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Reliability and Concurrent Validity of the Adapted Chinese Version of Scoliosis

Research Society-22 (SRS-22) Questionnaire

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ABSTRACT

Study Design. Validation study to define validity and reliability of an adapted and translated questionnaire.

Objective. Assessment of the concurrent validity and reliability of a Chinese version of SRS-22 outcome instrument.

Summary of Background Data. No valid health-related quality of life (HRQL) outcome instrument exists for patients with spinal deformity in Chinese. The modified SRS-22 questionnaire was proven to be an appropriate outcome instrument in English, and has already been translated and validated in several other languages.

Methods. The English version of the SRS-22 questionnaire was adapted to Chinese according to the International Quality of Life Assessment Project guidelines. To assess reliability, 48 subjects with adolescent idiopathic scoliosis (mean age 16.5 years) filled the questionnaire on 2 separate occasions_(Group 1). To assess concurrent validity, 50 subjects (mean age 21 years) filled in the same questionnaire and a previously validated Chinese version of the Short Form-36 (SF36) questionnaire (Group 2). Internal consistency, reproducibility and concurrent validity were determined with Cronbach's α coefficient, interclass correlation coefficient and Pearson correlation coefficient respectively.

Results. Cronbach's α coefficient for the four major domains (function/activity, pain, self-image/appearance and mental health) were high. Intraclass correlation was also excellent for all domains. For concurrent validity, excellent correlation was found in 1 domain, good in 12 domains, moderate in 3 domains and poor in 1 domain of the 17 relevant domains.

Discussion. Both cultural adaptation and linguistic translation are essential in any attempt to use a HRQL questionnaire across cultures. The Chinese version of the

SRS-22 outcome instrument has satisfactory internal consistency and excellent reproducibility. It is ready for use in clinical studies on idiopathic scoliosis in Chinese speaking societies.

KeyWords: Chinese adaptation, outcome instrument, idiopathic scoliosis, questionnaire, SRS-22, HRQL.

Mini Abstract:

Reliability and concurrent validity of the adapted Chinese version of SRS-22 questionnaire was studied. Analyses of results revealed that the Chinese version is a valid outcome instrument with high consistency and test-retest reliability.

Key Points:

- The Scoliosis Research Society health-related-quality-of-life outcomes instrument (SRS-22) was determined to be a simple, practical, disease-specific, assessment for patients with idiopathic scoliosis.
- The questionnaire was culturally adapted and translated into Chinese.
- Adapted version of SRS-22 questionnaire showed satisfactory internal consistency and excellent reproducibility.

Introduction

Scoliosis is a disease causing mainly cosmetic problems with a lesser incidence of functional deficit and pain. Previous assessment of results of treatment has largely relied on the amount of angular correction based on radiographic information. Increasing importance has been placed on the patient's perception of the deformity, their functional burden and symptoms which may influence their quality of life.

The health-related-quality-of-life (HRQL) questionnaires allow clinical professionals to explore many areas of interest, including the patient's perception of his/her condition and satisfaction with provided care. Scoliosis Research Society (SRS) Outcomes Instrument has been an accepted HRQL questionnaire to evaluate the perception of patients with spinal deformities of their status. The original SRS HRQL Outcomes Instrument was developed by Haher *et al.* to provide a simple, practical, disease-specific, assessment for patients with idiopathic scoliosis. Although sound in general concept, the original questionnaire was found to have several psychometric shortcomings, including questions requiring recall, limited response possibilities, overlapping domains, and incomplete validation¹. These have been addressed, resulting in the SRS-22 questionnaire that has been shown to have high reliability and concurrent validity in adults^{2,3} and discrimination validity and responsiveness to change in adolescents with scoliosis^{4,5}.

Being developed in an English-speaking country, the questionnaire was formulated in English and designed for a Caucasian population. It is now recognized that if outcome measures are to be used across cultures, the items must not only be translated well linguistically, but also must be adapted culturally to maintain the content validity of the instrument at a conceptual level across different cultures⁶⁻⁸.

This is because life-style differences between cultures may result in significant variations in behavioral patterns, and therefore could introduce a systematic bias to the outcome instrument if it was just simply translated. Thus in a review by Beaton et al. on cross-cultural adaptation⁸, it was recommended that when a questionnaire is applied to a different culture, language and country, cross-cultural adaptation and validation should always be performed.

Cross-cultural adaptation and validation of the SRS-22 questionnaire has been performed in both Turkey⁶ and Spain⁷. However it has not been carried out in the Chinese. China has one of the largest populations in the world. The incidence of scoliosis is around 1%⁹. No Chinese version of a HRQL questionnaire exists for spinal deformity patients. As Chinese people are culturally distinct from Caucasian, Turkish and Spanish people, it was felt important to adapt and translate the SRS-22 questionnaire into Chinese and to validate it before use. The purpose of this study was to assess the Chinese version of the SRS-22, and to determine its reliability and concurrent validity.

Materials and Methods

Adhering to the recommended protocol issued by the American Association of Orthopedic Surgeon (AAOS) Outcomes committee and outlined by Beaton et al⁸; the English version of the SRS-22 questionnaire was initially translated independently by two translators into Chinese. After comparing the two translations, discrepancies were identified and resolved by consensus. Two back-translations were performed by two other translators, without reference to the original SRS-22 questionnaire. The back-translators were neither aware nor informed of the outcome measurement in this study. All translators were bilingual, with a good command of both English and Chinese. The final form of the Chinese translation of the SRS-22 questionnaire is a consensus reached by an expert committee who are similarly bilingual and are familiar with spinal deformity. The final form of the Chinese translation of SRS-22 questionnaire is attached in appendix A.

Two surveys, one for evaluating the reliability and the other for evaluating the validity were carried out at a single center. During the first survey (Group 1), a total of 48 Chinese literate patients attending the outpatient clinic for scoliosis were selected at random. After being verbally informed of the purpose of the study, each of the patients completed the first set of the Chinese version of the SRS-22 questionnaire by themselves immediately. Each were given a second identical questionnaire with a stamped return envelop. They were instructed to complete the second questionnaire in one week's time and return it by post. This test-retest design was used to measure the temporal stability of the questionnaire, while the 7 day interval between test and retest is aimed at reducing the patient's item recall.

A second survey (Group 2) was carried out two weeks later in the same outpatient clinic, a group of 51 patients were randomly selected and given the translated

SRS-22 questionnaire. Upon completion they were given the previously validated Chinese version of the Short-Form 36 (SF-36) health survey¹⁰.

Reliability assessment of the Chinese version of the SRS-22 questionnaire was determined by calculating Cronbach α and intraclass correlation coefficient (ICC) values. Concurrent validity was evaluated by comparing SRS-22 domains with relevant domains in the SF-36 questionnaire, correlation was made using Pearson Correlation Coefficients (r).

Results

For Group 1, 36 (75%) out of 48 patients filled in and returned both questionnaires. There were 4 males and 32 females. Mean age was 16.5 years (Range: 8 – 28 years). The average time taken for the second mail-in of the questionnaire was 8 days (range 2 – 15 days).

For Group 2, 1 patient was discarded because of an incomplete questionnaire, all of the remaining 50 patients (4 males, 46 females) completed both the translated SRS-22 and SF-36 questionnaires. Mean age of patients was 21 years (range:12 – 51 years).

The score distribution for the five SRS-22 and eight SF-36 domains in terms of domain means, maximum ceiling score, minimum floor score and the ceiling and floor effect for both the translated Chinese version of SF-36 and SRS-22 can be found in Table 1. All of the domains of SRS-22 showed a low level of floor effect (<7% as defined in Table 1). However two domains (Role physical and role emotional) of SF-36 showed a high level of floor effect more than 7%. While SRS-22 demonstrates some ceiling effect in pain and function/activity, SF-36 also has a high ceiling effect on physical functioning, role-physical, pain index, social functioning and role emotional domains.

An extension of examination of the two data sets from SF-36 and SRS-22 is presented in Table 2, which shows the distribution of the SRS-22 and SF-36 domain scores by quantiles. In order for the comparison with SF-36 to be valid, the SRS-22 domain scores were rearranged into a 0 to 100 scale. For instance, the SRS-22 satisfaction with management domain had scores ranging from 20 to 100, with 25% of the surveyed patients scoring between 90 and 100 and 50% scoring between 20 and 80. There were weak spread in score distribution in SRS-22 pain, function/activity

and SF-36 physical functioning, role-physical, pain index, social functioning and role-emotional domains.

Internal consistency assessment of SRS-22 using Cronbach's α was applied to each of the 22 questions in turn, and the results are tabulated in Table 3. While very satisfactory internal consistency (Cronbach's $\alpha = 0.80-0.89$) were achieved for function/activity, pain and mental health domains; good consistency (Cronbach's $\alpha = 0.50-0.79$) was observed for self-image/appearance and satisfaction with management domains. All domains of SF-36 questionnaire showed excellent (Cronbach's $\alpha \geq 0.90$) (one domain), very satisfactory (four domains) or good (three domains)^{11, 12} internal consistency.

The test-retest reproducibility in terms of intraclass correlation was found excellent ($ICC \geq 0.75$)¹³ for all domains of SRS-22 questionnaire (see Table 4).

The concurrent validity in comparison with SF-36 appears in Table 5. Excellent ($r=0.75$ to 1) (one domain), good ($r=0.50$ to 0.75) (12 domains), moderate ($r=0.25$ to 0.50) (three domains) and poor ($r=0$ to 0.25) (one domain) correlations can be observed within the 17 relevant SF-36 and SRS-22 domains. For example, the correlation coefficient between SRS-22 function/activity and SF-36 role physical domain was 0.77 ($p<0.001$). On the other hand correlation coefficients between SRS-22 satisfaction with management and SF-36 physical functioning, role physical, pain index were 0.25, 0.25, 0.18, respectively ($p>0.05$); while moderate correlation ($r=0.49$) were demonstrated in the remaining general health perception domain ($p<0.001$).

Discussion

In this study, we have successfully adapted the SRS outcome instrument (SRS-22) to the Chinese language with a satisfactory reliability and validity. Overall, the Chinese version of SRS-22 demonstrated good metric qualities (internal consistency and test-retest reproducibility). The wide range of score distribution reflects variations in individual patient's interpretation of their treatment procedure, and more importantly, that this variation can be effectively captured by the questionnaire. Ceiling effects in the pain domain had been previously demonstrated, and it has been suggested that this might be a consequence of lack of pain in young adolescent idiopathic scoliosis patients^{2,6,7}.

The slightly lower mean overall Cronbach alpha than the original study¹⁴ (0.78 vs 0.86), reflects a trend which has been previously observed in other cross-cultural adaptations^{6,7}. The differences in the two mean Cronbach values can be due to subtle differences in living habits of people of different cultures, rather than due to problems in the translation itself.

The current study revealed a lower (Cronbach alpha 0.54) internal consistency for the satisfaction domain when compared to the SRS-22 in English, Turkish and Spanish versions. We have analyzed the possible reasons for this and after reviewing question 21 (Are you satisfied with the results of your back management?) and 22 (Would you have the same management again if you had the same condition?) of the satisfaction with management domain, we observed that, the mean score of question 21 was lower (3.6) than question 22 (4.1). We felt that this reflected that there were patients who were not completely satisfied with the results of management, but felt that they have got the best treatment possible for their condition. This is a common belief for many patients, as there are few reputed centers of excellence in the authors'

country. They therefore believed that they got the best treatment possible, although they were not completely satisfied with the cosmetic results.

The test-retest reproducibility involves only looking at the data provided by the first group of patients in the first survey while both internal-consistency and score data distribution looks at all the data collected in both surveys. Evaluation of results demonstrated excellent reproducibility with high ICC levels.

The study of concurrent validity showed satisfactory correlation coefficients when compared with SF-36 except the satisfaction with management domain. Lai et al. has demonstrated in a recent study that, SRS-22 management satisfaction/dissatisfaction domain poorly correlated with the related domains of SF-36 while the other domains showed a satisfactory correlation¹⁵. Thus, we believe that the lower correlation co-efficient in our study was a reflection of the intrinsically poor correlation of satisfaction domain of SRS-22 with the domains of SF-36, rather than a validity problem of the translated questionnaire. The other possible reason for the lower correlations in satisfaction with management domain may be due to the fact that the SF-36 questionnaire has not been validated for teenagers, while the study population included patients less than 18 years of age. Nonetheless, since SF-36 is the only adapted HRQL questionnaire in Chinese, we were limited in our choice of tools available for validation.

Recently, field survey tests of the SRS-22 questionnaire², as well as the Spanish⁶ and Turkish⁷ cross-cultural adaptations demonstrated low Cronbach's alpha values for question 15 (Are you and/or your family experiencing financial difficulties because of your back?); and question 18 (Does your back condition limit your going out with friends/family?) of the function domain. Both Turkish and Spanish studies had predominantly adolescent deformity patient populations with fewer adult patients.

This problem with questions 15 and 18 was especially for the younger subjects^{6,7,16}. The authors concluded that the perception of question 18 was difficult for young patients. They also concluded that question 15 might not be applicable for socialized countries. Thus in the Turkish version, questions 15 was cancelled while 18 was modified and a higher internal consistency for function domain was obtained in the second field survey⁶. This was followed by revision of the original English SRS-22 and the refined SRS-22 was obtained¹⁶. In the refined SRS-22 questionnaire, the authors changed only the stem and the responses of questionnaire 18 and did not cancel question 15. In their survey with the refined questionnaire, Cronbach's alpha value of the function domain was found more powerful not only for idiopathic scoliosis patients but also in other spinal disorders¹⁶. On the other hand, Bridwell et al. reported high internal consistency and excellent test/retest reliability for the adult spinal deformity population. They found SRS-22 instrument more effective and specific than the Oswestry and SF-12 for this particular group of patients³.

In the current study we have adapted the SRS-22 into the Chinese language and culture, as this was the published version at the start of this study. Interestingly, in the current study Cronbach's alpha values for questions 15 and 18 of the function domain have been found to be excellent as 0.86 and 0.83 respectively, when compared to the original⁶ and the translated forms^{2,3} of the SRS 22 questionnaire although the patient population was similar including predominantly adolescent patients with fewer adults. Because of this, we agree with Asher et al. to retain Question 15 in its original form, and we also do not see a need to alter Question 18 as done in the refined SRS-22 questionnaire¹⁶.

It should be noted that the current questionnaire was adapted using an urban population in a cosmopolitan city in one part of China. It is recognized that the

Chinese population is very diverse, and the applicability of this questionnaire to, for instance, rural populations is not known. However, the same limitation would apply to the original and other translated questionnaires.

In conclusion, it is well accepted that both cultural adaptation and linguistic translation are essential in any attempt to use a HRQL questionnaire across cultures, such that the content validity of the instrument under adaptation can be maintained at a constant conceptual level. The tests being performed in this study showed that the translated Chinese version of the Scoliosis Research Society (SRS) Outcomes Instrument is an internally consistent, easily reproducible, robust ordinal measure which is equivalent to the original, and suitable for use in Chinese patients with idiopathic scoliosis.

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Table 1. Descriptive Statistics on Individual Domain Scores (n=50)

Questionnaire/Domain(No. Questions)	Domain Means (SD)	Floor Score Minimum ⁺	% With Floor Effect	% With Ceiling Effect
SRS-22*				
Function/activity (5)	4.5 (.69)	1.8	2.0	44.0
Pain (5)	4.4 (.73)	1.6	2.0	30.0
Self-image/appearance (5)	3.8 (.64)	2.2	4.0	2.0
Mental health (5)	4.1 (.80)	1.8	4.0	18.0
Satisfaction with management (2)	3.9 (.75)	1.0	2.0	10.0
SF-36**				
Physical functioning (10)	81.7 (20.5)	35	6.0	32.0
Role-physical (4)	70.5 (38.4)	0	16.0	54.0
Pain index (2)	77.3 (25.3)	22.5	2.0	40.0
General health perceptions (5)	64.3 (22.1)	5	2.0	4.0
Vitality (4)	61.4 (18.5)	5	2.0	2.0
Social functioning (2)	76.5 (23.4)	12.5	2.0	42.0
Role-emotional (3)	72.0 (36.5)	0	14.0	54.0
Mental health index (5)	71.4 (17.6)	12	2.0	2.0

*SRS-22 scale 5=best; 1=worst.

**SF-36 scale 100=best; 0 =worst.

⁺ In each domain a ceiling score, 100 for SF-36 and 5 for SRS-22 except Self-image/appearance domain (4.8).

Table 2. Distribution of the SRS-22 and SF-36 Domain Scores by Quantiles

Quantiles	Pain	Self-Image	Function/Activity	Mental Health	Satisfaction with Management
SRS-22 Domains					
100%	100	96	100	100	100
75%	100	85	100	96	90
50%	88	78	96	86	80
25%	84	68	87	76	70
0%	32	44	36	36	20

Quantiles	Physical Function	Role Physical	Pain	General Health	Vitality	Social Function	Role Emotional	Mental Health
SF-36 Domains								
100%	100	100	100	100	100	100	100	100
75%	100	100	100	80	71.25	100	100	84
50%	85	100	90	65	62.5	75	100	72
25%	73.8	50	57.5	53.8	50	50	58.33	59
0%	35	0	22.5	5	5	12.5	0	12

Table 3. Internal Consistency Reliability (Cronbach's α)

SRS-22 Domain	α	SF-36 Domain	α
Function/activity	0.86	Physical functioning	0.90
Pain	0.87	Role-physical	0.85
Self-image/appearance	0.78	Pain index	0.87
Mental health	0.87	General health perceptions	0.85
Satisfaction with management	0.53	Vitality	0.75
		Social functioning	0.64
		Role-emotional	0.74
		Mental health index	0.83

Table 4. Test/Retest Reproducibility as Determined by the Intraclass Correlation Coefficient (n=36)

SRS-22 Domain	ICC
Function/activity	0.83
Pain	0.76
Self-image/appearance	0.79
Mental health	0.84
Satisfaction with management	0.82

Table 5. Concurrent Validity of SRS-22 Domains with Relevant SF-36 Domains as Determined by Pearson Correlation Coefficients (n=50)

SRS-22 Domain	SF-36 Domain	Pearson r
Function/activity	Role-physical	0.77
	Physical functioning	0.73
	Pain index	0.62
	General health perceptions	0.59
Pain	Pain index	0.72
	Role-physical	0.54
	Physical functioning	0.68
Self-image/appearance	General health perceptions	0.62
	Social functioning	0.59
	Physical functioning	0.50
Mental health	Mental health index	0.67
	Social functioning	0.57
	Vitality	0.66
Satisfaction with management	Physical functioning	0.25*
	Role-physical	0.24*
	Pain index	0.18*
	General health perceptions	0.49

*Not Significant (p>0.05)

SRS-22 病人問卷

姓名:_____ 出生日期:_____年 月 日

日期:_____ 性別: 男 / 女
年 月 日

電話:_____ 年齡:_____ + _____
歲 月

病歷記錄#:_____

指示: 我們正在小心評估你背部的情況，因此問卷上的每一條問題必須由你親自回答。
請在每一條問題所提供的選擇中，小心圈出你認為最正確的一個答案。

一. 以下哪一項最能夠準確描述你在過去六個月所感受到痛楚的程度？

- 無痛楚
- 輕微
- 中等
- 中等至嚴重
- 嚴重

二. 以下哪一項最能夠準確描述你在過去一個月所感受到痛楚的程度？

- 無痛楚
- 輕微
- 中等
- 中等至嚴重
- 嚴重

三. 整體來說，在過去六個月期間你有感到十分焦慮嗎？

- 完全沒有
- 小部份時間
- 有時
- 大部份時間
- 全部時間

(轉下頁)

四. 如果你必須在背部維持現狀不變的情況下繼續生活，你會有甚麼感受？

- 十分愉快
- 某程度上愉快
- 沒有愉快或不愉快
- 某程度上不愉快
- 十分不愉快

五. 你現時的活動能力如何？

- 只限於床上
- 基本上不能活動
- 些微的運動及勞動
- 有限度的運動及勞動
- 活動不受限制

六. 你在穿上衣服後的外觀如何？

- 很好
- 好
- 可以接受
- 差勁
- 十分差勁

七. 在過去六個月期間你會感到十分沮喪以至於任何事物也不能讓你開懷嗎？

- 經常
- 大多數時間
- 有時
- 很少數時間
- 完全沒有

八. 你在休息時背部有感到疼痛嗎？

- 經常
- 大多數時間
- 有時
- 很少數時間
- 完全沒有

(轉下頁)

九. 你現時在工作/學校的活動能力為多少？

正常的 100%

正常的 75%

正常的 50%

正常的 25%

正常的 0%

十. 以下哪一項最能夠描述你軀幹的外觀？(軀幹的定義為人的身體除去頭部及四肢)

很好

好

可以接受

差勁

十分差勁

十一. 下例哪一項最能準確地描述你因背部疼痛而所需要服用的藥物？

無

一般止痛藥 (每星期服用一次或更少)

一般止痛藥 (天天服用)

特效止痛藥 (每星期服用一次或更少)

特效止痛藥 (天天服用)

其他: _____

藥物名稱

使用程度(每星期或更少或天天)

十二. 你的背部疼痛有否影響你做家務的能力？

沒有

少許

某程度上有

很大程度上有

經常有

十三. 整體來說，你在過去六個月期間有感到安寧和平靜嗎？

經常

大多數時間

有時

很少數時間

完全沒有

(轉下頁)

十四. 你有否感到你背部的狀況對你的人際關係構成影響？

- 沒有
- 少許
- 某程度上有
- 很大程度上有
- 經常有

十五. 你以及/或你的家人有否因為你背部的問題而在經濟方面遇到困難？

- 極有
- 很大程度上有
- 某程度上有
- 少許
- 沒有

十六. 整體來說，在過去六個月期間你有否感到失落和灰心？

- 完全沒有
- 很少數時間
- 有時
- 大多數時間
- 經常

十七. 在過去三個月期間你有否因背痛而向學校/公司請假？如有，共有多少天？

- 零天
- 一天
- 兩天
- 三天
- 四天或以上

十八. 你背部的狀況有否阻礙你和家人/朋友外出？

- 從來沒有
- 很少數時間
- 有時
- 大多數時間
- 經常

(轉下頁)

十九. 你現時背部的狀況會否讓你覺得自己仍有吸引力？

會，很有吸引力

會，某程度上有吸引力

無影響

否，沒有甚麼吸引力

否，完全沒有吸引力

二十. 整體來說，你在過去的六個月裏感到愉快嗎？

完全沒有

很少數時間

有時

大多數時間

經常

二十一. 你對你背部治療的成效感到滿意嗎？

十分滿意

滿意

不是滿意也不是不滿意

不滿意

非常不滿意

二十二. 如果你的背部再次遇到同類的情況你會否接受同樣的治理？

一定會

可能會

不清楚

可能不會

一定不會

多謝你的合作，如有任何意見請填寫在以下的空位上。

~問卷完~