Reliability of the Scoliosis Research Society-22 Patient Questionnaire (Italian version) in mild adolescent vertebral deformities

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Aim. The reliability evaluation of the Italian version of the Scoliosis Research Society-22 Patient Questionnaire (SRS-22-I), administered to adolescents with mild vertebral deformities, is evaluated.

Methods. Study design: forward-backward translation, pretest, final version according to a focus-group evaluation, and 1 week test/retest. Population: pretest: 35 subjects (22 females), age range 8.5-19 years, 28 idiopathic scoliosis (17°±7°), 7 hyperkyphosis (54°±4°); test/retest: 20 subjects (11 females), age range 12-17.5 years, 15 idiopathic scoliosis (16°±8°), 5 hyperkyphosis (55°±5°). Statistical analysis: Spearman rank test, percent of agreement. Statistical significance: 0.05. Software: Statgraphics 3.0. We calculated the results of the questionnaire and performed the statistical analysis using non parametric test because of the charcteristics of the data: this differ from previously published results.

Results. Response rate was 100%. Total score: median 4 (range 3-5); results for different domains (median, range): function/activity 4 (3-5), pain 5 (3-5), self image/appearance 3 (2-5), mental health 4 (3-5), satisfaction with management 4 (2-5). Time required to answer the questionnaire ranged from 5 to 20'; for 12 to 17.5 years old subjects from 5 to 10'. pretest showed difficulties with questions on pain; the questionnaire was changed accordingly. Spearman's rho ranged from 0.42 to 1, not significantly different from null value for questions 12 and 21. Percent of agreement (evaluated only for question 11a) was 100%. The ceiling and floor effects have been found high.

Conclusion. The SRS-22-I was found to be reliable for young patients with mild vertebral deformities of different type. Lack of reliability for questions 12 and 21 should be better understood. Until now the psychometric properties of SRS-22 questionnaire have been evaluated only in USA populations, and in idiopathic scoliosis. Moreover, only one study has been proposed including patients with mild idiopathic scoliosis. This, together with the non-parametric statistical analysis used, could explain the high ceiling and floor effects we found in our data.

Key words: **Scoliosis - Rehabilitation - Questionnaires.**

Once diagnosed, idiopathic scoliosis can develop during adolescence in more than 85% of cases [1, 2] and requires treatment to be stopped. Both surgical and conservative treatments cause, respectively, permanent and transient disability, having a high psychological impact, often underestimated by health professions, even if they are relevant for patients and their families.[3, 4]

To entirely understand the scoliosis problem we have to go beyond its biological aspects, considering the adolescent's point of view, that is the most important to obtain a good compliance to the treatment. Patients' perceptions of several aspects of their health condition and the outcome of its management are crucial for final results.[4] Anyway, these results go beyond the simple clinical and, above all, strictly radiological

evaluation.[5] These results can be assessed by health related quality of life (HRQL) questionnaires: much remains to be discovered about population health in comprehensive terms of functional health and well-being, regarding the relative burden of disease, and the specific benefits of selected treatments.[5]

Advances and in-depth research have been largely conducted over these last few years for finding satisfying methods able to describe patients' subjective health status perceptions: today several valid and reliable patient-based tools are available. The most famous and world-known is the SF-36,[6] which has been employed in more than 1 000 indexed studies, and adopted because of its brevity and of its comprehensiveness.[7] The usefulness of the SF-36 in estimating disease burden is illustrated in many articles describing more than 130 diseases and conditions: among the most frequent, with more than 20 SF-36 English-speaking publications each, are arthritis, back pain, depression, hypertension and diabetes.[7] Translation, subsequent validation and reliability studies gave rise to many other indexed and not-indexed articles.[8-10]

The SF-36 is a generic HRQL questionnaire, but in specific diseases the usefulness of specific HRQL evaluations has been shown. In the field of scoliosis treatment, many efforts in this direction have been made by the Scoliosis Research Society.[11] The original Scoliosis Research Society HRQL questionnaire has been first produced by Haher *et al.* in 1999 [12] to provide a simple, direct, disease-specific, patient-based assessment for patients with idiopathic scoliosis. This first HRQL questionnaire demonstrated satisfactory internal consistency for all 7 domains and reproducibility for 3 of the domains in which it was divided.[12] Anyway, this HRQL scoliosis questionnaire needed important improvements and modifications in the following years.[13]

The results of these changes led to the Scoliosis Research Society-22 Patient Questionnaire (SRS-22), published in the past year by Asher *et al.*[14-16] This new questionnaire, named SRS-22 Patient Questionnaire, includes 5 domains. The domains and the number of the questions (reported in parenthesis) in each domain are the following: function/activity (5), pain (5), self-image/appearance (5), mental health (5) and satisfaction with management (2). The combination of the first 4 domains is labelled subtotal. The mental health questions were adapted with permission from SF-36. For each question, the scoring scale ranged

from 5 (best) to 1 (worst).[14] The SRS-22 patient questionnaire gained good score distribution, internal consistency, reproducibility, concurrent and discriminant validity,[14, 15] being shorter and more focused on the health issues related to adolescent idiopathic scoliosis (AIS) than SF-36. The SRS-22 patient questionnaire obtained a satisfying level of acceptance to be used and safely developed in pre/post surgical AIS English-speaking patients, for both clinical and research decisions.[15, 16]

The aim of this study was to develop an Italian version of the Scoliosis Research Society-22 Patient Questionnaire (SRS-22-I), and to verify its reliability and applicability in Italian adolescents with mild vertebral deformities in everyday clinical practice.

Materials and methods

We performed a forward-backward translation of the English version of the questionnaire, made both by an expert of scoliosis and a mother-tongue translator: a focus-group evaluation (group composed by senior and junior researchers, translator and statistician) produced the first version of the questionnaire. A pretest assessment was performed on the pretest group (PTG): self-compiled the questionnaire in presence of one researcher, which was there to receive his suggestions and identify his difficulties with any single questions. Consequently, the actual version of the questionnaire (named SRS-22-I, Appendix A) was produced after a second focus group evaluation (group now composed by senior and junior researchers, and statistician): its reliability was finally evaluated through test-retest in a second sample of patients, the test/retest group (TTG). In this phase, according to the original instructions, the questionnaire was self-compiled by the patients together with their parents in the waiting room, immediately after medical evaluation. Patients were asked to answer with no more instructions then those written on top of the questionnaire. The help of a researcher was available, but never required. Retest was performed at home after 7 days. The complete characteristics of PTG and TTG are reported in Table I.

Due to the nominal or ordinal nature of our data,[17] we choose to perform the statistical analysis according to a nonparametric approach using Spearman rank test (percent of agreement for question 11A and 11B).

TABLE I.—*Characteristics of the population.*

	Pre-test group (PTG)	Test-retest group (TRG)
Number	35	20
	(22 females)	(11 females)
Age (range)	8.5-19	12-17.5
Number of scoliotic patients	28	15
Cobb angle (mean±standard deviation)	17°±7°	16°±8°
Number of hyperkyphotic patients	7	5
Cobb angle (mean±standard deviation)	54°±4°	55°±5°

TABLE II.—*Question 11: comparison of the English and Italian version.*

English	Italian
11. Which one of the following best describes your medication usage for your back? — None — Non-narcotics weekly or less (*e.g.*, aspirin, Tylenol, Ibuprofen) — Narcotics daily — Other .... — Non-narcotics daily	11. A) Utilizzi farmaci per la tua schiena? — No — Sì B) Se hai risposto sì, quali? — .... C) Se hai risposto sì, con che frequenza? — Settimanalmente — Quotidianamente

Statistical significance was set at 0.05. Software used included Excel 7.0 and Statgraphics 3.0.

Results

The response rate was 100% in both populations and time required to answer the questionnaire ranged from 5 to 20 s in the PTG (which included also younger subjects) and from 5 to 10 s in the TTG.

During the pretest phase, patients gave some suggestions on the way questions had been written: there-

TABLE III.—*Statistical results of test/retest evaluation.*

Question	Spearman's ρ	p-value
d1	0.9862	0.0000
d2	0.9051	0.0001
d3	0.7739	0.0007
d4	0.9315	0.0000
d5	0.5322	0.0203
d6	0.7027	0.0022
d7	0.6458	0.0049
d8	0.6717	0.0034
d9	0.9295	0.0001
d10	0.5614	0.0144
d12	0.4239	0.0646*
d33	0.8175	0.0004
d14	0.8827	0.0001
d15	0.9761	0.0000
d16	0.5439	0.0177
d17	1	0.0000
d18	1	0.0000
d19	0.8217	0.0003
d20	0.9185	0.0001
d21	0.2218	0.3336*
d22	0.5787	0.0117

fore the instructions for compilation and the questions 1, 2, 7, 12, 13, 19, and 20 were slightly changed, while the questions 5, 6, 10 and 11 were completely changed to produce the final version. All these variations were related only to the translation of the questionnaire and did not change its general structure, with only one possible exception: in fact, the way question 11 was asked in English could not be proposed in Italian without medical explanations and we changed it slightly from the original (Table II).

The subjects required no explanations during the test phase. In the TTG, Spearman's rho ranged from 0.42 to 1, and it was not significantly different from null value for questions 12 and 21, belonging, respectively, to function/activity and satisfaction with management domains (Table III): it must be considered that

TABLE IV.

Domains	Min score	Floor effect		Max score	Ceiling effect	
		Italian version	USA version		Italian version	USA version
Function	3	5.7%	1.7	5	48.6%	5.2
Pain	4	25.7%	1.7	5	74.3%	20.7
Self-image	2	2.9%	1.7	5	8.6%	8.6
Mental health	3	11.4%	1.7	5	34.3%	15.5
Satisfaction with treatment	2	2.9%	1.7	5	20.0%	56.9
Total	68	5.7%		94	2.9%	
Single questions		14.7%			45.7%	

the p-value for question 12 was 0.06. Percent of agreement was evaluated only for question 11a, where all subjects answered "no", and was 100%. The floor/ceiling effect we found are reported in Table IV, compared with those of the original USA version (the last one have been obtained using the average to calculate the domains, while in our results we used the median, coherently with the data analyzed).

Looking at the results from a clinical point of view, the total score (median, range) was 4 (3-5), while the results for the 5 different domains were, respectively: function/activity 4 (range 3-5), pain 5 (3-5), self image/appearance 3 (2-5), mental health 4 (3-5), satisfaction with management 4 (2-5).

Discussion and conclusions

Scoliosis treatment cannot longer be considered (as) only a mere radiographic treatment: there are core aspects such as patients' satisfaction, psychological problems, quality of life etc.,[4] that all need to be to assessed and followed-up.

The well-known SF-36 is a useful instrument for studying general population, individuating the relative burden of diseases, differentiating the health benefits produced by a wide range of different treatments, and screening different patients.[7] However, the SF-36 is a multipurpose, generic health survey, that yields an 8-scale profile of scores as well as physical and mental health summary evaluation, opposed to questionnaires that target a specific age, disease, and treatment group, like AIS patients.[6]

The latest version of the American SRS-22 patient questionnaire has been strongly advocated to go beyond this limits:[13] this questionnaire proved to be highly tailored to this particular kind of patients and age, to their physical changes according to treatment (both surgical and conservative), to their psychological problems, and above all to their quality of life expectations.[14-16]

This study has been developed with clear intents. It may compare the Italian results with the results existing in the original version in the effort of verifying the reliability of this HRQL questionnaire for mild AIS Italian patients. We did not find problems during the forward-backward translation phase, reaching the final Italian version according to an expert group evaluation. Patients in the PTG demonstrated some difficulties, and the Italian version of the questionnaire was

changed accordingly. May be this could depend on the fact that our target was strictly mild idiopathic scoliosis: in this phase, pain is not as frequent as in the pre-surgical (or postsurgical) phase can be.

The questionnaire showed to be repeatable, with the exceptions of question 12 and 21. As happened in the original SRS-22 version,[14] the SRS-22-I demonstrated to be easily understandable and answerable in time (also for younger patients), repeatable, and reliable.

Asher *et al.* too found difficulties in the assessment of satisfaction with treatment [15] (question 21) but there are differences with the previous study: all our patients underwent conservative treatment (only exercise or exercise and brace treatment) and not also surgery; moreover, the questionnaires were self-compiled and not administered through interviews made by the surgeons. Anyway, in our study we had a change of setting (compilation at home *vs* in the waiting room of the Scoliosis Centre) that could drive to variations when asking about satisfaction with treatment (question 21), but also when looking at interference with everyday home activities (question 12). In this last case, it is also possible that the questionnaire produced attention to changes not even discovered before, or that the results of the visit drove to changes in everyday life not understood immediately after the medical evaluation. Nevertheless, even if the tendency toward significance of question 12 was clear, our results in this case should be deepened in future studies, while the answers to question 21 should be looked with great cautiousness.

When compared to Asher's results,[14] we have found satisfying clinical results in the self-image/appearance, pain and mental health domains: these results may depend upon the fact that mild idiopathic scoliosis produces a lower perception of the spinal deformities than presurgical conditions can determine. The self-image/appearance domain of SRS-22 patient questionnaire is not found in SF-36 HRQL questionnaire, being of greatest importance in scoliotic patients.[14] We must underline the ceiling effect we verified in our population, were the lowest answer was 2, and only in 2 domains (self image/appearance and satisfaction with management), while in the others it was 3. This is likely due to the low-medium degree of scoliosis considered in our sample: in future studies in this kind of population this result should be taken in account, even if changing the scale could drive to difficulties comparing the data internationally.

Another difference between our study and the pre-

vious one can be found for the age: Asher's results ranged from 10 to 16 years old subjects,[14-16] while we selected 8.5 to 19 years old subjects, proving the SRS-22-I reliability also in these 2 extremes of childhood and adolescence, respectively. Moreover, we included also hyperkyphotic patients.

The information gathered through this type of questionnaire can be of great importance, particularly when critical therapeutic decisions are advocated, dealing with the adolescent's perceptions, which in most cases are not easily understood during the few minutes of the visit. Asher concluded that SRS-22 patient questionnaire may become important in decision making for or against surgery.[16] We agree with him, but we also foresee this questionnaire decisive for all other therapeutic decisions, including the patient's own aesthetic decisions.

In conclusion, the SRS-22-I was found to be reliable for young Italian patients with mild vertebral deformities of different type, although the ceiling effect and not all questions proved to be without any problem. This is the first reliability study for a translated version of the original questionnaire in a non-English language: till now the SRS-22 questionnaire has been studied and applied only in USA populations, and particularly in pre/post surgical idiopathic scoliosis; moreover, only one study has been proposed including patients with mild idiopathic scoliosis.[16] The SRS-22-I proved to be suitable for self-administration, while computerized administration or administration by trained interviewers (in person or by telephone) to person aged 10 years and older should be evaluated in the future. We strongly recommend the everyday use of this questionnaire, which could bring many interesting information in research, but also in everyday clinics.

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APPENDICE A

Questionario SRS-22 - Versione Italiana

Istruzioni: stiamo valutando le condizioni di salute della tua schiena ed è perciò importante
che tu risponda a ognuna di queste domande da solo.
Per favore, segna per ogni domanda la risposta che ritieni più adeguata

1. Quale termine descrive meglio il dolore di cui hai sofferto negli ultimi sei mesi:
   ❏ nessuno
   ❏ lieve
   ❏ moderato
   ❏ da moderato a grave
   ❏ grave

2. Quale termine descrive meglio il dolore di cui hai sofferto nell'ultimo mese:
   ❏ nessuno
   ❏ lieve
   ❏ moderato
   ❏ da moderato a grave
   ❏ grave

3. Durante gli ultimi 6 mesi sei stato/a molto nervoso/a?
   ❏ mai
   ❏ poche volte
   ❏ qualche volta
   ❏ molte volte
   ❏ sempre

4. Se l'aspetto estetico della tua schiena dovesse restare quello attuale per il resto della tua vita, come ti sentiresti?
   ❏ molto felice
   ❏ abbastanza felice
   ❏ né felice né infelice
   ❏ abbastanza infelice
   ❏ molto infelice

5. Riesci a fare normalmente le tue attività quotidiane?
   ❏ no resto a letto
   ❏ fondamentalmente non faccio nulla
   ❏ poco lavoro e poco sport
   ❏ moderato lavoro e moderato sport
   ❏ faccio qualunque cosa senza limitazioni

6. Qual è il tuo aspetto quando sei vestito/a?
   ❏ molto bello
   ❏ bello
   ❏ né bello né brutto
   ❏ brutto
   ❏ molto brutto

7. Negli ultimi 6 mesi sei stato/a così depresso/a da non riuscire a reagire?
   ❏ molto spesso
   ❏ spesso
   ❏ qualche volta
   ❏ raramente
   ❏ mai

8. Hai mal di schiena a riposo?
   ❏ molto spesso
   ❏ spesso
   ❏ qualche volta
   ❏ raramente
   ❏ mai

9. Qual è il tuo attuale livello di attività lavorativa/scolastica?
   ❏ 100% del normale
   ❏ 75% del normale
   ❏ 50% del normale
   ❏ 25% del normale
   ❏ 0% del normale

10. Quale di questi termini meglio descrive l'aspetto del tuo tronco (ossia del tuo corpo, esclusi la testa e gli arti)?
    ❏ molto bello
    ❏ bello
    ❏ né bello né brutto
    ❏ brutto
    ❏ molto brutto

11. A. Utilizzi farmaci per la tua schiena?
   ❏ no
   ❏ sì
   B. Se hai risposto sì, quali ?
   ……………………………
   C. Se hai risposto sì, con che frequenza?
   ❏ Settimanalmente
   ❏ Quotidianamente

12. La tua schiena limita in qualche modo le tue attività in casa?
   ❏ mai
   ❏ raramente
   ❏ qualche volta
   ❏ spesso
   ❏ molto spesso

13. Ti sei sentito/a calmo/a e tranquillo/a negli ultimi 6 mesi?
   ❏ sempre
   ❏ molte volte
   ❏ qualche volta
   ❏ poche volte
   ❏ mai

14. Pensi che la condizione della tua schiena interferisca con le tue relazioni personali?
   ❏ no
   ❏ poco
   ❏ discretamente
   ❏ molto
   ❏ moltissimo

15. Tu e/o la tua famiglia state vivendo delle difficoltà economiche a causa della tua schiena?
   ❏ gravi
   ❏ da moderate a gravi
   ❏ moderate
   ❏ lievi
   ❏ no

16. Negli ultimi 6 mesi ti sei mai sentito/a disperato/a e affranto/a?
   ❏ mai
   ❏ raramente
   ❏ qualche volta
   ❏ spesso
   ❏ molto spesso

17. Negli ultimi 3 mesi ti sei mai assentato/a dal lavoro/scuola per il mal di schiena e se così è stato per quanti giorni ti sei assentato/a?
   ❏ 0
   ❏ 1
   ❏ 2
   ❏ 3
   ❏ 4 o più

18. Esci di più o di meno rispetto ai tuoi amici?
   ❏ molto di più
   ❏ di più
   ❏ allo stesso modo
   ❏ di meno
   ❏ molto di meno

19. Data la condizione attuale della tua schiena ti senti attraente?
   ❏ sì molto
   ❏ sì abbastanza
   ❏ né attraente né non attraente
   ❏ no non molto
   ❏ no per niente

20. Sei stato/a felice negli ultimi 6 mesi?
   ❏ mai
   ❏ poche volte
   ❏ qualche volta
   ❏ molte volte
   ❏ sempre

21. Sei soddisfatto dei risultati del trattamento della tua schiena?
   ❏ molto soddisfatto
   ❏ soddisfatto
   ❏ né soddisfatto né insoddisfatto
   ❏ insoddisfatto
   ❏ molto insoddisfatto

22. Ti sottoporresti ancora allo stesso trattamento se ti trovassi nella stessa condizione?
   ❏ assolutamente sì
   ❏ probabilmente sì
   ❏ non sono sicuro
   ❏ probabilmente no
   ❏ assolutamente no