

# Correlation between the clinical condition of scoliosis and own body image perception among girls with adolescent idiopathic scoliosis

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## Abstract

**Introduction.** The aim of the study was to evaluate the subjective impression of trunk deformity in patients with adolescent idiopathic scoliosis and to compare the results of the Trunk Appearance Perception Scale (TAPS) with the Cobb angle, extra-school physical activity, and scoliosis occurrence in the family.

**Methods.** Overall, 26 patients with adolescent idiopathic scoliosis (mean age,  $13.5 \pm 2.3$  years; 100% women) and no prior surgical treatment were included. Each patient completed TAPS and underwent a complete radiographic study of the spine (Cobb angle). Additionally, questions were asked on participation in extracurricular physical activity (yes/no) and scoliosis in the family (parents, siblings – yes/no). A correlation analysis between all variables was performed with chi-square test and Spearman correlation coefficient.

**Results.** The average TAPS score was 3.4. The patients most often assessed their body deformity between 3 and 4. There was a statistically significant negative correlation between TAPS and the Cobb angle ( $r = -0.7$ ). Nonsignificant correlation was found between TAPS and extra-school physical activity and scoliosis occurrence in the family.

**Conclusions.** Bigger angles of spinal curvature were accompanied by lower values of subjective impression of body posture, determined by TAPS. Patients noticed the distorted posture caused by scoliosis and were aware of changes in their silhouette. We did not find the impact of participation in extra-school physical activity or the occurrence of scoliosis in the family on own body image perception.

**Key words:** body image, AIS, TAPS

## Introduction

Adolescent idiopathic scoliosis (AIS) is one of the most common deformities of the spine in adolescents (1–3% of children aged 10–16 years) [1, 2]. In most cases, its course is mild, however in 10% of people the scope of scoliosis exceeds  $30^\circ$ . Trunk deformity and compensatory changes in the neighbouring structures of the musculoskeletal system make idiopathic scoliosis (IS) a 3-dimensional deformity of the spine with secondary changes in the chest, pelvis, and internal organs [3].

In the recent years, the approach to treating AIS has changed. In the evaluation of the results of therapeutic intervention, regardless of its type (conservative treatment or surgical treatment), examining the impact of trunk deformity on the perception of body image has become a necessary element. Increased deformity and aesthetic appearance related to it are currently among the most important clinical considerations when treatment is suggested. In addition to preventing severe spinal scoliosis, patients' satisfaction from cosmetic treatment, arising from improved image and perception of own body image, is one of the main objectives of treating scoliosis [4].

With advances in the study of health-related quality of life (HRQoL), greater attention has been given to the quality of life (QoL) of patients with AIS and their perception of deformity instead of just focusing on improving the rate of surgical correction [5].

It has been confirmed that scoliosis in adolescence constitutes a risk factor of psychosocial problems. The problem

of poor body image is almost always found in studies on adolescent scoliosis [6–8].

New treatment objectives resulted in the occurrence of new instruments to evaluate the results of treatment (indicator measures). Despite being the most measurable predictor of scoliosis progress in adolescence, the Cobb angle is an insufficient indicator of the effectiveness of therapy, in particular under conditions of rehabilitation (physiotherapy) being conducted and the significance of cosmetic results [9].

Some attempts to evaluate and monitor aesthetics have already been made. It was indicated that instruments (questionnaires, scales) to evaluate the perception of spinal deformity in patients (or parents) had good psychometric properties and that image scales correlated better with the radiological value of scoliosis than text scales [10]. Applying instruments to evaluate the perception of body aesthetics by patients during scoliosis therapy constitutes an important element of psychological assessment.

A person's image determined by the external appearance significantly affects self-esteem developed in early childhood. Disapproval of and lack of satisfaction with your own appearance cause negative emotions and can be a source of psychosocial problems: low self-esteem, lack of self-confidence, difficulties in establishing contact, depressive tendencies, or even social phobia [7]. A protective factor for one's body image is self-esteem, resulting from the acceptance of one's body and believing in own attractiveness [11].

The objective of this article was to evaluate the associa-

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tion between the perception of body image among patients with AIS (perception of trunk deformity) (TAPS, Trunk Appearance Perception Scale) and the parameters of scoliosis deformity (the Cobb angle), participation in extracurricular physical activity, and the occurrence of scoliosis in the family.

### Subjects and methods

A prospective cross-sectional study was performed. All the participants received detailed information on the aim of the study and were assured of its anonymity.

#### Selection criteria and sample size

The inclusion criteria were IS diagnosed on the basis of an X-ray, age 10–17 years, conservative treatment in progress (physiotherapeutic scoliosis-specific exercises or Cheneau brace combined with physiotherapeutic scoliosis-specific exercises), and the patient’s consent to participate in the study. The conservative treatment for IS was based on the International Scientific Society on Scoliosis Orthopaedic and Rehabilitation Treatment (SOSORT) guidelines [12]. Patients who had formerly received surgical treatment for scoliosis were excluded.

The analysis was performed in a group of 26 females with AIS treated conservatively. Single-curve thoracolumbar scoliosis was diagnosed in 4 patients, whereas double-curve scoliosis (right thoracic and left lumbar) in 22. Eight patients received specific physiotherapy, whilst 18 females were treated with both Cheneau brace and specific physiotherapy. The

patients were asked about their participation in extracurricular physical activity (yes/no) and the occurrence of scoliosis in the family (parents, siblings – yes/no) (Table 1). The patient’s parents verified and confirmed the information about scoliosis in the family. All patients completed TAPS. Questionnaires were administered as paper-based forms and were completed by the patients themselves, without any assistance of the attending physician or of the patients’ parents.

#### Measurement instruments

TAPS is a scale that evaluates the degree of trunk deformity and includes 3 sets of figures that depict the trunk from 3 viewpoints: a back view (set 1), a view of the patient bending forward seen from the front (Adam’s test) (set 2), and a frontal view (set 3). This last view has two sets of drawings, one for males and one for females (Figure 1). Each drawing is scored from 1 (greatest deformity) to 5 (smallest deformity) and the mean score is obtained by adding the scores for the 3 drawings and dividing the total by 3 [10].

#### Statistical analysis

The results underwent statistical analysis with the Statistica 10 software. Descriptive statistics were used: means and standard deviations. Associations between the evaluation of own body image perception (TAPS) and the radiological measures of the trunk deformity degree (the Cobb angle) were determined with Spearman correlation.

The nonparametric chi-square test was used to compare the average TAPS results in girls who participated in additional activity outside school and those who did not, as well as to compare the average results of girls with the history of scoliosis in their closest family with those without such history. Statistical significance was established at  $p = 0.05$ .

#### Ethical approval

The research related to human use has been complied with all the relevant national regulations and institutional policies, has followed the tenets of the Declaration of Helsinki, and has been approved by the Ethics Committee at the University School of Physical Education in Wrocław (number of the permission: 35/2016).

#### Informed consent

Informed consent has been obtained from all individuals included in this study.

Table 1. Clinical and radiological characteristics of patients (n = 26)

	Mean ± SD	Range (min.–max.)
Age (years)	13.5 ± 2.3	10–16.5
Height (cm)	156.9 ± 11.7	134–170.5
Body mass (kg)	47 ± 7.5	33–60
Cobb angle (°)	27.3 ± 11	10–58
Gender	100% female	
Extracurricular physical activity	57.7% yes	42.3% no
Scoliosis in the family	30.8% yes	69.2% no

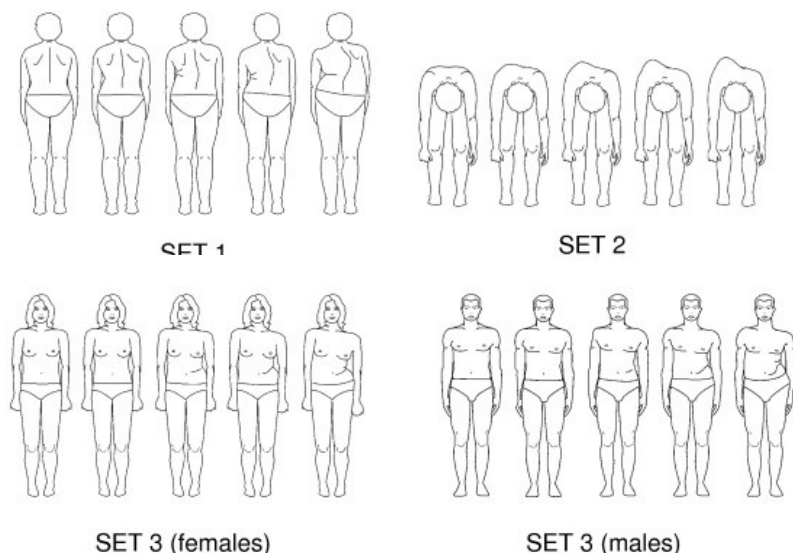


Figure 1. The Trunk Appearance Perception Scale (TAPS) [10]

## Results

The average TAPS score was 3.4. The results show that patients most often assessed their body deformity between 3 and 4. Table 2 presents the distribution of the TAPS results.

There was a statistically significant negative correlation between TAPS and the Cobb angle in the study group ( $r = -0.7$ ). Lower values of TAPS (denoting larger deformations) usually corresponded to bigger Cobb angles.

The correlation between the scores of the TAPS questionnaire and the Cobb angle is shown in Figure 2.

A nonsignificant correlation was found between TAPS and extra-school physical activity and scoliosis occurrence in the family. Only one of the 3 viewpoints of the trunk – set 1, looking towards the back – correlated significantly with extra-school physical activity (Table 3).

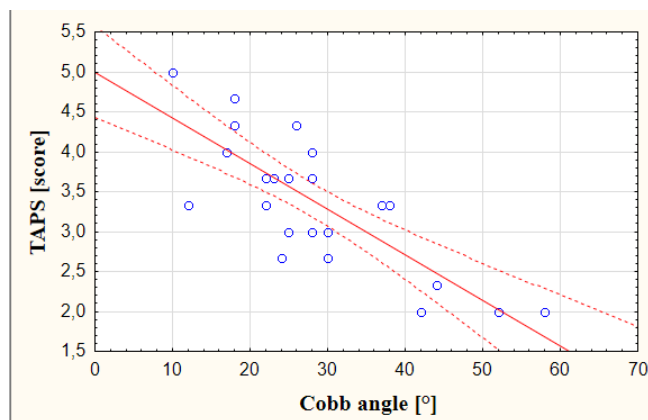


Figure 2. Graphical representation of the correlation between the Cobb angle and TAPS score

## Discussion

The issue of QoL in patients with AIS is being discussed with increased frequency by physicians, physiotherapists, and other specialists, including psychologists. The analysis of treatment objectives is presented by the SOSORT 2016 consensus, which underlines the significance of the patients' QoL, sense of aesthetics, and psychological support for the success of treating scoliosis [12].

Treatment, either conservative or surgical, does not always bring the expected cosmetic result. Wearing braces, e.g. spinal fusion and Harrington instrumentation, improves physical parameters, e.g. reduces the rib hump; however, it does not necessarily affect aesthetics or give the desired cosmetic result [13]. The applied modifications in braces bring satisfaction with the aesthetic appearance of the back only in some AIS patients. Vasiliadis et al. [14], conducting their studies in Boston, indicated that the modified buckle may improve the aesthetic appearance of the back in AIS patients, but it is more effective in the case of double and chest curves.

Self-image is the most difficult domain of spinal deformity to measure, especially because people's perspectives may change over the course of their lives. This parameter is therefore not easy to assess, although self-image itself is one of the most important characteristics related to spinal deformity. The measurement of self-image is a constantly evolving process, contingent upon a person's level of maturity and their sociocultural environment [15].

In the present study, the authors aimed not only to evaluate the subjective perception of the trunk deformity with TAPS questionnaire, but also to compare the correlation between the subjects' own body image perception and the parameters of deformity, extracurricular physical activity, and scoliosis occurrence in the family. When correlating the dependency

Table 2. The Trunk Appearance Perception Scale – score distribution

	Mean ± SD	Median	Lower quartile	Upper quartile
Set 1	3.3 ± 0.9	3	3.00	4.00
Set 2	3.7 ± 1	4	3.00	4.00
Set 3	3.2 ± 0.9	3	3.00	4.00
Total score	3.4 ± 0.8	3.3	3.00	4.00

Table 3. Association between the perception of own body image (TAPS) and participation in extracurricular physical activity and scoliosis occurrence in the family

	TAPS	No, median	Yes, median	Chi-square test
Scoliosis in the family		$n = 18$	$n = 8$	
	Set 1	3	3.5	$p = 0.70$
	Set 2	4	4	$p = 0.55$
	Set 3	3	3	$p = 0.32$
	Total score	3.3	3.3	$p = 0.46$
Physical activity		$n = 11$	$n = 15$	
	Set 1	3	4	$p = 0.01^*$
	Set 2	3	4	$p = 0.38$
	Set 3	3	3	$p = 0.10$
	Total score	3	3.7	$p = 0.31$

\*  $p < 0.05$

between body image perception as expressed in TAPS and the Cobb angle in the conducted study, a statistically significant negative correlation (with a high strength,  $r = -0.7$ ) was observed. Lower TAPS values (which correspond to larger deformities) were usually accompanied by higher values of the Cobb angle. In the obtained results, the average TAPS score shows that patients most often assessed their trunk deformity between 3 and 4. Similar results were achieved by Bago et al. [10]. Their study involved 186 patients with diagnosed IS who were treated conservatively with a brace; some of them had been subject to surgical treatment earlier. The average TAPS score equalled 3.6, which shows that patients also assessed their trunk deformity between 3 and 4. In those studies, TAPS also correlated well with the curve angle ( $r_s = -0.55$ ). Another group of researchers, Rigo and D'Agata [16], conducted similar studies of dependencies between the objective and subjective evaluation of deformity. It was confirmed that TAPS presented a good correlation with the scope of scoliosis ( $r_s = -0.55$ ). Comparable results were observed by Matamalas et al. [17], with the average TAPS score of 3.2. On the basis of the TAPS questionnaire results analysis, it can be stated that people with scoliosis selected a figure with the deformity of the spine between 3 and 4 more often, which may indicate that patients notice their deformity, perceive changes in their body image, and are aware of changes in their silhouette. The results of the authors' own study proved no significant dependencies between body image perception and participation in extracurricular physical activity or its lack, and history of scoliosis in the family or its lack. Leszczewska et al. [18] only observed that physical activity was a factor reducing stress in patients with IS (on the basis of the BSSQ-Brace questionnaire results) [18].

Own body perception is significant as appearance is a considerable source of satisfaction. It is commonly known that the perception of one's body image in the case of trunk deformity due to scoliosis causes negative emotions, the belief that one is different, leading to low self-esteem and shame [8]. Improving aesthetics is one of the most important objectives in treating scoliosis, regardless of whether it is conservative or surgical treatment. Koch et al. [19] observed that 73% of AIS patients subjected to surgical treatment were satisfied with the aesthetic result in the form of a significant improvement of body appearance. Perception of own body image may vary significantly among both children and parents. Rigo et al. [20] reported a discrepancy between TAPS results in patients and their parents.

In sum, the aesthetic sequelae have been considered a critical factor for patients with IS. Patients and their families are often very concerned about the effect on the patient's image of the hump; this anxiety about aesthetics is also notably related to self-esteem. The low level of satisfaction with life and the declining self-esteem often associated with physical disorders can have a serious emotional and psychological impact, which leads to deterioration in physical condition and self-perceived QoL [15, 21].

## Limitations

Limitations in the interpretation of the obtained results of the study can be related to the small sample size. The analysis of the collected data leads to a conclusion that there is a need for further research involving male sex.

## Conclusions

The study indicated that patients with AIS with a bigger angle of spinal curvature presented lower values of the subjective impression of body posture, expressed by TAPS score. The studied girls noticed the distorted posture caused by scoliosis and were aware of changes in their silhouette. We did not find any impact of participation in extra-school physical activity or scoliosis occurrence in the family on the subjects' perception of own body image. The conclusions should be confirmed in larger material and with the use of more advanced methodology.

## Disclosure statement

No author has any financial interest or received any financial benefit from this research.

## Conflict of interest

The authors state no conflict of interest.

## References

1. Hawasli AH, Hullar TE, Dorward IG. Idiopathic scoliosis and the vestibular system. *Eur Spine J.* 2015;24(2):227–233; doi: 10.1007/s00586-014-3701-4.
2. Choudhry MN, Ahmad Z, Verma R. Adolescent idiopathic scoliosis. *Open Orthop J.* 2016;10:143–154; doi: 10.2174/1874325001610010143.
3. Negrini S, Aulisa AG, Aulisa L, Circo AB, de Mauroy JC, Durmala J, et al. 2011 SOSORT guidelines: orthopaedic and rehabilitation treatment of idiopathic scoliosis during growth. *Scoliosis.* 2012;7(1):3; doi: 10.1186/1748-7161-7-3.
4. Zaina F, Negrini S, Fusco C, Atanasio S. How to improve aesthetics in patients with adolescent idiopathic scoliosis (AIS): a SPoRT brace treatment according to SOSORT management criteria. *Scoliosis.* 2009;4:18; doi: 10.1186/1748-7161-4-18.
5. Han J, Xu Q, Yang Y, Yao Z, Zhang C. Evaluation of quality of life and risk factors affecting quality of life in adolescent idiopathic scoliosis. *Intractable Rare Dis Res.* 2015;4(1):12–16; doi: 10.5582/iridr.2014.01032.
6. Tones M, Moss N, Polly DW Jr. A review of quality of life and psychosocial issues in scoliosis. *Spine.* 2006;31(26):3027–3038; doi: 10.1097/01.brs.0000249555.87601.fc.
7. Saccomani L, Vercellino F, Rizzo P, Becchetti S. Adolescents with scoliosis: psychological and psychopathological aspects [in Italian]. *Minerva Pediatr.* 1998;50(1–2):9–14.
8. Reichel D, Schanz J. Developmental psychological aspects of scoliosis treatment. *Pediatr Rehabil.* 2003;6(3–4):221–225; doi: 10.1080/13638490310001644593.
9. Hawes MC, O'Brien JP. A century of spine surgery: what can patients expect? *Disabil Rehabil.* 2008;30(10):808–817; doi: 10.1080/09638280801889972.
10. 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; doi: 10.1186/1748-7161-5-6.
11. Monticone M, Ambrosini E, Cazzaniga D, Rocca B, Ferrante S. Active self-correction and task-oriented exercises reduce spinal deformity and improve quality of life in subjects with mild adolescent idiopathic scoliosis. Results of a randomised controlled trial. *Eur Spine J.* 2014;23(6):1204–1214; doi: 10.1007/s00586-014-3241-y.



12. Negrini S, Donzelli S, Aulisa AG, Czaprowski D, Schreiber S, de Mauroy JC, et al. 2016 SOSORT guidelines: orthopaedic and rehabilitation treatment of idiopathic scoliosis during growth. *Scoliosis Spinal Disord.* 2018;13:3; doi: 10.1186/s13013-017-0145-8.
13. Danielsson AJ, Wiklund I, Pehrsson K, Nachemson AL. Health-related quality of life in patients with adolescent idiopathic scoliosis: a matched follow-up at least 20 years after treatment with brace or surgery. *Eur Spine J.* 2001; 10(4):278–288; doi: 10.1007/s005860100309 .
14. Vasiliadis E, Grivas TB, Savvidou O, Triantafyllopoulos G. The influence of brace on quality of life of adolescents with idiopathic scoliosis. *Stud Health Technol Inform.* 2006; 123:352–356.
15. Carrasco MIB, Ruiz MCS. Perceived self-image in adolescent idiopathic scoliosis: an integrative review of the literature. *Rev Esc Enferm USP.* 2014;48(4):748–757; doi: 10.1590/S0080-623420140000400024.
16. Rigo M, D'Agata E. Comparison between subjective perception of trunk deformity (TAPS) and objective assessment of back asymmetry (surface topography). *Scoliosis.* 2013;8(Suppl. 1):O9; doi: 10.1186/1748-7161-8-S1-O9.
17. Matamalas A, Bagó J, D'Agata E, Pellisé F. Body image in idiopathic scoliosis: a comparison study of psychometric properties between four patient-reported outcome instruments. *Health Qual Life Outcomes.* 2014;12(1):81; doi: 10.1186/1477-7525-12-81.
18. Leszczewska J, Czaprowski D, Pawłowska P, Kolwicz A, Kotwicki T. Evaluation of the stress level of children with idiopathic scoliosis in relation to the method of treatment and parameters of the deformity. *Sci World J.* 2012;2012: 538409. doi: 10.1100/2012/538409. Available from: <https://www.hindawi.com/journals/tswj/2012/538409/abs/>.
19. Koch KD, Buchanan R, Birch JG, Morton AA, Gatchel RJ, Browne RH. Adolescents undergoing surgery for idiopathic scoliosis: how physical and psychological characteristics relate to patient satisfaction with the cosmetic result. *Spine.* 2001;26(19):2119–2124.
20. Rigo M, D'Agata E, Jelacic M. Trunk appearance perception scale (TAPS) discrepancy between adolescents with idiopathic scoliosis and their parents influences HRQL. *Scoliosis.* 2013;8(Suppl 1):O55; doi: 10.1186/1748-7161-8-S1-O55.
21. Zhang J, He D, Gao J, Yu X, Sun H, Chen Z, et al. Changes in life satisfaction and self-esteem in patients with adolescent idiopathic scoliosis with and without surgical intervention. *Spine.* 2011;36(9):741–745; doi: 10.1097/BRS.0b013e3181e0f034.