In summary, psychosocial domains particularly self-image and mental health were the most adversely affected HRQoL components in adolescents with idiopathic scoliosis. Radiographic parameters such as curve magnitude and curve location, as well as demographic characteristics, demonstrated minimal impact on patient-reported outcomes. These findings highlight the critical importance of integrating psychosocial evaluation into AIS management and underscore the limited value of radiographic severity as a surrogate marker for adolescents' lived experience of scoliosis. A novel contribution of this study is its domain-specific approach, which isolates the independent effects of curve magnitude and curve location on each SRS-22 domain rather than relying on global HRQoL scores. By demonstrating that psychosocial impairment persists irrespective of radiographic characteristics, this work provides evidence that AIS care should shift toward patient-centered models prioritizing body image perception and emotional well-being.

Ethics

Ethics Committee Approval: This single-center, clinical study, patient data were prospectively evaluated after obtaining ethical committee approval from Ondokuz Mayıs University Clinical Research Ethics Committee (approval no: 2025/305, date: 11.06.2025).

Informed Consent: Written and verbal consent was obtained from all participants.

Acknowledgments

The authors gratefully acknowledge Metin Altın for his support and guidance for the statistical analysis.

Footnotes

Authorship Contributions

Surgical and Medical Practices: B.A., A.A., H.S.C., Concept: B.N.Ö.E., A.U., H.S.C., Design: B.N.Ö.E., A.U., H.S.C., Data Collection or Processing: B.N.Ö.E., B.A., A.A., H.S.C., Analysis or Interpretation: B.N.Ö.E., Literature Search: B.N.Ö.E., A.U., H.S.C., Writing: B.N.Ö.E., H.S.C.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

REFERENCES

1. Cheung KM, Senkoylu A, Alanay A, Genc Y, Lau S, Luk KD. Reliability and concurrent validity of the adapted Chinese version of scoliosis research society-22 (SRS-22) questionnaire. Spine (Phila Pa 1976). 2007;32:1141-5.
2. Asher M, Min Lai S, Burton D, Manna B. The reliability and concurrent validity of the scoliosis research society-22 patient questionnaire for idiopathic scoliosis. Spine (Phila Pa 1976). 2003;28:63-9.
3. Carreon LY, Sanders JO, Diab M, Sucato DJ, Sturm PF, Glassman SD; Spinal Deformity Study Group. The minimum clinically important difference in scoliosis research society-22 appearance, activity, and pain domains after surgical correction of adolescent idiopathic scoliosis. Spine (Phila Pa 1976). 2010;35:2079-83.
4. Torén S, Diarbakerli E. Health-related quality of life in adolescents with idiopathic scoliosis: a cross-sectional study including healthy controls. Eur Spine J. 2022;31:3512-8.
5. Tones M, Moss N, Polly DW Jr. A review of quality of life and psychosocial issues in scoliosis. Spine (Phila Pa 1976). 2006;31:3027-38.
6. Oeffinger DJ, Iwinski H, Talwalkar V, Roberto R, Dueber D, Bagley A. Examining the impact of adolescent idiopathic scoliosis on psychosocial well-being and physical function: revealing insights from patient-reported outcomes. Spine Deform. 2025;13:1851-9.
7. Sanders AE, Andras LM, Iantorno SE, Hamilton A, Choi PD, Skaggs DL. Clinically significant psychological and emotional distress in 32% of adolescent idiopathic scoliosis patients. Spine Deform. 2018;6:435-40.
8. Parent EC, Dang R, Hill D, Mahood J, Moreau M, Raso J, et al. Score distribution of the scoliosis research society-22 questionnaire in subgroups of patients of all ages with idiopathic scoliosis. Spine (Phila Pa 1976). 2010;35:568-77.
9. Auerbach JD, Lonner BS, Crerand CE, Shah SA, Flynn JM, Bastrom T, et al. Body image in patients with adolescent idiopathic scoliosis: validation of the body image disturbance questionnaire--scoliosis version. J Bone Joint Surg Am. 2014;96:e61.
10. Pezham H, Babaee T, Bagheripour B, Asgari M, Jiryaei Z, Vahab Kashani R, et al. Stress level and quality of life of adolescents with idiopathic scoliosis during brace treatment. Turk J Phys Med Rehabil. 2022;68:231-7.
11. Belli G, Toselli S, Latessa PM, Mauro M. Evaluation of self-perceived body image in adolescents with mild idiopathic scoliosis. Eur J Investig Health Psychol Educ. 2022;12:319-33.
12. Horne JP, Flannery R, Usman S. Adolescent idiopathic scoliosis: diagnosis and management. Am Fam Physician. 2014;89:193-8.
13. Bago J, Sanchez-Raya J, Perez-Grueso FJ, Climent JM. The trunk appearance perception scale (TAPS): a new tool to evaluate subjective impression of trunk deformity in patients with idiopathic scoliosis. Scoliosis. 2010;5:6.
14. Kınıklı Gİ, Bazancir Z, Beydağı MG, Bozgeyik S, Güney-Deniz H, Demirkıran HG. Body image disturbance in patients with adolescent idiopathic scoliosis: correlation with deformity perception, trunk aesthetic, and quality of life. Journal of Exercise Therapy and Rehabilitation. 2022;9:125-32.
15. Cheung KM, Cheng EY, Chan SC, Yeung KW, Luk KD. Outcome assessment of bracing in adolescent idiopathic scoliosis by the use of the SRS-22 questionnaire. Int Orthop. 2007;31:507-11.
16. Berliner JL, Verma K, Lonner BS, Penn PU, Bharucha NJ. Discriminative validity of the scoliosis research society 22 questionnaire among five curve-severity subgroups of adolescents with idiopathic scoliosis. Spine J. 2013;13:127-33.
17. Hresko MT, Talwalkar V, Schwend R; AAOS, SRS, and POSNA. Early detection of idiopathic scoliosis in adolescents. J Bone Joint Surg Am. 2016;98:e67.
18. Çolak TK, Akgül T, Çolak I, Dereli EE, Chodza M, Dikici F. Health related quality of life and perception of deformity in patients with adolescent idiopathic scoliosis. J Back Musculoskelet Rehabil. 2017;30:597-602.
19. Çubukçu D, Bilir İ. Quality of life and perception of visual deformity in adolescents with mild idiopathic scoliosis. Turk J Osteoporos. 2022;28:200-5.
20. D'Agata E, Rigo M, Pérez-Testor C, Puigví NC, Castellano-Tejedor C. Emotional indicators in young patients with idiopathic scoliosis: a study through the drawing of human figure. Scoliosis. 2014;9:24.