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ORIGINAL ARTICLE

Adaptation and validation of the Spanish self-report version of the Spinal Cord Independence Measure (SCIM III)

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Study design: This is a cross-sectional validation study.

Objective: The objective of this study was to adapt and validate a self-report version of the Spinal Cord Independence Measure (SCIM III) for the Spanish population.

Methods: A cross-cultural adaptation of the self-report version of the SCIM III for the Spanish population was performed on the basis of international guidelines. A total of 100 patients with spinal cord injury (SCI) were recruited. A team of healthcare professionals administered the SCIM III by observation. In addition, the patients completed the Spanish self-report version (eSCIM-SR). Data from both questionnaires were analysed jointly.

Results: A high correlation was observed between SCIM III and eSCIM-SR. Lin's concordance correlation coefficient for the global score was 0.998 (95% confidence interval: 0.997, 0.998), and the subscale scores were 0.988 (0.982, 0.992) for self-care, 0.992 (0.988, 0.995) for respiration and sphincter management and 0.997 (0.995, 0.998) for Mobility. Bland–Altman plots showed a small bias of − 0.32 (95% limits of agreement: − 3.01, 2.37). The estimated bias was low in all three domains, with values of − 0.22 (−2.12, 1.68), − 0.1 (−2.02, 1.82) and − 0.03 (–1.69, 1.63) for the self-care, respiration and sphincter management and mobility subscales, respectively.

Conclusion: Our study validates the eSCIM-SR as a tool for the functional assessment of patients with SCI, principally in the outpatient setting.

INTRODUCTION

Short- and long-term complications in patients with spinal cord injury (SCI) cause significant disability and diminish functional abilities that must be accurately assessed using scales that have been designed specifically for this purpose. It is particularly important to evaluate patient functional status and objectively assess treatment effectiveness in rehabilitation medicine.[1]

In this regard, the third version of the Spinal Cord Independence Measure (SCIM III) has demonstrated satisfactory psychometric properties, reliability, validity and sensitivity to functional changes in multicentre studies. It is the only scale that was specifically designed to evaluate the functional capacity of patients with SCI.[2–7]

The SCIM III evaluates three specific and highly relevant functional areas in patients with SCI: self-care (six items, scores range from 0 to 20), respiration and sphincter management (four items, scores range from 0 to 40) and mobility (nine items, scores range from 0 to 40). Each subscore is scored according to its proportional weight in the patient's overall activity. The total score of the scale is 100 points, with higher scores indicating higher levels of functional independence. A team of healthcare professionals evaluates the patients by observation.[8] Administration of the scale by observation requires time and is primarily performed in the hospital setting.[3]

In light of the need for an instrument to assess SCI patients' functional independence that consumes fewer resources with rapid data collection using little effort, and that can be administered regardless of setting, in Switzerland in 2013 Fekete et al.[9] developed a self-report version of the SCIM III (SCIM-SR) in German. The new scale consists of 17 items (4 of which have multiple choices) and the same subscales as the SCIM III. Both scales and their scores are equivalent. With a sample of 100 patients with SCI, Fekete et al. achieved a high correlation with the professional-rated SCIM III scale. The SCIM-SR has proven to be an important instrument for evaluating SCI patients' functional status in the long term and can even be performed in their own homes.

The SCIM-SR has been translated into English, French and Italian, but only the German version has been validated. Before its use in clinical care and research, it must be validated for different countries and cultures.[10]

The aim of this work is to perform a transcultural adaptation and validation of the SCIM-SR for the Spanish population as a tool to measure functional capacity in patients with SCI.

MATERIALS AND METHODS

This cross-sectional validation study was approved by the Clinical Research Ethics Board of the Hospital Universitario y Politécnico La Fe de Valencia,

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Spain. The use of the SCIM-SR was authorised by Fekete. Verbal informed consent was obtained from all study participants before their inclusion.

This study includes two well-defined parts: transcultural adaptation and validation.

Transcultural Adaptation

The translation and transcultural adaptation of the scale were conducted in accordance with the international guidelines and proposals put forth by Sperber,[11] as detailed below.

Translation into Spanish. Two professional, native Spanish-speaking translators who were members of the Interuniversity Institute of Applied Modern Languages (IULMA) at the University of Valencia made two independent translations of the English version of the SCIM-SR.[9] Each translator provided a written report that the study authors combined into a single Spanish version.

Back translation. The Spanish version of the SCIM-SR was translated back into English by two other professional translators from the Translation Service at the Hospital Universitario y Politécnico La Fe de Valencia. Both translators were native English speakers and were unaware of the original English version of the questionnaire. Each translator provided a different report that the study authors again combined into a single English version.

Linguistic validation. Thirty reviewers with a high level of English who were specialised translation students at the Faculty of Philology, Translation, and Communication at the University of Valencia, Spain, independently compared each item of the new English version with the original questionnaire. The purpose of this process was to identify potentially problematic items so that they could be re-translated until they were interpreted in the same way in both languages. Two scales were used: one to analyse the comparability of the language and another to analyse the similarity of its interpretability. Both were Likert-type scales and were scored from 1 (extremely comparable/extremely similar) to 7 (not comparable at all/not similar at all). A mean score was obtained for each item. Items with a mean score of three or less were directly incorporated into the Spanish version, whereas items with a mean score >3 were revised and translated again until a mean score of 3 or less was obtained.

This phase was considered complete only when all of the items reached a mean score of 3 or less.

Pilot study. The Spanish version of the SCIM-SR (eSCIM-SR) was tested in 20 subjects who had been diagnosed with SCI. Each subject provided feedback regarding his/her understanding of the questionnaire, which was used to make final corrections. The study authors discussed the information obtained. Once these changes were made, the final Spanish version was obtained.

Validation of the Spanish version of the SCIM-SR

Patients. A total of 100 patients with SCI who were aged over 18 years and cared for at the Spinal Cord Unit at the Hospital Universitario y Politécnico la Fe de Valencia between February and April 2014 were included in this study. The inclusion criteria were inpatients or outpatients with either traumatic or non-traumatic SCI, a time since the injury of ⩾1 month, a sufficient level of Spanish (tested by the study authors before study inclusion) and the ability to read and answer questions from a questionnaire without assistance. Individuals with severe health issues or cognitive impairment, or those who had undergone surgery within seven days before the study, were excluded.

Procedure. Researchers who were experienced with the use of the SCIM III and had a high level of English administered the English questionnaire by observation to each study participant. Patients were then given the eSCIM-SR to be completed independently or with writing assistance if the level of their injury impeded the use of a pen. No more than three days elapsed between completion of the SCIM III and eSCIM-SR.

Sociodemographic (age, gender and education level) and injury-related (date, aetiology and vertebral level) data were recorded, as was whether the patients were inpatients or outpatients.

We declare that all applicable institutional and governmental regulations concerning the ethical use of human volunteers were followed during the course of this research.

Statistical analysis. From the collected data, we calculated the mean, s.d., median and first and third quartiles in the case of numeric variables and relative frequencies in the case of categorical variables. Concordance between the original SCIM III and Spanish self-report version was assessed by Lin's[12] concordance correlation coefficient and by Bland–Altman plots.[13] The mean bias and 95% limits of agreement between both tests were also estimated. In addition to overall agreement, partial concordance among the different domains of the questionnaires was assessed using the same approaches. All statistical analyses were performed using the R software (version 3.1.0) (Auckland, New Zealand).

Table 1 Characteristics of the study population

	Total sample (n = 100)
Sociodemographics	
Gender (%)	Male: 68; female: 32
Age in years, mean (s.d.); median (IQR)	55.4 (15.2); 50 (40–63)
Education level (%)	Illiterate: 2; basic: 60; intermediate: 23; high: 15
Injury characteristics	
Time since injury in years, mean (s.d.); median (IQR)	10.9 (10.8), 9,5 (1–16)
Vertebral level (%)	C: 19; Th: 60; L: 11; CE: 10
Complete or incomplete (%)	Complete: 33; incomplete: 67
Cause of the injury (%)	Traumatic: 55; non-traumatic: 45
Setting	
Inpatients or outpatients (%)	Inpatients: 14; outpatients: 86
Questionnaire completion	
Assistance required to complete the eSCIM-SR (%)	No: 87; yes: 13
Time needed to complete the eSCIM-SR (min), mean (s.d.); median (IQR)	9.0 (3.7); 10.0 (5.0–10.0)

Abbreviations: C, cervical; CE, cauda equina; eSCIM-SR, Spanish self-report version of SCIM III; IQR, interquartile range; L, lumbar; SCIM, Spinal Cord Independence Measure; Th, thoracic.

Table 2 Total and subscale scores of SCIM III and eSCIM-SR

	Total score		Self-care		Respiration and sphincter management		Mobility	
	SCIM III	eSCIM-SR	SCIM III	eSCIM-SR	SCIM III	eSCIM-SR	SCIM III	eSCIM-SR
Mean (s.d.)	55.8 (20.9)	55.4 (21.1)	13.3 (6.3)	13.0 (6.3)	26.9 (7.8)	26.8 (7.8)	15.6 (10.1)	15.6 (10.2)
Median (IQR)	57.0 (42–69)	56.5 (42–68)	15.5 (8–18)	15.0 (8–18)	29.0 (21.8–32)	28.5 (21–32)	14.5 (9–19)	15 (9–19)

Abbreviations: eSCIM-SR, Spanish self-report version of SCIM III; IQR, Interquartile range; SCIM, Spinal Cord Independence Measure.

RESULTS

Characteristics of the study population are presented in Table 1.

The total and subscale scores of the SCIM III and the eSCIM-SR are presented in Table 2. The mean scores were

similar between the questionnaires for both the total and each subscale.

The distribution of the total scores was similar between SCIM III and eSCIM-SR, as shown in Figure 1.

Table 3 shows Lin's correlations and Bland–Altman differences between SCIM III and eSCIM-SR. Concordance between both tests was almost complete,[14] with a Lin's concordance correlation coefficient of 0.998 (95% confidence interval; 0.997, 0.998).

The Bland–Altman plot showed a small bias of − 0.32 (95% limits of agreement; − 3.01, 2.37). The concordance of the different domains was also very high, with a Lin's concordance correlation coefficient of 0.988 (95% confidence interval; 0.982, 0.992) for the self-care subscale, 0.992 (95% confidence interval; 0.988, 0995) for the respiration and sphincter management subscale and 0.997 (95% confidence interval; 0.995, 0.998) for the mobility subscale. Estimated bias was low in all three domains, with values of − 0.22, − 0.1 and − 0.03 for the Self-Care, respiration and sphincter management and mobility subscales, respectively. The 95% limits of agreement were also low,
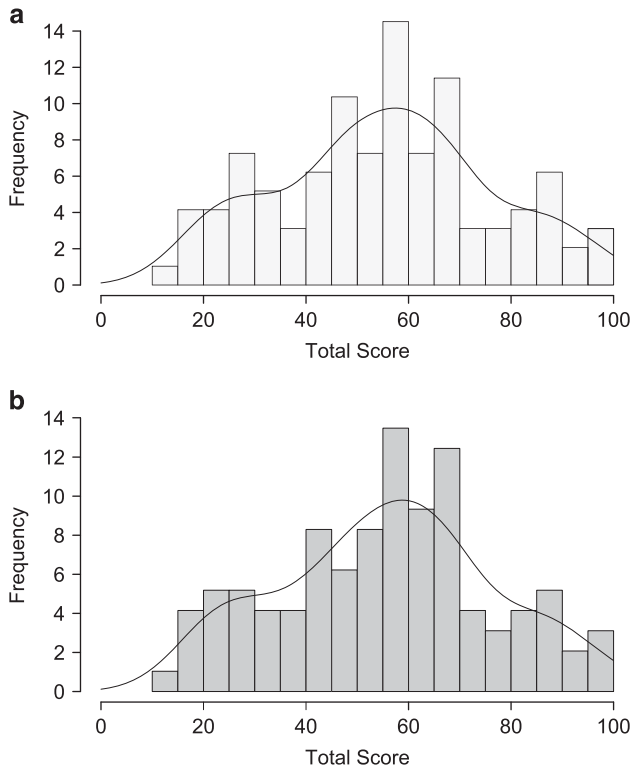
Figure 1 Relative frequency distribution of total scores: (**a**) SCIM III and (**b**) eSCIM-SR.

Table 3 Lin's correlation and Bland–Altman differences of SCIM III and eSCIM-SR

	Lin's correlation (95% CI)	Bland–Altman plot	
		Bias	*95% LOA*
Total score	0.998 (0.997, 0.998)	− 0.32	(−3.01, 2.37]
Self-care	0.988 (0.982, 0.992)	− 0.22	(−2.12, 1.68)
Respiration and sphincter management	0.992 (0.988, 0.995)	− 0.10	(−2.02, 1.82)
Mobility	0.997 (0.995, 0.998)	− 0.03	(−1.69, 1.63)

Abbreviations: CI, confidence interval; eSCIM-SR, Spanish self-report version of SCIM III; LOA, limits of agreement; SCIM, Spinal Cord Independence Measure.
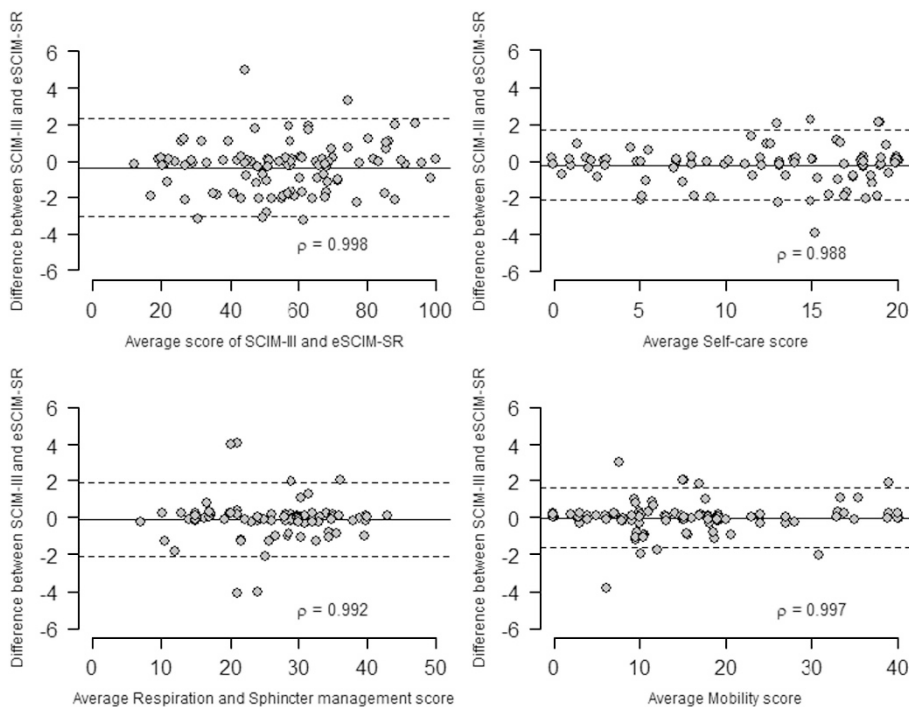
Figure 2 Bland–Altman plots for the agreement of the total score between SCIM III and eSCIM-SR and for the partial agreement of the subscale scores between SCIM III and eSCIM-SR.

ranging from the lowest limit of − 2.12 for the self-care subscale to the highest limit of 1.82 for the respiration and sphincter management subscales.

Figure 2 shows the Bland–Altman plots for the agreement of the total score between SCIM III and eSCIM-SR and for the partial agreement of the subscale scores between SCIM III and eSCIM-SR.

DISCUSSION

The results of this study demonstrate the validity of the eSCIM-SR relative to the SCIM III, yielding a Lin's correlation value of 0.998 for the total score and a Lin's correlation value exceeding 0.98 for each of the three subscale scores.[12]

Only the study by Fekete *et al.*[9] has validated a self-reported scale based on SCIM III (SCIM-SR) and was performed in German-speaking inpatients with SCI, resulting in low Pearson's correlation values (that is, above 0.7). Fekete *et al.* attributed the low concordance between the SCIM III and SCIM-SR to greater differences among the inpatients, as the questionnaire reflected the patients' current situation instead of their situation at the time of admission. In our study, 84% of the subjects were outpatients with stable health conditions, which may have accounted for the high concordance between the SCIM III and eSCIM-SR.

Our findings also validate the eSCIM-SR as a useful assessment tool of functional independence in patients with SCI in an outpatient setting, and its use has the advantage of requiring less healthcare resources for its application.

In our study, the greatest correlation was observed for the Mobility subscale, which may have occurred because it is one of the easiest areas to substantiate by both external observation and the patients themselves.

As in the study by Fekete *et al.*, the limitations of our study are related to item number 6 (Bladder Management) of the SCIM III, because it had to be modified for a self-report version as it is impossible for patients to measure their residual volume of urine. However, as with the study by Fekete *et al.*, a high correlation was obtained between the item 6 scores of the SCIM III and their equivalents on the eSCIM-SR.

The eSCIM-SR is the second self-report version of the SCIM III to be validated. Our findings are considered valid only for the Spanish population. However, it is worth noting that both the German SCIM-SR and our Spanish eSCIM-SR were derived from the English version of the SCIM-SR. We believe that validation of the English SCIM-SR is warranted and eagerly await this research.

One of the strengths of our study is the process of transcultural adaptation through which the Spanish version was created, which conforms with the guidelines and international criteria proposed by Sperber.[11] In addition, we believe that our sample size ($n = 100$) was sufficiently large, with no missing values for any of the variables analysed.

CONCLUSION

Our study validates the eSCIM-SR as a tool for the functional assessment of patients with SCI, principally in the outpatient setting.

DATA ARCHIVING

There were no data to deposit.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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