RESEARCH ARTICLE

Validity and Reliability of an Adapted Persian Version of the Scoliosis Research Society-30 Questionnaire

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Abstract

Background: Adolescent idiopathic scoliosis (AIS) is a common type of spinal deformity confronting surgeons. The Scoliosis Research Society Health-Related Quality of Life (SRS-30) Questionnaire has been translated into Persian to evaluate its internal consistency, reliability, validity, and cross-cultural adaptability in the Persian population.

Methods: The translation and cultural adaptation process was based on the American Academy of Orthopaedic Surgeons guidelines. A total of 102 AIS patients referring to our institution were enrolled in this study within March 2014-March 2016. The 36-item Short Form (SF-36) was used for adapting the Persian SRS-30 questionnaire. The convergent validity of the Persian SRS-30 was examined using the Pearson correlation coefficient. Furthermore, its internal consistency and validity were tested using Cronbach α with bootstrapped 95% confidence interval. Interclass Correlation Coefficient (ICC) was used to test and retest reliability.

Results: The total correlation coefficient between the Persian SRS-30 and SF-36 was obtained at 0.74 (0.67-0.80), which was statistically significant (P=0.001). The total Cronbach α for the Persian SRS-30 was estimated at 0.84, ranging from 0.51 in satisfaction with management domains to 0.88 in mental health domains. The Persian SRS-30r domains indicated satisfactory test-retest reliability with ICC rage of 0.79-0.87.

Conclusion: The Persian SRS-30 translation was reliable and valid for the AIS Iranian patients. The internal consistency of this instrument was found to be good and excellent in all domains except satisfaction with management, which was moderate. The authors believe that the Persian version of SRS-30 is simple and easy to use and now it can be applied in clinical settings for future outcome studies in Iran.

Level of evidence: IV

Keywords: Adolescent idiopathic scoliosis, Scoliosis research society-30r, Reliability, Validity, Iran

Introduction

Recently, patient-based outcome evaluation of musculoskeletal disorders, especially the patient-reported health-related quality of life (HRQoL) questionnaires, have attracted widespread interest (1). Adult deformities are a common phenomenon worldwide.

According to the results of previous studies, the prevalence of these deformities in the adolescent and adult population has been estimated at 60% (2, 3). Unlike adolescent idiopathic scoliosis (AIS), spine deformity in adult patients includes sagittal imbalance and other degenerative problems, such as spinal stenosis and nerve compression,

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causing pain and disability (4, 5). In adolescent and adult patients with idiopathic scoliosis, HRQoL is negatively affected, according to the findings of recent studies (1, 6).

The main concerns of AIS patients are pain, impaired mobility, psychological dysfunction, physical appearance, uncertain prognosis, limitation in social activities, pulmonary dysfunction, and difficulty in work and education (7, 8). The primary purpose of the health service providers, particularly in the chronic cases of skeletal musculoskeletal disorders, is to improve symptoms, performance, and quality of life in patients. Interest in curing and improving the quality of life in patients with idiopathic scoliosis has led to the development of some related tools and questionnaires (9).

In recent years, the Scoliosis Research Society (SRS) was originally introduced in American English to evaluate AIS (10). The first version (originally in English) of the SRS-24 questionnaire developed by Haher et al. was shown to be reproducible and reliable (11). It underwent several modifications to improve psychometric qualities, achieving the final version of SRS-22r (12, 13). Later, SRS-30, encompassing the earlier SRS-22, was used for analyzing the operative treatment of adult spinal deformity.

The English version of SRS-22 has been validated with optimal internal consistency and discriminative validity in Iranian adult patients with spinal deformity. In recent years, version 30 of the questionnaire has been evaluated and investigated in various countries concerning its internal consistency and validity (14, 15). Thus far, the SRS-30 questionnaire has not been verified in Persian and Iranian culture. Furthermore, the original SRS-30 has not been translated or cross-culturally validated for adult spine deformity in Iranian patients. Therefore, this study aimed to investigate the psychometric properties of the SRS30 questionnaire in patients with scoliosis after translating it into Persian.

Materials and Methods

This retrospective study was approved by the Research Ethics Committee of Iran University of Medical Sciences, Tehran, Iran, under number 1729. A total of 106 adult patients with scoliosis were enrolled in the study within March 2014-March 2016. They were consecutively selected among patients referring to the Spine Clinic of Shafa Yahyaian Hospital, Tehran, Iran. Although this hospital is located in Tehran, more than 80% of the patients referring to physicians are from other cities in Iran.

The goals and methods of the study were explained to the patients; therefore, they participated in this research with full knowledge and satisfaction. They were also informed of the possibility of study withdrawal at any stage of the research. Informed consent was obtained from all the participants in the study. Adolescent idiopathic scoliosis patients with the age range of 7- 25 years, who could communicate in written Persian, referring to the Spine Surgery Clinic of Shafa Yahyaian Hospital were enrolled in the study. The reliability of the Persian SRS-30r was estimated using internal consistency and test-retest reliability. Cronbach's alpha coefficient was used to estimate the internal consistency of this tool. Test-retest was applied to measure its

reliability at two different times, and 60 patients completed the SRS-30r Persian questionnaire 1 month after the surgery.

This questionnaire was compared with a commonly used generic measure of HRQoL, probably indicating the effects of this disease. As a result, based on the results of previous similar studies conducted in Finnish (14), Japanese (16), and Arabic(17) languages, SF-36 was used to evaluate the convergent validity of the Persian Questionnaire.

Questionnaires
Scoliosis research society 30-item Questionnaire

The SRS-30 questionnaire consisted of 30 items, of which the last 7 (24-30) items are designed for post-surgery patients only. Except for post-surgery items (i.e., 25, 26, 27, 28, and 30), which are rated on a 3-point Likert scale, the other remaining items are scored on a 5-point Likert scale.

The English version of this questionnaire is available on the website www.srs.com. The patients were recommended to choose the best answer to each item according to their own circumstances. The questionnaire evaluates five domains, namely function/activity, pain, self-image/appearance, mental health, and satisfaction with management. Scoring allows the calculation of different combinations; meaning that with or without post-surgery items, the subtotal of four domains without satisfaction with management can be calculated. The total score in this questionnaire ranges from 23-115, without 7 post-surgery items, and the total score ranges from 30-150 for post-surgery patients.

Short Form 36-item Questionnaire

The 36-item Short Form (SF-36) was used to adapt the Persian SRS-30r questionnaire to the AIS Iranian patients. This questionnaire (18) is a general health evaluation tool consisting of eight subscales, namely physical functioning, physical role, general health, social function, pain, vitality, emotional role, and mental health. The Persian version of this questionnaire has been validated to be used in Iran (19). The total score of this questionnaire ranges from 0-100, with higher scores indicating more health.

Translation and Cross-Cultural Adaptation
Forward translation

The translation and cultural adaptation processes were based on the American Academy of Orthopaedic Surgeons (AAOS) guidelines (19). The original version of the SRS-30 questionnaire was independently translated into Persian by two native Persian-speaking translators and healthcare professionals. Subsequently, at a meeting with the presence of the researcher, experts, and translators, the main translation of both questionnaires was prepared by discussing the differences between the translations and their documentation. At the next stage, a bilingual translator assessed the quality of the initial translation at the level of clarity, conceptual equation, common language, and acceptance. At this stage, scoring was based on a scale of 0-100, with the two extreme scores indicating totally

undesirable quality and perfectly desirable qualities, respectively. The scores below 80, 80-90, and above 90 showed undesirable quality, relatively desirable qualities, and optimal quality, respectively, which were used as a criterion for the translation quality of the questions.

Back translation

The original translation was translated into English by two other translators in the form of native English. Back translation was made by an expert bilingual translator in English as the first language, who lacked any healthcare background. The final versions of both questionnaires were obtained by a committee of experts, including translators, the research team, and experts. Afterward, a field test was conducted to assess the quality of the translations by the pilot on a small group of people with eligible scoliosis. Finally, the English version was verified and validated by a credible reference in that context.

Pre-final Persian SRS-30 was pilot-tested with 15 Persian-speaking scoliotic adolescents with spine pain who completed the questionnaire. They were asked to provide written notifications in the case of any ambiguity or difficulty in answering or understanding the items. The evaluation demonstrated no reasons to change or concern the content; therefore, the final version of the Persian SRS-30 was approved and introduced.

Statistical Analysis

The statistical analysis was performed using SPSS software (version 16) for Windows. The data distribution was examined; since the results indicated the normal distribution of scores, parametric tests were used for data analysis. The ceiling and floor effects were considered present if more than 15% of the respondents achieved the lowest or highest possible score, respectively. The convergent validity of the Persian SRS-30 was examined using the Pearson correlation coefficient. Correlation values equal to 0.40 or above were acceptable. Cronbach α with bootstrapped 95% confidence interval was used to test the internal consistency and validity of the Persian SRS-30. The Cronbach alpha ranging from 0-1 and values of > 0.7 indicated adequate internal consistency for the scale. Interclass Correlation Coefficient (ICC) was employed to test and retest reliability. Interclass Correlation Coefficient values varied from 0 (totally unreliable) to 1 (perfectly reliable), with values above 0.80 considered evidence of excellent reliability. A p-value of less than 0.05 was considered significant.

Results

Overall, 102 (96%) patients completed the Persian SRS-30 questionnaire without missing any data; however, 4 (4%) patients had several missing values. The patients' population included 59 (55.7%) females and 47 (44.3%) males with the mean age of 16.2±3.1 years (ranging 11-20). At the research time, 87 (85.2%) of the patients had been subjected to surgical treatment. Deformity location was the trunk in 88 (83%) patients, and stinging in 33 (32.1%) and burning in 24 (23.6%) patients were the pain type. The mean body mass index was obtained at 23.4±3.1 kg/m2.

Table1 presents the demographic and clinical characteristics of the included patients [Table1].

The mean total SRS-30 score in the patients was estimated at 3.31±0.7; moreover, the mean self-image domain was 3.41±0.75. The ceiling and floor effect on the subscales of pain, general health, self-image, satisfaction with management, and mental health was negligible. The floor effect scores on satisfaction with management, self-image, and pain reduction subscales were 0.2, 0.14, and 0.08, respectively. Furthermore, the ceiling effect scores on mental health dimensions and satisfaction with management were reported to be 0.12 and 0.16, respectively, in the Persian SRS-30 questionnaire. The ceiling and the floor effect for other dimensions were not observed [Table 2].

Table 1. Demographic and Clinical Characteristics of 106 Patients	
Characteristic	**Value**
Age	16.2±3.1
Body mass index	23.4±3.1
Gender	
• Male	47 (44.3%)
• Female	59 (55.7%)
Underwent surgery	87 (85.2%)
Type of pain	
• Stinging	33 (32.1%)
• Burning	24 (23.6%)
• Sharp	14 (13.2%)
• Deep	23 (21.6%)
• Unknown	10 (9.5%)
Deformity location	
• Upper limb	4 (3.7%)
• Trunk	88 (83%)
• Lower limb	8 (7.7%)
• Unknown	6 (5.6%)

Table 2. Distribution of the Persian Scoliosis Research Society 30-item Domains				
SRS-30 Domains	**Mean score (SD)**	**Range**	**Floor %**	**Ceiling %**
Function	3.12 (0.65)	1.09-4.7	0	0
Pain	2.85 (0.82)	1-4.6	0.08	0
Self-image	3.41 (0.75)	1-4.8	0.14	0
Mental health	3.46 (0.62)	1.2-5	0	0.12
Sub-score	2.95 (0.84)	1.11-4.6	0	0
Satisfaction with management	3.22 (0.62)	1-5	0.2	0.16
Total SRS-30	3.31 (0.7)	1.23-4.7	0	0

SRS: Scoliosis Research Society

The total correlation coefficient between the Persian SRS-30 and SF-36 was calculated at 0.74 (0.67-0.80). This correlation was statistically significant (P=0.001). The

Spearman correlations between the relevant SF-36 subscales and SRS-30 domains ranged from 0.43-0.76 in function, 0.42-0.69 in pain, 0.49-0.62 in self-image, 0.63-0.82 in mental health, and 0.29-0.37 in satisfaction with management [Table 3].

Table 3. Pearson Correlation Coefficients of the Persian SRS-30 and the Relevant Subscales of the SF-36		
SRS-30 Domains	SF-36 Subscales	Pearson r (95% confidence interval)
Function	• Physical functioning • Role-physical • Bodily pain • General health	0.76 (0.66-0.83) 0.59 (0.51-0.73) 0.43 (0.46-0.70) 0.69 (0.61-0.76)
Pain	• Bodily pain • Physical functioning • Role-physical	0.69 (0.57-0.72) 0.42 (0.31-0.63) 0.61 (0.42-0.77)
Self-image	• General health • Social functioning • Physical functioning	0.62 (0.54-0.73) 0.49 (0.41-0.62) 0.53 (0.46-0.66)
Mental health	• Mental health • Social functioning • Vitality	0.82 (0.77-0.95) 0.69 (0.62-0.74) 0.63 (0.56-0.70)
Sub score	• General health • Physical functioning • Role-physical • Bodily pain • Social functioning	0.74 (0.66-0.82) 0.72 (0.65-0.78) 0.43 (0.36-0.61) 0.66 (0.59-0.72) 0.67 (0.59-0.75)
Satisfaction with management	• Physical functioning • Role-physical • Bodily pain • General health	0.34 (0.24-0.42) 0.37 (0.26-0.52) 0.29 (0.19-0.39) 0.35 (0.21-0.56)
Total SRS-30	Total SF-36	0.74 (0.67-0.80)

SRS: Scoliosis Research Society; SF: Short form

The total Cronbach α of the Persian SRS-30 was 0.84 ranging from 0.51 in satisfaction with management domains to 0.88 in mental health domains. Additionally, its total ICC was estimated at 0.86 (0.78-0.93). The range of ICC for the Persian SRS-30 domains was (0.54-0.90). The highest and the lowest ICC scores were for the mental health dimension (0.9) and satisfaction with management (0.54), respectively [Table 4].

Discussion

This study aimed to prepare a cross-cultural translation and adaptation of the Persian SRS-30 questionnaire to evaluate its reliability and validity for

the Persian-speaking patients in Iran. The SRS-30 questionnaire has been proved to be a valid instrument to evaluate HRQoL in adolescents with idiopathic scoliosis

Table 4. Internal Consistency and Test-Retest Reliability of the Persian SRS-30		
SRS-30 Domains	Cronbach's α (95% Confidence interval)	Intraclass correlation coefficient
Function	0.84 (0.77-0.89)	0.86 (0.80-0.91)
Pain	0.77 (0.711-0.83)	0.81 (0.76-0.87)
Self-image	0.75 (0.70-0.81)	0.79 (0.73-0.86)
Mental health	0.88 (0.82-0.93)	0.90 (0.84-0.94)
Sub-score	0.76 (0.66-0.83)	0.79 (0.71-0.86)
Satisfaction with management	0.51 (0.45-0.57)	0.54 (0.48-0.59)
Total SRS-30	0.84 (0.74-0.91)	0.86 (0.78-0.93)

SRS-30r: Scoliosis Research Society in two time

in the United States. The use of this questionnaire for different nationalities with various languages and cultures requires cross-cultural and linguistic adaptation and validation of the instrument with those cultures and languages. To the best of our knowledge, this research was the first large-scale study of this type performed in the Iranian population.

The results of this research indicated that the adaptation and development of the Persian SRS-30 questionnaire for the Iranian patients were successful, and the Committee of Experts agreed to create a valid questionnaire. This questionnaire had high internal consistency and reliability for the AIS Iranian patients.

For the domains of pain, self-image, and sub-score, the internal consistency was found to be good and excellent in mental health and function moderate, respectively. The internal consistency was moderate in satisfaction with management. The total Cronbach α values were optimal and excellent in the Persian SRS-30 domains. The total ICC was calculated at 0.86; its range was from 0.78-0.93. The ICC was good or excellent in all categories except for satisfaction with management (0.54).

The total Cronbach α value in the present study was 0.84, at the range of 0.74-0.91, being optimal and suggesting acceptable internal consistency of the questionnaire in the Persian SRS-30 domains. This could be due to very high values of homogeneous items. Kati et al. (2016) tested and adapted a Finnish version of the SRS-30 questionnaire; the questionnaire was translated based on the AAOS guidelines. To conduct the mentioned research, 274 adult patients with scoliosis were selected to answer the translated questionnaire. Based on their study results, the internal consistency and reliability of SRS-30 were good with Cronbach α = 0.853 and ICC = 0.905, respectively, which was consistent with the results of our study (14). Carrico et al. (2012) (15) translated and adapted SRS-30 in the Portuguese-Brazilian language. They conducted a study with a postoperative AIS cohort.

Their version of the SRS-30 lacked high appropriate internal consistency and reliability; however, SRS-22r was validated for Swedish (20), Turkish (21), and Chinese (22) versions in AIS patients; this result was inconsistent with those of our study. This discrepancy in the results can be justified by the unknown cultures and the difference between the two countries' cultures and languages.

Musavi et al. (2016) (23) performed a cross-sectional survey in which they evaluated the internal consistency, reliability, and validity of the SRS-22r Persian version. A total of 86 patients with scoliosis were included in their study. Similar to our study, the translation and cultural adaptation process was based on the AAOS guidelines, and the Short-Form Health Survey (SF-36) was used to test convergent validity. The results of their research, in line with ours, indicated a moderate to high correlation coefficient between SRS-22r domains and SF-36 subscales. Cronbach α ranged from 0.68-0.78, and ICC was optimal and acceptable.

In the present study, for the function/activity domain, the Cronbach α was obtained at 0.84, better than that obtained in Finnish (α=0.72) (14) and Portuguese-Brazilian (α=0.68) SRS-30 versions (15). In addition, the Cronbach α coefficient for pain (α=0.77) and satisfaction with management (α=0.51) domains were more than those in Finnish (α=0.63) (14) and Portuguese-Brazilian (α=0.43) SRS-30 versions (15). However, the values for self-image (α=0.73) and mental health (α=0.88) domains were lower than those in Finnish (α=0.75) (14) and Portuguese-Brazilian (α=0.92) (15) SRS-30 version.

The test and retest processes were performed in 1 month to assess the reliability of the Persian SRS-30 questionnaire. The mean ICC was estimated at 0.86; it ranged from 0.78-0.93. Except for satisfaction with management, ICC was good or excellent in all domains of the Persian SRS-30 version, which may be due to the patients' misinterpretation of the first consultation without intervention. The results were in line with those of previous studies (23, 24).

Similar to our study, the total ICC for the Finnish version of this questionnaire was estimated at 0.905 by Kati et al. (14). It was revealed that ICC scores for function/activity, pain, satisfaction with management, and mental health domains were better than those in Finnish (14) and Portuguese-Brazilian(15) SRS-30 versions. Nevertheless, the value for the self-image (0.75) domain was lower than those in Finnish (0.79) (14) and Portuguese-Brazilian (0.81) (15) SRS-30 versions.

Based on our results, the correlation between the SRS-30 and SF-36 questionnaire was reported to be very good and acceptable in all the domains, except for satisfaction with the management scale that was moderate. The correlation between SRS-30 and SF-36 in the satisfaction with management dimension was reported in the range of 0.29-0.37, being consistent with the results of a study carried out by Moosavi et al., reporting the same correlation in the range of 0.3-2.0 (23). The lower internal consistency of the satisfaction with management in the SRS-30 questionnaire can be due to fewer items in this dimension (2 items). While the number of items in other dimensions of this questionnaire is more (5-6 items per domain), being consistent with the results of previous studies (10, 23, 24).

Limitations and Future Studies

The strength of the present study was that the subgroups were analyzed separately to demonstrate good reproducibility and control the possible changes in self-perceived health status. Furthermore, based on our review and to the best of our knowledge, the current research was the first attempt to translate and validate SRS-30 in the Middle East for adolescents with idiopathic scoliosis.

The major limitation was that this study was one-centered. The present research was a cross-sectional study of Iranian adolescents with idiopathic scoliosis referring to the Spine Clinic of Shafa Yahyaian Hospital. Due to the specialty of the center, the patients referring to the clinic could be in worse situations; consequently, the results of our study could not be generalized to the whole community. The performance of the study in other centers may yield different results.

The results of the present study indicated that the Persian SRS-30 translation was reliable and valid for Iranian adolescent patients with idiopathic scoliosis. Internal consistency was found to be good and excellent in all domains of the Persian SRS-30 except satisfaction with management. The internal consistency was moderate in satisfaction with management. The Persian SRS-30 can be suggested to be used among Iranian patients for pain and disability associated with adult spine deformities.

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REFERENCES

1. Tones M, Moss N, Polly Jr DW. A review of quality of life and psychosocial issues in scoliosis. Spine. 2006;31(26):3027-38.
2. Amorim Junior DC, Herrero CF, Nogueira-Barbosa M, Defino HL. Prevalência da escoliose lombar em adultos. Coluna/Columna. 2011;10:284-5.
3. *Improvement of back pain with operative and nonoperative treatment in adults with scoliosis.* Neurosurgery, 2009. **65**(1): p. 86-94.
4. Schwab F, Dubey A, Gamez L, El Fegoun AB, Hwang K, Pagala M, et al. Adult scoliosis: prevalence, SF-36, and nutritional

parameters in an elderly volunteer population. Spine. 2005;30(9):1082-5.
5. Smith JS, Shaffrey CI, Glassman SD, Berven SH, Schwab FJ, Hamill CL, et al. Risk-benefit assessment of surgery for adult scoliosis: an analysis based on patient age. Spine. 2011;36(10):817-24.
6. Danielsson AJ. What impact does spinal deformity correction for adolescent idiopathic scoliosis make on quality of life?. Spine. 2007;32(19):S101-8.
7. 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. 2010;35(5):568-77.
8. Parent EC, Wong D, Hill D, Mahood J, Moreau M, Raso VJ, et al. The association between Scoliosis Research Society-22 scores and scoliosis severity changes at a clinically relevant threshold. Spine. 2010;35(3):315-22.
9. Boonstra AM, Preuper HR, Reneman MF, Posthumus JB, Stewart RE. Reliability and validity of the visual analogue scale for disability in patients with chronic musculoskeletal pain. International journal of rehabilitation research. 2008;31(2):165-9.
10. Sathira-Angkura V, Pithankuakul K, Sakulpipatana S, Piyaskulkaew C, Kunakornsawat S. Validity and reliability of an adapted Thai version of Scoliosis Research Society-22 questionnaire for adolescent idiopathic scoliosis. Spine. 2012;37(9):783-7.
11. Haher TR, Gorup JM, Shin TM, Homel P, Merola AA, Grogan DP, et al. Results of the Scoliosis Research Society instrument for evaluation of surgical outcome in adolescent idiopathic scoliosis: a multicenter study of 244 patients. Spine. 1999;24(14):1435.
12. Asher M, Lai SM, Burton D, Manna B. The reliability and concurrent validity of the scoliosis research society-22 patient questionnaire for idiopathic scoliosis. Spine. 2003;28(1):63-9.
13. Burton DC, Asher MA, Lai SM, Glattes RC, Fraser E. The Reliability and Concurrent Validity of the SRS-22r and CHQ-CF87 Patient Questionnaires for Spinal Deformity Patients Ages 8 through 18 years. InSpine Journal Meeting Abstracts 2006 (p. 47). LWW.
14. Kyrölä K, Järvenpää S, Ylinen J, Mecklin JP, Repo JP, Häkkinen A. Reliability and validity study of the Finnish adaptation of

Scoliosis Research Society questionnaire version SRS-30. Spine. 2017;42(12):943-9.
15. Carriço, G., R. Meves, and O. Avanzi, *Cross-Cultural Adaptation and Validity of an Adapted Brazilian Portuguese Version of Scoliosis Research Society–30 Questionnaire.* Spine, 2012. **37**(1): p. E60-E63.
16. Hashimoto H, Sase T, Arai Y, Maruyama T, Isobe K, Shouno Y. Validation of a Japanese version of the Scoliosis Research Society-22 Patient Questionnaire among idiopathic scoliosis patients in Japan. Spine. 2007;32(4):E141-6.
17. Haidar RK, Kassak K, Masrouha K, Ibrahim K, Mhaidli H. Reliability and validity of an adapted Arabic version of the Scoliosis Research Society-22r questionnaire. Spine. 2015;40(17):E971-7.
18. Zhang Y, Bo QU, Lun SS, Guo Y, Liu J. The 36-item short form health survey: reliability and validity in Chinese medical students. International journal of medical sciences. 2012;9(7):521.
19. Beaton DE, Bombardier C, Guillemin F, Ferraz MB. Guidelines for the process of cross-cultural adaptation of self-report measures. Spine. 2000;25(24):3186-91.
20. Danielsson AJ, Romberg K. Reliability and validity of the swedish version of the scoliosis research society–22 (SRS-22r) patient questionnaire for idiopathic scoliosis. Spine. 2013;38(21):1875-84.
21. Alanay A, Cil A, Berk H, Acaroglu RE, Yazici M, Akcali O, et al. Reliability and validity of adapted Turkish Version of Scoliosis Research Society-22 (SRS-22) questionnaire. Spine. 2005;30(21):2464-8.
22. 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. 2007;32(10):1141-5.
23. Mousavi SJ, Mobini B, Mehdian H, Akbarnia B, Bouzari B, Askary-Ashtiani A, et al. Reliability and validity of the Persian version of the Scoliosis Research Society-22r questionnaire. Spine. 2010;35(7):784-9.
24. Antonarakos PD, Katranitsa L, Angelis L, Paganas A, Koen EM, Christodoulou EA, et al. Reliability and validity of the adapted Greek version of scoliosis research society–22 (SRS-22) questionnaire. Scoliosis. 2009;4(1):1-7.