Research

Psikiyatride Güncel Yaklaşımlar-Current Approaches in Psychiatry 2026; 18(Suppl 1):562-575

doi: 10.18863/pgy.2006213

Mediating Role of Body Image Psychological Inflexibility in the Relationship Between Self-Esteem and Idiopathic Scoliosis-Related Body Image

Benlik Saygısı ile İdiyopatik Skolyoza İlişkili Beden İmgesi Arasındaki İlişkide Beden İmgesi Psikolojik Katılığının Aracı Rolü

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ABSTRACT

Objective: This study aimed to examine the mediating role of body image psychological inflexibility in the relationship between self-esteem and scoliosis-related body image.

Method: This cross-sectional study included 150 individuals (120 females, 30 males) aged 11–37 years with a diagnosis of idiopathic scoliosis. Participants completed the Sociodemographic and Medical Information Form, Rosenberg Self-Esteem Scale, Body Image Disturbance Questionnaire–Scoliosis, and Body Image Psychological Inflexibility Scale.

Results: Self-esteem was negatively associated with body image dissatisfaction and body image psychological inflexibility, whereas body image psychological inflexibility was positively associated with the personal and social dimensions of body image. After controlling for the covariates, the indirect effect through body image psychological inflexibility was significant for both the personal and social dimensions. The models explained 37.2% of the variance in the personal dimension and 43.0% of the variance in the social dimension.

Conclusion: Body image psychological inflexibility may represent an important mediating process between self-esteem and scoliosis-related body image.

Keywords: Idiopathic scoliosis, body image, self-esteem, body image psychological inflexibility

ÖZ

Amaç: Bu çalışmada, beden imgesi psikolojik katılığının benlik saygısı ile skolyoza ilişkin beden imgesi arasındaki aracı rolünün incelenmesi amaçlanmıştır.

Yöntem: Kesitsel tasarlanan çalışmaya, idiyopatik skolyoz tanısı almış 11–37 yaşları arasındaki 150 birey (120 kadın, 30 erkek) dahil edilmiştir. Katılımcılara Sosyodemografik ve Tıbbi Bilgi Formu, Rosenberg Benlik Saygısı Ölçeği, Skolyoza İlişkin Beden İmgesi Ölçeği ve Beden İmgesi Psikolojik Katılığı Ölçeği uygulanmıştır.

Bulgular: Benlik saygısı, beden imgesi memnuniyetsizliği ve beden imgesi psikolojik katılığı ile negatif; beden imgesi psikolojik katılığı ise beden imgesinin kişisel ve sosyal boyutlarıyla pozitif ilişkili bulunmuştur. Kovaryatlar incelendiğinde beden imgesi psikolojik katılığı üzerinden gerçekleşen dolaylı etkinin beden imgesinin kişisel ve sosyal boyutları için anlamlı olduğu görülmüştür. Kurulan modeller, beden imgesinin kişisel boyutundaki varyansın %37,2'sini, sosyal boyutundaki varyansın ise %43,0'ını açıklamıştır.

Sonuç: Bulgular, beden imgesi psikolojik katılığı, benlik saygısı ile skolyoza ilişkin beden imgesi arasında önemli bir aracı süreç olabileceğini işaret etmektedir.

Anahtar sözcükler: İdiyopatik skolyoz, beden imgesi, benlik saygısı, beden imgesi psikolojik katılığı

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Received: 29.07.2026 | **Accepted:** 15.10.2026

Introduction

Scoliosis is a condition that can lead not only to spinal curvature but also to changes in the appearance of the rib cage and trunk (Grivas et al. 2008). On radiographic examination, a lateral curvature of 10° or more in the coronal plane is considered scoliosis (Lonstein 1994). These curvatures are often accompanied by vertebral rotation and other alterations in the normal structure of the spine (Weinstein et al. 2008). Idiopathic scoliosis, the most common form of structural scoliosis and one for which the etiology remains unknown, accounts for approximately 75–80% of cases (Lenke et al. 2001). Diagnosis is based on clinical assessment and radiographic imaging, and curve severity is quantified using the Cobb method. The Cobb angle is measured on a radiograph by identifying the upper and lower end vertebrae of the curve and the apex, drawing lines parallel to the endplates of the end vertebrae, and measuring the angle formed by the perpendiculars to these lines (Greiner 2002). The Cobb angle is a key clinical measure used to determine curve severity, monitor progression, and inform treatment planning. Treatment approaches include regular observation, scoliosis-specific exercises, bracing, and surgical intervention for curves exceeding approximately 45° (Negrini et al. 2012, Kaelin 2020).

Idiopathic scoliosis commonly emerges during adolescence and may negatively affect body image because of the visible trunk asymmetries it can cause (Goldberg et al. 1994). Trunk asymmetry and treatment modalities such as bracing may increase the discrepancy between perceived physical characteristics and internalized appearance ideals, contributing to body image dissatisfaction and psychosocial difficulties. Self-esteem, which reflects an individual's affective evaluation of the self, is strongly related to body image, and both body dissatisfaction and low self-esteem may adversely affect psychological well-being in adolescents with scoliosis (Kuzu et al. 2017, Özcan Erişgin et al. 2026). Furthermore, when body image psychological inflexibility is high, adolescents may be more likely to avoid social situations or withdraw from personally meaningful activities due to negative appearance-related evaluations (Rogers et al. 2018, Brichacek et al. 2024).

Body image is a multidimensional construct encompassing thoughts, emotions, beliefs, and behaviors related to one's perceptions of and attitudes toward the body (Cash and Pruzinsky 1990). Whereas the perceptual dimension of body image refers to the mental representation of the body, the attitudinal dimension concerns the degree of satisfaction with one's body (Slade 1994, Thompson and Van den Berg 2002).

Body image dissatisfaction arises from a discrepancy between perceived physical characteristics and internalized appearance ideals (Fallon and Rozin 1985, Cash and Szymanski 1995). In individuals with scoliosis, body image may also be related to disease-specific factors such as treatment modality (surgery, physical therapy, or bracing), duration of brace use, and Cobb angle as an indicator of curve severity (Danielsson et al. 2012). In a study of individuals aged 10–19 years with idiopathic scoliosis, greater curve severity among those with Cobb angles above 45° was associated with higher overall body dissatisfaction and lower life satisfaction (Bauer 2021).

Body image dissatisfaction in this population has also been associated with poorer quality of life and may make treatment adherence more difficult (Tones et al. 2006, Auerbach et al. 2014). Studies have particularly identified bracing as an important factor that may adversely affect body image because of the visible differences it can create in appearance (Danielsson et al. 2012). Nevertheless, most studies examining scoliosis and body image dissatisfaction have focused primarily on medical characteristics of the condition, whereas research addressing the psychosocial determinants and consequences of body image remains limited (Tones et al. 2006, Bertuccelli et al. 2023).

Self-esteem is another important psychological factor associated with body image dissatisfaction. It can be defined as an affective evaluation that encompasses individuals' judgments about themselves and attitudes toward their own behavior (Dwyer et al. 2013). The relationship between self-esteem and body image has been studied for decades, alongside associations of self-esteem with anxiety, depression, anger, hostility, social anxiety, shame, guilt, and loneliness. The literature demonstrates robust associations between self-esteem and body image, although the direction of these associations varies

across studies (Tiggemann and Stevens 1999, Webster and Tiggemann 2003, Tiggemann 2005, Masheb et al. 2006, Paxton et al. 2006, Özmen et al. 2007, Buhlmann et al. 2009). Although there is no consensus regarding directionality, some studies indicate that individuals who are more satisfied with their bodies also report higher self-esteem (Rosen and Ross 1968, Silberstein et al. 1988, Allgood-Merten and Stockard 1991). Similarly, in idiopathic scoliosis, low self-esteem has been identified as a factor associated with poorer psychological well-being, treatment adherence, and treatment outcomes (Lindeman and Behm 1999). However, the psychological processes through which self-esteem is related to body image remain insufficiently understood.

In recent years, body image flexibility, a body-specific manifestation of psychological flexibility developed particularly within the framework of Acceptance and Commitment Therapy (ACT), has received increasing attention. Body image flexibility refers to the capacity to experience body-related thoughts and emotions without attempting to change, suppress, or avoid them while continuing to act in accordance with personal values (Sandoz et al. 2013). In this sense, body image flexibility may function as a protective factor that supports psychological adjustment in the face of appearance-related threats or negative evaluations, such as thoughts of "I look terrible in my brace" in a person with scoliosis who uses a brace (Sandoz et al. 2013, Webb et al. 2014). When body image flexibility is low—that is, when body image psychological inflexibility is high—individuals may respond to such thoughts and emotions by avoiding social situations, discontinuing brace use, or withdrawing from personally meaningful activities. By contrast, individuals with greater body image flexibility may notice and accept similar thoughts and emotions while continuing to behave in line with their personal values (Webb 2015).

Compared with healthy individuals, people with idiopathic scoliosis have been reported to experience higher levels of negative body image, low self-esteem, self-criticism, anxiety, and depressive symptoms (Talić et al. 2016). Scoliosis that emerges during adolescence may be particularly relevant to body satisfaction because of the visible changes it can produce in appearance. Body image dissatisfaction is therefore considered a common psychosocial concern in scoliosis (Fällström et al. 1986). At the same time, the fact that not every individual with scoliosis experiences body image dissatisfaction suggests that psychological processes, in addition to spinal deformity itself, may contribute to this experience. Existing research has focused predominantly on medical characteristics of scoliosis, and studies examining self-esteem and body image flexibility together as psychological factors involved in this process remain limited.

The variables in the research model were ordered within a hierarchical framework extending from general psychological resources to mediating processes and disease-specific outcomes. Self-esteem, as a general evaluation of the self, was positioned as a basic vulnerability or protective factor that may shape psychological adjustment. According to cognitive-behavioral theories and third-wave cognitive-behavioral approaches such as ACT, individuals with lower general self-esteem may be more prone to cognitive fusion with negative body-related evaluations and experiential avoidance (body image psychological inflexibility) when they encounter such evaluations (Timko et al. 2014, Acar 2022). Body image psychological inflexibility, as a mediating mechanism, may in turn make it more difficult for individuals to accept negative experiences related to scoliosis deformity and may be associated with poorer scoliosis-related body image across its personal and social dimensions (Kuzu 2018). Although prospective studies have reported bidirectional relationships between body dissatisfaction and self-esteem (Tiggemann 2005, Paxton et al. 2006), the ordering of variables in the present study was based on Cash's cognitive-behavioral model of body image and its later conceptual framework (Cash 2002, Cash and Smolak 2011). In this model, body image perceptions and attitudes are considered in relation to broader developmental influences such as cultural and interpersonal experiences, physical characteristics, and individual characteristics, together with body-related cognitive processing, internal dialogue, and self-regulatory processes. Although the model does not define self-esteem as a separate variable, it proposes that individual risk and resilience characteristics may contribute to the formation of body image evaluations. Within this framework, self-esteem was conceptualized as a relatively higher-level individual characteristic representing a more general evaluation of the self, whereas body image psychological inflexibility was conceptualized as a more proximal cognitive and self-regulatory process reflecting how individuals relate to negative body-related thoughts and emotions.

Accordingly, the primary aim of this study was to examine the mediating role of body image psychological inflexibility in the relationship between self-esteem and the personal and social subscales of scoliosis-related body image in individuals diagnosed with idiopathic scoliosis. The empirical and theoretical rationale for analyzing the personal and social subscales as distinct outcome variables is based on the Turkish adaptation and validation study of the measure (Kuzu et al. 2020). Kuzu et al. (2020) confirmed that, in a Turkish scoliosis population, the measure showed a two-factor structure that provided an empirically better fit than a one-factor model. In line with this two-dimensional structure identified in the Turkish adaptation study, the two subscales were modeled as separate outcomes in order to examine the specific mediating role of self-esteem and body image psychological inflexibility in relation to both individuals' internal body perceptions and their external/social concerns. Thus, by testing the mediating role of body image psychological inflexibility in the relationship between a general self-related resource, self-esteem, and the scoliosis-specific personal and social dimensions of body image within an integrated theoretical framework, this study extends the traditionally medical focus of the literature by incorporating a psychosocial and self-regulatory mechanism. Based on this theoretical framework and the empirical aims of the study, the primary hypothesis was that body image psychological inflexibility would have a mediating role in the relationship between self-esteem and both the personal and social subscales of scoliosis-related body image.

Method

The study was conducted in accordance with the Declaration of Helsinki and received ethical approval from the Acıbadem Mehmet Ali Aydınlar University Medical Research Evaluation Board (ATADEK; Meeting Date: September 22, 2023; Decision No. 2023-14/510).

Sample

The study sample consisted of individuals with idiopathic scoliosis who were receiving treatment in the spine unit and agreed to participate in the study. A total of 169 individuals participated in the data collection process. Inclusion criteria were a diagnosis of idiopathic scoliosis, a Cobb angle of at least 10°, age between 11 and 40 years, and voluntary agreement to participate. Exclusion criteria were an additional diagnosis of kyphosis or another orthopedic condition that could cause a marked visible deformity, a diagnosis of an eating disorder or body dysmorphic disorder predating the scoliosis diagnosis, and a history of scoliosis surgery.

Two participants who left more than 10% of the scale items unanswered were excluded from the dataset. Initial screening showed that seven participants were outside the predefined age range of 11–40 years, two did not provide appropriate responses to the control questions, and two had a history of scoliosis surgery; these participants were excluded from the analyses. Thus, after applying the exclusion criteria, data from 156 participants were included in pre-analysis screening. Data suitability was evaluated according to the criteria proposed by Tabachnick and Fidell (2013). In the univariate outlier analysis, five participants with extreme values ($|z| \geq 3.29$) on multiple variables were removed. Multivariate outliers were assessed using Mahalanobis distances based on scale and subscale total scores; one additional participant exceeding the chi-square critical value was also excluded. The final analyses were therefore conducted with 150 participants (120 females, 30 males). In addition, for the age-related sensitivity analysis, the 18 participants older than 18 years were removed from the same final dataset (N = 150), yielding a subsample of 132 participants aged 11–18 years, and the mediation analyses were repeated in this group.

The final sample comprised 150 participants aged 11–37 years (N = 150, M = 15.86, SD = 4.69). Of the participants, 80.0% identified as female (n = 120) and 20.0% as male (n = 30). When grouped by developmental stage, 45.3% (n = 68) were in early adolescence, 42.7% (n = 64) were in middle adolescence, and 12.0% (n = 18) were older than 18 years. Thus, most of the sample consisted of participants in adolescence. Although idiopathic scoliosis most commonly emerges during adolescence, difficulties related to body appearance and body image may continue into young adulthood; therefore, the predefined inclusion age range was 11–40 years. This broader range was intended to assess the psychosocial

manifestations of scoliosis-related body image not only during adolescence but also in young adulthood. Participants' demographic and clinical characteristics are presented in Table 1.

Table 1. Demographic and clinical characteristics of participants

Variable	Category	n	%
Sex	Female	120	80.0
	Male	30	20.0
Age group	11–14.9	68	45.3
	15–18	64	42.7
	>18 years	18	12.0
Brace use	Yes	75	50.0
	No	75	50.0
Physical therapy	Yes	101	67.3
	No	49	32.7
Cobb angle	<40°	126	84.0
	≥40°	24	16.0

Procedure

Data were collected via convenience sampling from individuals receiving follow-up care or treatment for idiopathic scoliosis at the Spine Health Center of Acibadem Maslak Hospital during the study period. Data collection was conducted face to face by a single researcher during outpatient visits, using either a tablet or paper-and-pencil forms. After written and verbal informed consent had been obtained from all participants (from parents/guardians for individuals younger than 18 years), sociodemographic and treatment-related information was obtained from participant self-report. Clinical information, including the diagnosis of idiopathic scoliosis and Cobb angle, was verified against the hospital's electronic medical records with the assistance of authorized unit staff and with participants' knowledge. In the limited number of cases in which the current Cobb angle was not clearly documented in the records, radiographic images were evaluated with the assistance of the treating physician or physician assistants to determine the Cobb angle. This procedure allowed the clinical variables to be verified against available medical records and radiographic data rather than relying solely on self-report. No names, surnames, or other information that could directly identify participants were recorded in the research dataset, and the data were analyzed anonymously.

Measures

All measures were administered face to face. Before data collection, participants were informed in writing and verbally about the purpose and duration of the study, voluntary participation, and confidentiality. The informed consent forms provided information about the researchers, the content and purpose of the study, and the estimated time required to complete the questionnaires. Participation was explicitly voluntary, and participants were informed that they could withdraw consent at any time. No directly identifying information was collected.

Separate consent materials were used for adults and adolescents. Written informed consent was obtained from the parents or legal guardians of participants younger than 18 years, and the study was explained to adolescents in developmentally appropriate language so that their voluntary assent could also be obtained. For participants aged 11–15 years, questionnaire completion took place under the researcher's supervision. No difficulties requiring additional assistance were observed in understanding or completing the measures.

Data were collected using a Sociodemographic and Medical Information Form developed by the researchers, the Body Image Disturbance Questionnaire–Scoliosis, the Rosenberg Self-Esteem Scale, and the Body Image Psychological Inflexibility Scale.

Sociodemographic and Medical Information Form

This researcher-developed form assessed basic demographic characteristics, including age, sex, and marital status, as well as scoliosis-related information such as brace use and duration, Cobb angle, and whether the participant had received physical therapy.

Body Image Disturbance Questionnaire–Scoliosis

The Body Image Disturbance Questionnaire developed by Cash et al. (2002) was adapted for individuals with scoliosis by Auerbach et al. (2014). The Turkish validity and reliability study was conducted by Kuzu et al. (2020). The seven-item measure has a two-factor structure. The first factor consists of four items and primarily reflects the social dimension of body image dissatisfaction, including concerns involving family and peers; the second factor consists of three items and reflects personal concerns about body satisfaction. Higher scores indicate greater body image disturbance and psychosocial impairment. The measure has also been used in adolescent samples (Kuzu 2018). In the present study, Cronbach's alpha was .85 for the personal subscale and .76 for the social subscale.

Rosenberg Self-Esteem Scale

The Rosenberg Self-Esteem Scale was developed by Rosenberg (1965) and adapted into Turkish by Çuhadaroğlu (1986). It is a 10-item Likert-type measure with a single-factor structure. A total score is calculated by summing all 10 items, with higher scores indicating higher self-esteem. The scale has been used in adolescent samples and has demonstrated adequate validity and reliability in this age group (Özbey and Gültekin 2021, Albayrak et al. 2023). In the present study, Cronbach's alpha was .87.

Body Image Psychological Inflexibility Scale

The Body Image Psychological Inflexibility Scale was developed by Callaghan et al. (2015) and adapted into Turkish by Kara and Ekşi (2021). The 14-item Likert-type scale assesses psychological inflexibility related to body image problems and has a single-factor structure; higher scores indicate greater body image psychological inflexibility. Although the Turkish adaptation was conducted in an adult sample, the scale has also been used internationally with adolescents. For example, Carrot et al. (2019) used the Body Image Psychological Inflexibility Scale in adolescents and young people aged 13–19 years with anorexia nervosa. In addition, Brichacek et al. (2023) collected data from 724 high school and university students aged 11–30 years while developing a measure of body image flexibility and inflexibility and reported measurement invariance across age groups. Although this latter study examined a distinct instrument, it provides supporting evidence that body image-specific flexibility and inflexibility can be assessed across a broad youth age range. In the present study, Cronbach's alpha for the Body Image Psychological Inflexibility Scale was .94.

Statistical Analysis

IBM SPSS Statistics version 26.0 was used to calculate Pearson correlation coefficients among the study variables. Two separate mediation analyses were conducted using Hayes' (2018) PROCESS Macro Model 4 to examine the indirect effect of body image psychological inflexibility in the relationship between self-esteem and scoliosis-related body image. The personal and social subscales of scoliosis-related body image were entered as separate outcome variables. Age, sex, Cobb angle, brace use, and physical therapy status were included as covariates in all mediation models.

Indirect effects were evaluated using 95% percentile bootstrap confidence intervals based on 5,000 bootstrap samples; an indirect effect was considered statistically significant when the confidence interval did not include zero. To examine whether age heterogeneity affected the main findings, the same models were repeated as sensitivity analyses in the subsample of participants aged 11–18 years (n = 132). The covariates used in the primary models were retained in the sensitivity analyses.

Results

Correlations among the main study variables are presented in Table 2. The personal subscale of scoliosis-related body image was positively correlated with body image psychological inflexibility ($r = .539$, $p < .01$) and negatively correlated with self-esteem ($r = -.442$, $p < .01$). Similarly, the social subscale was positively correlated with body image psychological inflexibility ($r = .567$, $p < .01$) and negatively correlated with self-esteem ($r = -.441$, $p < .01$).

Table 2. Correlations among the main study variables

Variable	1	2	3	4
1. SIBI-P	1	.579***	-.442***	.539***
2. SIBI-S		1	-.441***	.567***
3. Self-esteem			1	-.648***
4. BIPI				1

***p < .001; SIBI-P = Scoliosis-Related Body Image–Personal Subscale; SIBI-S = Scoliosis-Related Body Image–Social Subscale; BIPI = Body Image Psychological Inflexibility

In the mediation model examining self-esteem, body image psychological inflexibility, and the personal dimension of scoliosis-related body image, age, sex, Cobb angle, brace use, and physical therapy status were controlled. Self-esteem was significantly and negatively associated with body image psychological inflexibility ($B = -2.05$, $SE = .20$, $t = -10.06$, $p < .001$, 95% CI [-2.45, -1.65]). Body image psychological inflexibility was significantly and positively associated with the personal dimension of scoliosis-related body image ($B = .05$, $SE = .01$, $t = 4.68$, $p < .001$, 95% CI [.03, .07]). The total effect of self-esteem on personal body image was significant ($B = -.16$, $SE = .03$, $t = -5.72$, $p < .001$, 95% CI [-.22, -.11]), whereas the direct effect was not significant after body image psychological inflexibility was included in the model ($B = -.06$, $SE = .03$, $t = -1.68$, $p = .095$, 95% CI [-.13, .01]). The 95% bootstrap confidence interval for the indirect effect through body image psychological inflexibility did not include zero ($B = -.10$, BootSE = .03, 95% bootstrap CI [-.16, -.05]). Among the covariates, Cobb angle was significantly and positively associated with personal body image ($B = .03$, $SE = .01$, $t = 2.27$, $p = .025$, 95% CI [.004, .060]); the independent associations of the remaining covariates were not significant. The model explained 37.2% of the variance in personal body image scores, $F(7, 142) = 12.02$, $p < .001$ (Table 3).

Table 3. Results of the mediation analysis of the role of body image psychological inflexibility in the relationship between self-esteem and the personal subscale of scoliosis-related body image

Effect	B	SE	t	p	%95 CI
Self-Esteem→ BIPI (a)	-2.051	.204	-10.06	<.001	[-2.454; -1.648]
BIPI→SIBI-P (b)	.051	.011	4.68	<.001	[.029; .072]
Total effect: SE → SIBI-P (c)	-.162	.028	-5.72	<.001	[-.218; -.106]
Direct effect: SE → SIBI-P (c')	-.058	.035	-1.68	.095	[-.126; .010]
Indirect effect: SE → BIPI → SIBI-P (ab)	-.104	.027[1]	—	—	[-.159; -.051]

B = unstandardized regression coefficient; SE = standard error; CI = confidence interval; BIPI = body image psychological inflexibility; SIBI-P = Scoliosis-Related Body Image–Personal Subscale. Age, sex, Cobb angle, brace use, and physical therapy status were included as covariates. [1]Bootstrap standard error (BootSE) is reported for the indirect effect. The 95% confidence interval for the indirect effect is based on 5,000 percentile bootstrap samples.

Although the direct effect of self-esteem on the personal dimension of scoliosis-related body image was not significant, the percentile bootstrap confidence interval for the indirect effect through body image psychological inflexibility excluded zero, indicating a statistically significant indirect association. The findings indicate a pattern in which higher self-esteem was associated with lower body image psychological inflexibility, which in turn was associated with lower personal body image dissatisfaction. Thus, the results supported an indirect role of body image psychological inflexibility in the association between self-esteem and the personal dimension of scoliosis-related body image. The model is presented in Figure 1.

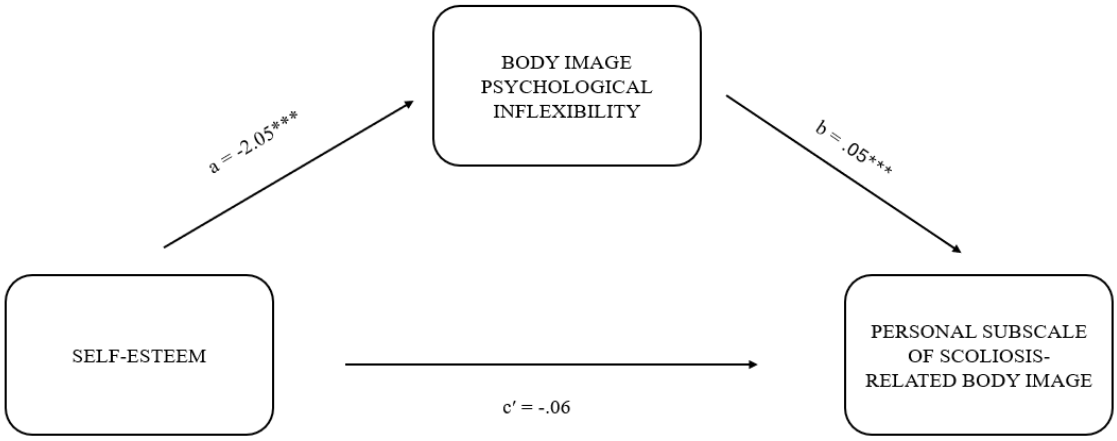


Figure 1. Mediation model of body image psychological inflexibility in the relationship between self-esteem and the personal subscale of scoliosis-related body image

Total effect (c) = -.16, p < .001. ***p < .001

A second mediation analysis examined the role of body image psychological inflexibility in the association between self-esteem and the social dimension of scoliosis-related body image, again controlling for age, sex, Cobb angle, brace use, and physical therapy status. Self-esteem was significantly and negatively associated with body image psychological inflexibility (B = -2.05, SE = .20, t = -10.06, p < .001, 95% CI [-2.45, -1.65]). Body image psychological inflexibility was significantly and positively associated with the social dimension of scoliosis-related body image (B = .07, SE = .01, t = 6.18, p < .001, 95% CI [.05, .09]). The total effect of self-esteem on social body image was significant (B = -.17, SE = .03, t = -5.66, p < .001, 95% CI [-.23, -.11]), whereas the direct effect was not significant (B = -.03, SE = .04, t = -.89, p = .377, 95% CI [-.10, .04]). The 95% bootstrap confidence interval for the indirect effect through body image psychological inflexibility did not include zero (B = -.14, BootSE = .03, 95% bootstrap CI [-.20, -.08]). Among the covariates, age was significantly and positively associated with social body image (B = .11, SE = .04, t = 3.08, p = .003, 95% CI [.04, .18]); the independent associations of the remaining covariates were not significant. The model explained 43.0% of the variance in social body image scores, F(7, 142) = 15.28, p < .001 (Table 4).

Table 4. Results of the mediation analysis of the role of body image psychological inflexibility in the relationship between self-esteem and the social subscale of scoliosis-related body image

Effect	B	SE	t	p	%95 GA
Self-Esteem → BIPI (a)	-2.051	.204	-10.06	<.001	[-2.454; -1.648]
BIPI → SIBI-S (b)	.069	.011	6.18	<.001	[.047; .091]
Total effect: SE → SIBI-S (c)	-.173	.031	-5.66	<.001	[-.234; -.113]
Direct effect: SE → SIBI-S (c')	-.032	.036	-.89	.377	[-.102; .039]
Indirect effect: SE → BIPI → SIBI-S (ab)	-.142	.031[1]	—	—	[-.204; -.084]

B = standardize edilmemiş regresyon katsayısı; SE = standart hata; GA = güven aralığı; BS = Benlik Saygısı; BİPK = Beden İmgesi Psikolojik Katılığı; SİBİ-S = Skolyoza İlişkin Beden İmgesi–Sosyal Alt Boyutu. Yaş, cinsiyet, Cobb açısı, korse kullanımı ve fizik tedavi durumu kovaryat olarak kontrol edilmiştir. [1]Dolaylı etki için bootstrap standart hatası (BootSE) verilmiştir. Dolaylı etkiye ilişkin %95 güven aralığı 5000 yüzdelik bootstrap örneklemine dayanmaktadır.

The direct effect of self-esteem on the social dimension of scoliosis-related body image was not significant; however, the bootstrap confidence interval for the indirect effect through body image psychological inflexibility excluded zero, supporting a statistically significant indirect association. The findings indicate a pattern in which higher self-esteem was associated with lower body image psychological inflexibility, which in turn was associated with lower social body image dissatisfaction. Thus, the results supported an indirect role of body image psychological inflexibility in the association between self-esteem and the social dimension of scoliosis-related body image. The model is presented in Figure 2.

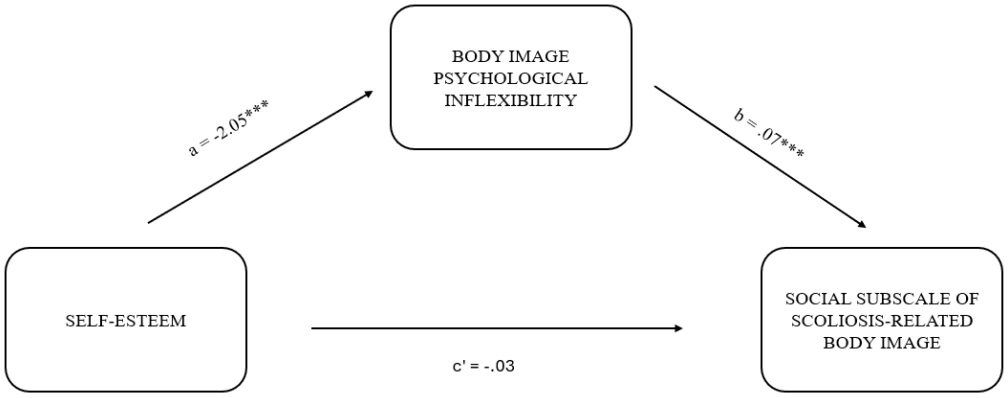


Figure 2. Mediation model of body image psychological inflexibility in the relationship between self-esteem and the social subscale of scoliosis-related body image

Total effect (c) = -.17, p < .001. ***p < .001

To assess whether the broad age range of the sample affected the main findings, the mediation models were repeated using only participants aged 11–18 years (n = 132). After controlling for age, sex, Cobb angle, brace use, and physical therapy status, the indirect effect through body image psychological inflexibility remained significant for personal body image (B = -.0994, BootSE = .0279, 95% bootstrap CI [-.1575, -.0480]). The indirect effect also remained significant for social body image (B = -.1399, BootSE = .0305, 95% bootstrap CI [-.2033, -.0828]). In the personal body image model, the direct effect of self-esteem was significant (B = -.0755, SE = .0363, t = -2.08, p = .040, 95% CI [-.1474, -.0035]), whereas the direct effect was not significant in the social body image model (B = .0038, SE = .0366, t = .10, p = .918, 95% CI [-.0687, .0763]). These findings indicate that the overall pattern of indirect effects was retained in the 11–18-year-old subgroup.

Discussion

The present findings support an indirect role of body image psychological inflexibility in the association between self-esteem and scoliosis-related body image across both its personal and social dimensions. In the two mediation models, the indirect effect of body image psychological inflexibility was statistically significant for both outcomes. The non-significant direct effect of self-esteem after body image psychological inflexibility was included in the full-sample models, together with the significant indirect effects, suggests that body image psychological inflexibility may represent an important psychological process in this association. However, given the cross-sectional design, these findings should be regarded as associational evidence pointing to a possible psychological process rather than as evidence of a causal mechanism. The variance explained by the models (37.2%–43.0%) further indicates that self-esteem and body image psychological inflexibility make meaningful contributions to understanding scoliosis-related body image.

With respect to the covariates, Cobb angle was positively associated with the personal dimension of scoliosis-related body image. This finding suggests that radiographic curve severity may be related to individuals' evaluations of their own bodies. In their review, Bertuccelli et al. (2023) reported that greater curve severity was associated with poorer body image in many studies examining Cobb angle and body image, although the association between objective clinical measures and subjective body perception was generally neither strong nor consistent. Similarly, Skaftourou et al. (2026) found no significant association between Cobb angle and adolescents' self-perceived spinal appearance, suggesting that the objective severity of physical deformity may diverge from subjective appearance perceptions. In the present study, the finding that Cobb angle was associated with personal but not social body image is notable. The social dimension of body image may depend less on radiographic curve magnitude than on how visible the deformity is to others, how individuals believe they are evaluated by others, and their interpersonal experiences. Taşpolat et al. (2026), for example, reported that greater curve severity was associated with

poorer body image and social anxiety among adolescents with idiopathic scoliosis, while perceived external visibility of scoliosis was the strongest predictor of peer victimization. Taken together, these findings suggest that the physical severity of scoliosis may be more directly reflected in personal body evaluations, whereas social body image may be more closely related to how the deformity is perceived and interpreted in social contexts. In addition, the positive association between age and the social body image dimension in the present study suggests that the social significance of appearance may change across development. By contrast, sex, brace use, and physical therapy status did not show significant independent associations with either personal or social body image after adjustment for the other variables, underscoring the importance of considering psychological processes such as how individuals perceive and relate to bodily changes.

The broad age range of the sample should also be considered when interpreting age-related findings. Accordingly, the analyses were repeated in participants aged 11–18 years, and the indirect effect through body image psychological inflexibility remained significant for both personal and social body image. In contrast to the full sample, in which the direct effect of self-esteem on personal body image was not significant, the direct association was significant in the adolescent subgroup. This difference suggests that, during adolescence, self-esteem may have a direct association with personal body dissatisfaction in addition to its indirect association through psychological inflexibility. Moreover, age was significantly associated with social body image in the full sample but not in the adolescent subgroup, suggesting that the age effect observed in the full sample may reflect broader developmental differences. Because the number of adult participants was limited, however, these findings should not be interpreted as evidence of a direct difference between age groups.

The negative association observed between self-esteem and scoliosis-related body image is consistent with the broader body image literature (Webster and Tiggemann 2003, Masheb et al. 2006, Özmen et al. 2007, Buhlmann et al. 2009, Pop 2016). The negative associations of self-esteem with both the personal and social dimensions suggest that general self-evaluation may be related to both subjective body perceptions and body-related concerns in social interactions. Similarly, Al-Musharaf et al. (2022) reported that low self-esteem was associated with body dissatisfaction, whereas Kuzu et al. (2017) found that negative body image in individuals with scoliosis was associated with lower self-esteem, social anxiety, and impaired social functioning. The present findings therefore contribute to understanding the psychological processes associated with body image in scoliosis.

The negative association between self-esteem and body image psychological inflexibility suggests that individuals with higher self-esteem may tend to show less psychological inflexibility in response to distressing body-related thoughts and emotions. During adolescence, a developmental period in which self-esteem can fluctuate, negative appearance-related evaluations may become more salient among individuals with lower self-esteem (Özbey and Gültekin 2021). Body image psychological inflexibility may, in turn, adversely affect psychological adjustment by promoting avoidance of distressing body-related experiences, whether in relation to personal body acceptance or visibility in social settings (Brichacek et al. 2023).

Body image-related inflexibility may also contribute to the persistence of negative appearance evaluations in individuals with lower self-esteem. Consistent with this interpretation, Linardon et al. (2021) reported a significant association between body image flexibility and self-esteem.

The psychological impact of scoliosis cannot be fully explained by objective or radiographic characteristics of the deformity alone; subjective evaluations of the condition and the body are also important (Matamalas et al. 2014, Cheshire et al. 2017, Özcan Erişgin et al. 2026). The fact that individuals with similar Cobb angles may differ substantially in body image is consistent with this view. Adolescence is a developmental period in which peer relationships and visible physical characteristics play a central role in self-evaluation. Trunk asymmetry, clothing choices, concerns about being judged by others, and visible physical differences related to spinal curvature may therefore intensify negative appearance-related thoughts in adolescents (Liskey-Fitzwater et al. 1993, Taşpolat et al. 2026). Relating to these thoughts in a more rigid manner may contribute to the maintenance of negative body image. Body image psychological inflexibility may thus be

relevant to the psychological consequences of scoliosis because it captures not only physical deformity but also how adolescents experience and respond to that deformity (Guan et al. 2026). This interpretation is conceptually consistent with previous findings on psychological flexibility in scoliosis and related areas. Thorsell Cederberg et al. (2024) reported that general psychological flexibility may support psychological adjustment and well-being, particularly following scoliosis surgery. Koushiou et al. (2021) identified a mediating role of psychological inflexibility in eating-disorder symptoms, and Guo et al. (2022) reported related findings for obsessive-compulsive and depressive symptoms. Findings from these different populations provide a conceptually parallel framework for understanding the role of general psychological flexibility in associations between self-evaluation and psychological adjustment. Nevertheless, general psychological flexibility and the body image-specific psychological inflexibility examined in the present study are not equivalent constructs, despite sharing a common theoretical foundation. Evidence regarding general psychological flexibility should therefore be regarded as conceptually supportive rather than as direct evidence for body image-specific inflexibility. By examining psychological inflexibility specifically in the domain of body image among individuals with scoliosis, the present study contributes to a more precise understanding of relevant psychological processes. Distinguishing personal dissatisfaction from socially oriented concerns in separate models may also help identify more specific domains for future clinical assessment and intervention.

The findings of this study make important contributions to the idiopathic scoliosis literature; however, several methodological and conceptual limitations should be considered when interpreting the results. First, the cross-sectional design prevents the relationships among self-esteem, body image psychological inflexibility, and scoliosis-related body image from being explained definitively within a causal framework. As emphasized in the longitudinal studies by Tiggemann (2005) and Paxton et al. (2006), alternative causal orderings or bidirectional relationships between body image and related psychological constructs cannot be fully ruled out. In addition, the recruitment of the sample from a single center, the predominance of female participants, and the broad age range of 11–37 years in the final sample represent important limitations in terms of age heterogeneity; the findings should also be interpreted with the participants excluded during data screening in mind. Although the Turkish forms of the measures have been used in studies involving groups with similar characteristics, the lack of independent psychometric validation studies across the full age range represented here may also be considered a limitation. In addition, conceptual similarity and content overlap may exist between body image psychological inflexibility, examined as the mediator, and scoliosis-related body image, examined as the outcome, which may create a potential measurement limitation. Nevertheless, examining the personal and social dimensions separately in two mediation models allowed the manifestations of this possible overlap across different dimensions to be observed more specifically.

Conclusion

The findings indicate that body image difficulties in this predominantly adolescent sample with idiopathic scoliosis may be related not only to physical deformity but also to body-related psychological processes. The significant indirect role of body image psychological inflexibility in both the personal and social body image models suggests that clinical assessment may benefit from considering not only physical and radiographic characteristics but also how individuals relate to body-related thoughts and emotions. Approaches aimed at increasing psychological flexibility, such as Acceptance and Commitment Therapy (ACT), may have potential for supporting psychological adjustment among adolescents at risk for body image difficulties; this possibility should be tested in future intervention studies. Given the cross-sectional design of the present study, however, the findings do not demonstrate that such interventions would directly improve self-esteem or body image. Likewise, the temporal direction of the associations among self-esteem, body image psychological inflexibility, and scoliosis-related body image cannot be established, and the present mediation model cannot be considered causally superior to reverse or alternative orderings. Future research should therefore include more balanced sex distributions, narrower developmental age groups, control for additional potential confounders, and longitudinal or intervention-based designs to clarify the direction and clinical significance of these associations.

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Authors Contributions: The author(s) have declared that they have made a significant scientific contribution to the study and have assisted in the preparation or revision of the manuscript

Peer-review: Externally peer-reviewed.

Ethical Approval: Ethical approval for this study was obtained from the Acıbadem Mehmet Ali Aydınlar University Medical Research Evaluation Board pursuant to date 22.09.2023 and number 2023-14/510. Participants provided informed consent prior to participating in the study.

Conflict of Interest: No conflict of interest was declared.

Financial Disclosure: No financial support was declared for this study.

Acknowledgments: This study is based on the first author's master's thesis, which was completed under the supervision of the second author.