

## HEALTH SERVICES RESEARCH

# Reliability and Validity of an Adapted Arabic Version of the Scoliosis Research Society-22r Questionnaire

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**Study Design.** Cross-sectional validation and reliability assessment study of Arabic version of Scoliosis Research Society-22 (SRS-22r) Questionnaire.

**Objective.** To develop and validate the Arabic version of the SRS-22r questionnaire.

**Summary of Background Data.** The diagnosis and treatment of adolescent idiopathic scoliosis may influence patient quality of life. SRS-22r is an internationally validated questionnaire used to assess function/activity, pain, self-image, and mental health of patients with scoliosis. It has been translated into several languages but not into Arabic language. Therefore, a valid health-related quality-of-life outcome questionnaire for patients with spinal deformity is still lacking in Arabic language.

**Methods.** The English version of SRS-22r questionnaire was translated, back-translated, and culturally adapted to Arabic language. Then, 81 patients with idiopathic adolescent scoliosis were allocated randomly into either the reliability testing group (group 1) or the validity testing group (group 2). Group 1 patients completed Arabic version of SRS-22r questionnaire twice with 1-week interval in-between. Cronbach  $\alpha$  and intraclass correlation coefficient were measured to determine internal consistency and temporal reliability. Group 2 patients completed the Arabic version of SRS-22r questionnaire and the previously validated Arabic version

of 36-Item Short Form Health Survey (Short Form-36) questionnaire concurrently, and Pearson correlation coefficient was obtained to assess validity.

**Results.** Content analysis, internal consistency reliability, test/retest reproducibility (intraclass correlation coefficient range: 0.82–0.90), and test of concurrent validity showed satisfactory results. Function/activity and satisfaction with management domains had a lower Cronbach  $\alpha$  (0.58 and 0.44, respectively, vs. 0.71–0.85 range for others). Self-image/appearance and satisfaction with management had a lower correlation with domains of the 36-Item Short Form Health Survey.

**Conclusion.** An Arabic version of the SRS-22r questionnaire has been developed and validated. This questionnaire will aid health care workers and researchers in evaluation of patient perception of the deformity, satisfaction with treatment, and quality of life in Arabic-speaking populations.

**Key words:** SRS-22r questionnaire, validity, reliability, adolescent idiopathic scoliosis, Arabic version, SF-36 questionnaire, Cronbach  $\alpha$ , intraclass correlation coefficient, Pearson correlation coefficient, translation.

**Level of Evidence:** 3

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Scoliosis and its treatment might influence patient quality of life because of its effect on appearance and physical activity, particularly in the adolescent age group, which is most commonly affected. The Scoliosis Research Society (SRS) has recognized the importance of quality-of-life issues in patients undergoing treatment of scoliosis and designed a questionnaire to help evaluate patients' perception of their condition and satisfaction with its treatment. An SRS questionnaire with 24 items (SRS-24) was developed in 1999 and validated in a multicenter study.<sup>1</sup> It was then truncated into the SRS questionnaire with 22 items (SRS-22r) in 2000.<sup>2</sup> This was later developed into SRS-22r, the most thoroughly validated version, which can be used to assess function, pain, self-image, mental health, and satisfaction with management of scoliosis.<sup>3</sup>

The modified SRS-22r questionnaire was proven to be an appropriate outcome instrument in English. It was later

translated and culturally adapted by global researchers to the following languages: Chinese, Thai, Danish, Finnish, French, German, Greek, Italian, Japanese, Norwegian, Persian, Polish, Portuguese, Spanish, Swedish, and Turkish.<sup>4-22</sup> Because no valid health-related quality of life (HRQOL) outcome questionnaire exists in the Arabic language for patients with spinal deformity, the SRS-22r, translated and adapted to Arabic, will provide the first questionnaire to assess spinal deformity in the native language of Arabic-speaking populations.

The aim of this study was to develop and validate an Arabic version of the SRS-22r questionnaire. This will aid health care workers and researchers in the evaluation of patient perception of the deformity, satisfaction with treatment, and quality of life in Arabic-speaking populations using an internationally reliable questionnaire. Moreover, this will allow clinicians to better counsel their patients to meet expectations and provide optimal care.

## MATERIALS AND METHODS

This is a cross-sectional validation study to assess the validity and reliability of a questionnaire translated from English to Arabic.

### Translation

The English version of the SRS-22r questionnaire was adapted into Arabic according to the International Quality of Life Assessment Project guidelines.<sup>23,24</sup> Adhering to the recommended protocol issued by the American Association of Orthopedic Surgeon Outcomes committee and outlined by Beaton *et al*,<sup>24</sup> 2 translators independently translated the English version of the SRS-22r questionnaire into Arabic. After comparing the 2 translations, discrepancies were identified and resolved by consensus. Two back-translations were then performed by 2 other translators, without reference to the original SRS-22r questionnaire. The back-translators were neither aware nor informed about the English version of SRS-22r questionnaire. The final form of the Arabic translation of the SRS-22r questionnaire was a consensus reached by members of an expert committee who are similarly bilingual and are familiar with spinal deformity (see Supplemental Digital Content Appendix, available at: <http://links.lww.com/BRSA987>).

### 36-Item Short Form Health Survey Questionnaire

A similar questionnaire that measures general health status, not specific to scoliosis, is the 36-Item Short Form Health Survey (SF-36) health survey. It is the most widely used generic questionnaire for assessing HRQOL, for which validated Arabic version exists. It has 36 items that are categorized into 8 dimensions; physical functioning, role limitation due to physical problems, role functioning due to emotional problems, social functioning, mental health, pain, vitality, and general health perception. Despite its comprehensiveness and proven validity, SF-36 is unable to fully capture the perspective of patient with scoliosis because it lacks self-image and treatment satisfaction domains noted in SRS-22r questionnaire.<sup>25</sup>

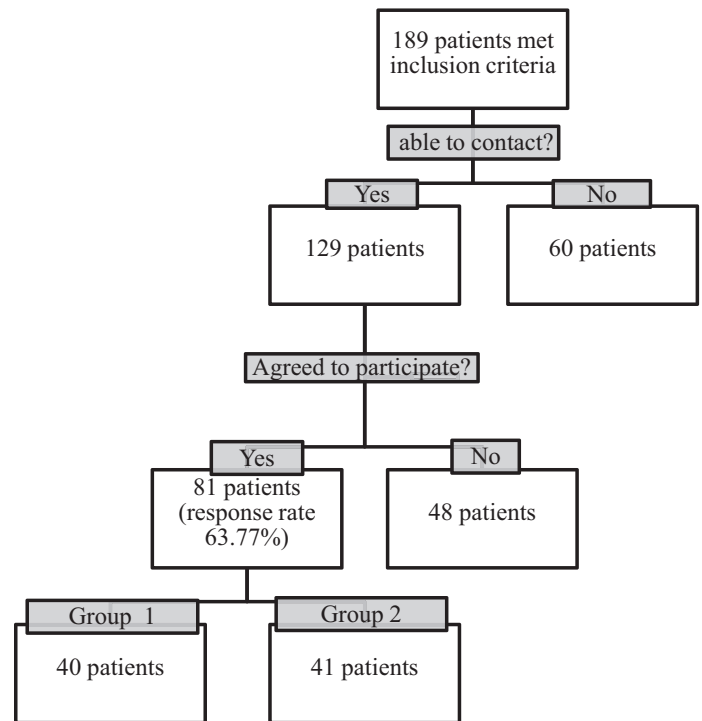


Figure 1. The recruitment process of patients.

### Patient Recruitment and Enrollment

After obtaining institutional review board approval, all patients with idiopathic scoliosis who were treated by the corresponding author between 2004 and 2012 were identified from the medical records of the corresponding author (Figure 1). Inclusion criteria were patients with radiographically confirmed diagnosis of idiopathic scoliosis, age of first presentation between 10 and 18 years (inclusive), and who were Arabic literate. These patients were contacted by phone to assess their willingness to participate in the study. Recruited patients were asked to present to the study offices to discuss and sign the informed consent form (Figure 1).

Consented patients received subject numbers and were allocated randomly into either the reliability testing group (group 1) or the validity testing group (group 2). Patients were randomized using a simple randomization schedule. A single sequence of numbers was followed, with odd numbers assigned to group 1 and even numbers to group 2. Data collected on each patient, whether in group 1 or group 2 included age and sex.

### Group 1

Subjects in group 1 participated in a test-retest design that allowed for measurement of the temporal stability of the questionnaire. A total of 41 patients were assigned to this group and completed the Arabic version of the SRS-22r questionnaire twice at 2 points in time with a 7-day interval to reduce recall bias.

### Group 2

Subjects in group 2 participated in a validity design. A total of 40 patients were assigned to complete the Arabic version

**TABLE 1. Patient Characteristics of Reliability Testing Study Group (Group 1) and Validation Study Group (Group 2)**

	Group 1 (n = 41)	Group 2 (n = 40)
Age		
Mean Age (yr)	16.78 ± 4.41	17.35 ± 4.45
Minimum age (yr)	10	10
Maximum age (yr)	28	26
Sex		
Male (%)	7 (17.1%)	8 (20.0%)
Female (%)	34 (82.9%)	31 (80.0%)
Disease characteristics		
Cobb angle (°)	24.12 ± 12.17	25.94 ± 19.23
Disease management		
Observation	52.9%	52.8%
Brace	29.4%	25.0%
Surgery	17.7%	22.2%

of the SRS-22r questionnaire as with group 1 along with the already validated Arabic version of the SF-36 health survey.<sup>26</sup>

### Content Analysis

SRS-22r was scored in the same method as the original, with 5 indicating the maximum score and 1 indicating the minimum score in all items, and the domain scores were obtained as means from the corresponding set of items. There were 5 questions each for pain, function, self-image, and mental health domains, and 2 questions for the satisfaction with management domain.<sup>14</sup> Regarding content analysis, for each domain in the questionnaires, the mean, standard deviation, and range were calculated. In addition, floor and ceiling effects (when >10% of subjects respond with minimum or maximum score, respectively) were calculated.

### Reliability

Reliability assessment of the Arabic version of the SRS-22r questionnaire was assessed using Cronbach  $\alpha$  and intraclass correlation coefficient (ICC) values.<sup>5,6,9,11</sup> Cronbach  $\alpha$  coefficient provides an estimate of interval consistency that ranges from 0 to 1. Higher coefficient values correspond to higher reliability and lower standard error of measurement. Cronbach  $\alpha$  of 0.9 or more was considered excellent, 0.7 to 0.89 as good, 0.6 to 0.69 as acceptable, 0.5 to 0.59 as poor, and less than 0.5 as unacceptable. An ICC value between 0.7 and 0.8 indicates good reliability, and more than 0.8 indicates excellent reliability.

### Validity

Concurrent validity was evaluated by comparing SRS-22r domains with relevant dimensions from the SF-36

questionnaire.<sup>6</sup> Correlation was made using Pearson correlation coefficients ( $r$ ). A Pearson correlation coefficient of more than 0.7 was considered excellent, 0.5 to 0.7 as good, and less than 0.2 as poor.

Data were analyzed using SPSS 17 (New York, NY), with significance considered if  $P$  value less than 0.05.

## RESULTS

### Patients

A total of 81 patients accepted to participate and completed the study. Of these, 41 patients were randomized into group 1 and 40 patients into group 2 (Figure 1). Patient characteristics and demographics are summarized in Table 1. There were no significant differences between the 2 groups with regard to age or sex.

### Content Analysis

For the Arabic version of SRS-22r, mean domain scores ranged from 3.7 to 4.2 (Table 2). No floor effects were noted; however, ceiling effects were exhibited for the pain and satisfaction with management domains (14.6% and 26.8%, respectively). Regarding the Arabic version of SF-36, mean domain scores ranged from 64 to 85. As with the Arabic version of SRS-22r, no floor effects were noted. There were ceiling effects for 5 domains: physical functioning, role-physical, pain index, social functioning, and role-emotional (17.5%, 60%, 35%, 50%, and 75%, respectively).

### Reliability

Internal consistency for patients taking the Arabic version of SRS-22r was acceptable with a Cronbach  $\alpha$  of 0.68 (Table 3).

**TABLE 2. Descriptive Analysis of Individual Domains of Arabic Version of SRS-22 and SF-36 Questionnaires**

Questionnaire/Domain (no. of Questions)	Domain Means (SD)	Floor Score Minimum	Ceiling Score Maximum	% With Floor Effect	% With Ceiling Effect
<b>SRS-22*</b>					
Function/activity (5)	4.1 (0.51)	2.6	5	2.4	4.9
Pain (5)	4.2 (0.69)	2.2	5	2.4	14.6
Self-image/appearance (5)	3.7 (0.78)	1.8	5	2.4	4.9
Mental health (5)	3.7 (0.64)	2.6	5	4.9	2.4
Satisfaction with management (2)	4.0 (0.82)	2	5	4.9	26.8
<b>SF-36†</b>					
Physical functioning (10)	74 (25.7)	10	100	2.5	17.5
Role-physical (4)	76 (35.3)	0	100	10.0	60.0
Pain index (2)	80 (20.8)	25	100	2.5	35.0
General health perceptions (5)	67 (20.1)	30	100	2.5	7.5
Vitality (4)	64 (20.2)	20	100	2.5	7.5
Social functioning (2)	85 (18.6)	38	100	2.5	50.0
Role-emotional (3)	83 (31.1)	0	100	5.0	75.0
Mental health index (5)	72 (19.5)	16	100	2.5	2.5
*SRS-22 scale 5 = best; 1 = worst.					
†SF-36 scale 100 = best; 0 = worst.					
SRS-22 indicates Scoliosis Research Society-22; SF-36, 36-Item Short Form Health Survey.					

Three domains had good reliability: pain (0.82), self-image/appearance (0.85), and mental health (0.71). However, the reliability for the function/activity domain was poor (0.58) and that of satisfaction with management was unacceptable (0.44). The internal consistency of the SF-36 was good with Cronbach  $\alpha$  of 0.74. Physical functioning had excellent reliability (0.90), whereas all other domains had good reliability, except for

social functioning, which was unacceptable (0.46). For the test/retest reproducibility as determined by the ICC, all domains scored excellent with a range from 0.82 to 0.9 (Table 3).

**Validity**

The SRS-22r domain for function, pain, self-image/appearance, and mental health showed good (0.510) to excellent

**TABLE 3. Test/Retest Reliability and Internal Consistency Reliability of Arabic Version of SRS-22r Is Depicted With Intraclass Correlation Coefficient (n = 41) and Cronbach  $\alpha$ , respectively; in Addition the Internal Consistency Reliability SF-36 Questionnaires (n = 40)**

SRS-22r Domain	ICC	$\alpha$	SF-36 Domain	$\alpha$
Function/activity	0.87	0.58	Physical Functioning	0.90
Pain	0.90	0.82	Pain	0.74
Self-image/appearance	0.84	0.85	General health perceptions	0.70
Mental health	0.88	0.71	Mental health	0.79
Satisfaction with management	0.82	0.44	Role-physical	0.84
			Role-emotional	0.77
			Social functioning	0.46
			Vitality	0.76
SRS-22 indicates Scoliosis Research Society-22; ICC, intraclass correlation coefficient; SF-36, 36-Item Short Form Health Survey.				

**TABLE 4. Concurrent Validity of Arabic Version of SRS-22r Questionnaire Domains With That of SF-36 Questionnaire**

SF-36 Subscales	SRS-22r Domains				
	Function/Activity	Pain	Self-Image/ Appearance	Mental Health	Satisfaction With Management
Physical functioning	0.510*	0.367†			
Pain	0.489*	0.933*	0.325†	0.409*	0.384†
General health perception.	0.441*	0.491*	0.527*	0.544*	0.577*
Mental health	0.572*	0.428*		0.809*	0.360†
Role-physical	0.451*	0.556*			
Role-emotional		0.461*		0.364†	
Social functioning	0.388†			0.352†	
Vitality	0.363†	0.560*	0.560*	0.691*	0.320†

\*Correlations are significant at 0.01 level.  
†Correlations are significant at 0.05 level.  
SRS-22 indicates Scoliosis Research Society-22; SF-36, 36-Item Short Form Health Survey.

(0.933) correlation with SF-36 dimensions. These data are summarized in Table 4.

## DISCUSSION

An Arabic translation of the SRS-22r questionnaire was developed and evaluated for reliability and validity using international standards in an Arabic-speaking population of patients with idiopathic scoliosis. Previous adaptations of the SRS-22r questionnaire have been tested for reliability and validity in other languages using similar statistical methods and population sizes.<sup>5-19</sup> Furthermore, the SRS-22r was tested for validity against a previously validated Arabic version of the SF-36 health survey which is one of the most frequently used generic HRQOL questionnaires and has been previously shown to have similar characteristics and reliability.<sup>25-27</sup> Results showed that the Arabic version of the SRS-22r is reliable and correlates well with a widely used generic health questionnaire.

The Arabic version of the SRS-22r did not exhibit floor effects in any of the domains, yet there were ceiling effects in the pain and satisfaction with management domains. This was previously shown in the original version of the SRS-22r and many of its adaptations. The probable and frequently cited reason for the ceiling effect in the pain domain is that patients with idiopathic scoliosis do not experience pain because of their condition.<sup>7,15</sup> Regarding the ceiling effect in the satisfaction with management domain, one speculation in the literature is that there is a response bias because the questionnaire is usually administered by the treating orthopedic surgeon or that there was a high level of confidence in the treating medical center.<sup>7,15,19</sup> A similar effect was noted, however, in the Brazilian adaptation, despite the fact that it was administered by physical therapy students who were not involved in the treatment of patients with scoliosis.<sup>19</sup> We think that this effect

is related to the generally good results of the management of this condition.

Overall internal consistency of the Arabic version of SRS-22r was acceptable (Table 3). The domains for pain, self-image/appearance, and mental health showed good reliability. However, that of function/activity domain was poor and that of satisfaction with management was unacceptable. Lower scores in these domains have been previously reported.<sup>7</sup> The poor internal consistency of the function/activity domain may be due to multiple factors that may influence responses in this domain, as discussed by Niemeyer *et al*,<sup>7</sup> making it difficult to interpret. These factors may include educational background, financial abilities, activities, and expectation of outcomes. The low Cronbach  $\alpha$  for the satisfaction with management domain has been shown in previous studies<sup>7,20-22,28</sup>; however, it was particularly low in our case. This value could be due to the fact that the significant number of patients was treated with brace. The experience of wearing a brace in adolescent population is very unpleasant, and this would explain that why the patients did not like to repeat the brace treatment despite being satisfied with the treatment outcome.

With regard to test/retest reproducibility, all domains had excellent ICC scores, ranging from 0.82 to 0.9. These results are in line with those reported in the literature.<sup>7,16,19,20,27</sup>

The Arabic version of SRS-22r correlated well with corresponding dimensions of the Arabic version of SF-36. This was particularly true for the domains of function/activity, pain, and mental health. Correlation was not as strong for the domains of self-image/appearance and satisfaction with management. These findings have been previously reported<sup>17,25</sup> and speak for the importance of SRS-22r in evaluation of patients with scoliosis.

This study incorporates some limitations. Simple randomization might result in unequal distribution of some variables



between the groups; however, this effect was minimized by the coherency of the scoliosis population. The study was conducted in a single institution, which might limit the variety in patient population; still this institution being a referral center, welcomes patients from different regions. The concurrent validity of SRS-22r was proven using SF-36. The validity of the latter has only been proven in adult patients, despite being used for adolescent populations in several previous studies.<sup>11,15,17,25,27</sup> Unfortunately, the Arabic version of SF-36 questionnaire was the only appropriate option available. Arabic versions of HRQOL questionnaires are much needed and SRS-22r will be a good addition to this repertoire.

The Arabic version of SRS-22r is reliable, valid, and appropriate for use in Arabic-speaking patients with adolescent idiopathic scoliosis. Thus, this tool will be invaluable to clinicians and researchers working with idiopathic scoliosis patients in the Arabic-speaking populations.

### ➤ Key Points

- ❑ SRS-22r questionnaire was translated and adapted to Arabic language.
- ❑ The Arabic version of SRS-22r questionnaire was found to be valid when compared with the Arabic version of SF-36, using concurrent validity analyses, in Arabic-speaking patients with idiopathic scoliosis.
- ❑ The Arabic version of SRS-22r questionnaire was found to be reliable and reproducible in Arabic-speaking patients with idiopathic scoliosis, using Cronbach  $\alpha$  and intraclass correlation coefficient.
- ❑ This Arabic version of SRS-22r questionnaire is a valid and reliable instrument to be used by clinicians and researchers working with patients with idiopathic scoliosis for further quality of life studies.

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