Turkish adaptation of Spinal Cord Independence Measure – version III

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Various rating scales have been used to assess ability in individuals with spinal cord injury. There is no specific functional assessment scale for Turkish patients with spinal cord injury. The Spinal Cord Independence Measure (SCIM) is a specific test, which has become popular in the last decade. A study was conducted to validate and evaluate the Turkish adaptation of the SCIM III (T-SCIM III). The SCIM III was translated into Turkish. Reliability, (internal consistency, interrater reliability, and test-retest reliability), validity (with Functional Independence Measurement), and sensitivity (changes in 8-week exercise program) were studied. Internal consistency for total score was sufficient (Cronbach α =0.79). The interrater reliability was moderate to high (Cohen κ between 0.72 and 1). Convergent validity was high (r=0.89, P<0.01). The T-SCIM III was found to be more sensitive than the Functional Independence Measurement to changes in

Introduction

Functional independence is the main target of medical rehabilitation (Kuipers et al., 2011). Reliable, valid, and easy-to-use tools are needed to measure the changes and improvements in rehabilitation. The measurement of outcomes and functionalities has tended to use generic measures, for example, the Functional Independence Measure (FIM) for functional assessment in spinal cord injury (SCI) patients (Cohen and Marino, 2000; Nilsson et al., 2005). Although FIM is the most frequently used disability scale in our country, studies elsewhere reported that it has low sensitivity to changes in function (Gresham et al., 1986; Marino et al., 1993; Catz et al., 1997; Prysak et al., 2000; Seekins and Ravesloot, 2000). It has limited use for tetraplegics and it is not sensitive to change over time (Gresham et al., 1986; Catz et al., 1997). For these reasons, scales like Spinal Cord Independence Measure (SCIM) and Quadriplegia Index of Function were developed (Gresham et al., 1986; Catz et al., 1997). Both scales are used for functional assessment, whereby Quadriplegia Index of Function was designed especially for tetraplegics and it is not suitable for paraplegics (Meyers et al., 2000).

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function. Hence, we recommend the use of T-SCIM III in clinical practice as a reliable, valid, and easy-touse tool. *International Journal of Rehabilitation Research* 35:88–91 © 2012 Wolters Kluwer Health | Lippincott Williams & Wilkins.

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SCIM was developed at the Loewenstein Rehabilitation Hospital (Catz *et al.*, 1997). The SCIM I, II, III have been shown to be valid and reliable for SCL between 1997 and 2007 (Catz *et al.*, 1997, 2001, 2007; Itzkovich *et al.*, 2007). Each version of SCIM was more sensitive than the preceding one and in all versions, FIM was used for convergent validation.

Previously, reliability and validity (by comparison with FIM) of the Turkish version of SCIM II have been studied (Kesiktas *et al.*, 2007). According to the creator of SCIM, rewording was needed to address intercultural biases (Catz *et al.*, 2007). The SCIM III consists of four subscales and it is subdivided into 19 items (Catz *et al.*, 2007). It was validated through international studies including Canada, Germany, Denmark, England, Italy, and Israel (Catz *et al.*, 2007). In addition, the validity of the Italian version was studied (Invernizzi *et al.*, 2010). The aim of the present study was to provide translation and cultural adaptation of SCIM III for Turkey, and validate the Turkish version of the scale.

Materials and methods

The Turkish translation of Spinal Cord Independence Measure III

Before starting the study, permission for translation of the SCIM into Turkish was obtained from Professor Amiram Catz on 11 February 2006, through e-mail. The translation of SCIM III into Turkish was performed by applying

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the forward-backward method (Beaton *et al.*, 2000). The SCIM III was first translated from English into Turkish by two medical doctors who are fluent in English and an English teacher who works in academia. All independent translations were compared by the authors of the study and were reviewed along with two physiotherapists and two nurses. After the first part of the translation process, the scale was applied to five SCI patients. All items were well understood, so nothing was changed.

The scale was back translated into English by two native English speakers who did not know the purpose of study and were totally blind to the original version of the scale. Each of the two translations was then compared with the original version of the SCIM III by the study team. After establishing equivalence between the Turkish translation (T-SCIM III) and the original, the translated tool was passed into reliability study.

Participants and design *Reliability study*

Test-retest reliability was assessed in 20 SCI participants meeting the inclusion criteria (age > 18 years, male, American Spinal Injury Association impairment grade A, B, C, D, injury time > 18 months), who were randomly selected from the membership of a nongovernment organization (The Spinal Cord Paralytics Association of Turkey). The SCIM III was filled in by the same two raters. Each patient was examined by the two raters; only the first rater assessed patients 1 week later.

Validity study

A list of the SCI patients was created from the Istanbul Medical Faculty Physical Medicine and Rehabilitation Department, Haseki Education and Research Hospital, and Istanbul Physical Medicine and Rehabilitation Training and Research Hospital 2nd Department. From the list, 78 patients were recruited according to the inclusion criteria (age > 18 years, American Spinal Injury Association impairment grade A, B, C, D). FIM was applied by the same rater to all the patients. Sensitivity of the scale to functional changes was studied by applying it before upper extremity strength exercises and after 8 weeks. Exercises and shoulder prevention training were provided to the patients as an outpatient service.

Ethical approval

The study was carried out in compliance with the Helsinki Declaration, and approved by the Ethics Committee of the Istanbul Faculty of Medicine, Istanbul University. Verbal and written consents were obtained from the patients before inclusion in the study.

Scales

The FIM consists of 18 items (13 motor and five social/ cognitive items) covering self-care, sphincter control, transfers, locomotion, communication, and social integration. The scale evaluates the functions on a seven-point scale with 7 representing complete independence, 6 modified independence, 5 supervision, 4 minimal contact assistance, 3 moderate assistance, 2 maximal assistance, and 1 representing total dependence (Keith *et al.*, 1987). It has been shown that there are the two separate subscales (motor and social/cognitive scale) in the Turkish version (Kucukdeveci *et al.*, 2001).

The SCIM III consists of four areas of function: self-care, respiration and sphincter management, mobility in room and toilet, and mobility indoors and outdoors. The scale is subdivided into 19 items. It is easy to use and requires no manuals. The range of total score is 0–100 (Catz *et al.*, 2007).

Statistics

The SPSS 10.0 software (SPSS Inc., Chicago, Illinois, USA) was used to perform statistical analyses. Internal consistency was assessed using Cronbach's α coefficient. Interrater reliability was tested using κ coefficient (Fleiss, 1981). Test-retest reliability was assessed using intraclass correlation coefficient (ICC). To establish convergent validity, the relationship between the T-SCIM III and FIM total scores was assessed using the Pearson correlation coefficient. The McNemar test was used for evaluation of sensitivity of the test to functional changes in the scores of T-SCIM III and FIM, whereas FIM score was normalized to the 1–100 range with the formula FIM* = (FIM – 18)/(126 – 18) × 100.

Results

Sociodemographic characteristics of the patients are presented in Table 1. Twenty men with a mean age of 36.6 (SD 9.0) years were accepted for the interrater reliability, internal consistency, and test–retest reliability study. A total of 78 patients with SCI were recruited for the validation study; about 70% of them were male. The time needed for each evaluation was 20–25 min.

Internal consistency for the total score as assessed with Cronbach's α was 0.79 (Table 2). The ICC values for all subscales are reported in Table 2. The estimated test-retest reliability of respiratory and sphincter management was 0.85. The estimated test-retest reliability for all

Table 1 Characteristics of the samples

	Reliability study group	Validity study group
Number of SCI patients	20	78
Age [years; mean (SD)]	36.6 (9.0)	30.2 (11.1)
Male sex	100% (20)	70% (50)
Traumatic etiology	100%	100%
Injury duration [years; mean (SD)]	5.6 (2.8)	2.3 (0.4)
AIS grade		
A	11	41
В	9	10
С	-	10
D	-	17

AIS, American Spinal Injury Association Impairment Scale; SCI, spinal cord injury.

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other subscales and the total score was above 0.95, and all ICC values were statistically significant (P < 0.001) (Table 2).

High agreement between raters is demonstrated in Table 3. Kappa coefficients ranged between 0.72 and 1 (Table 3). The lowest agreement was found regarding the 'stair management' item ($\kappa = 0.72$).

The mean total SCIM III score was 56.1 and the mean total FIM score was 86.2. Statistically significant correlation was found between the two scales (r = 0.89, P < 0.001) (Table 4). The T-SCIM III was found to be more sensitive than FIM to the changes in functions in SCI patients. When the differences between total scores

Table 2 Estimated internal consistency (Cronbach's $\boldsymbol{\alpha}$) and intraclass correlation

	Rater 1 (Cronbach's α)	Rater 2 (Cronbach's α)	ICC
Self-care	0.90	0.90	0.99
Respiratory and sphincter management	0.70	0.70	0.85
Mobility in the room and toilet	0.75	0.75	0.95
Mobility indoors and outdoors	0.85	0.85	0.99
Total	0.79	0.79	0.95

ICC, intraclass correlation.

Table 3 Agreement between raters for individual T-Spinal Cord Independence Measure III tasks

Task	Total agreement (%)	κ
Feeding	95	0.94
Bathing upper body	95	0.94
Bathing lower body	95	0.94
Dressing upper body	100	1
Dressing lower body	93	0.90
Grooming	95	0.94
Respiration	100	1
Bladder management	99	0.98
Bowel management	98	0.97
Use of toilet	89	0.82
Mobility in bed	100	1
Transfers bed/wheelchair	100	1
Transfer wheelchair/toilet/tub	95	0.94
Mobility indoor	100	1
Mobility moderate distances	93	0.90
Mobility outdoors	89	0.82
Stair management	85	0.72
Transfer wheelchair/car	100	1
Transfer ground/wheelchair	100	1

Table 4 Correlation (Pearson *r*) between Functional Independence Measurement and T-Spinal Cord Independence Measure III at baseline and at the end of the exercise program

	Baseline	End of the exercise program
Self-care	0.88 (P<0.01)	0.89 (<i>P</i> <0.01)
Respiration and sphincter management	0.90 (<i>P</i> <0.01)	0.90 (<i>P</i> <0.01)
Mobility in the room and toilet	0.85 (P<0.01)	0.89 (P<0.01)
Mobility indoors and outdors	0.80 (P<0.01)	0.84 (P<0.01)
Total	0.89 (P<0.01)	0.89 (<i>P</i> <0.01)

after therapy and baseline values were compared, the mean difference was significantly higher for the T-SCIM III than for the FIM* (P < 0.01).

Discussion

The study showed that the T-SCIM III is a consistent, reliable, and valid scale for SCI patients who speak Turkish. The T-SCIM III is the first validated and specific tool for SCI in Turkish.

Internal consistency of T-SCIM III, as estimated by Cronbach's α , was found to be above the minimum acceptance level of 0.70 for the subscales and the total score. The estimate for the respiratory and sphincter management subscale was lower than in the Italian version of SCIM III (Invernizzi *et al.*, 2010), but their other results for internal consistency were also higher than 0.70 and consistent with ours. Cronbach's α values were lower in the original multicentre study, but still higher than 0.70 (Itzkovich *et al.*, 2007). The values of ICC that we obtained were similarly high as in the original multicentre study (Itzkovich *et al.*, 2007) and in the Italian version (Invernizzi *et al.*, 2010).

The correlation between FIM and SCIM III was 0.79 in the original study (Catz *et al.*, 2007); our estimate was higher (0.89), whereas the Italian study found even higher correlation between FIM and SCIM III (Invernizzi *et al.*, 2010). We found a similar correlation (0.85) in a previous study with the Turkish version of SCIM II (Kesiktas *et al.*, 2007).

Functional assessments of SCI patients had been performed almost exclusively using the FIM until the last decade, although some results about its efficacy in measuring changes in SCI were doubtful (Gresham et al., 1986; Marino et al., 1993; Catz et al., 1997; Prysak et al., 2000; Seekins and Ravesloot, 2000). The SCIM III was found to be more sensitive than the FIM in many studies, especially for the respiratory and sphincter management and the mobility indoors and outdoors subscales (Itzkovich et al., 2007; Invernizzi et al., 2010). Changes in the scores of the mobility indoors and outdoors subscales were more significant in T-SCIM III than in FIM. This implies that the T-SCIM is more sensitive than FIM. Our results regarding sensitivity might differ from the Italian version because of the patient selection (e.g. regarding time of injury). Patients' age was not as high as in the Italian's study, whereas the proportion of males in our study was approximately the same as in the Italian study (Invernizzi et al., 2010).

There are some limitations to our study. The first limitation was the use of only two physician raters for evaluation of the interrater agreement. Secondly, the SCI sample in this study for both reliability and validity studies was relatively small. Rasch analysis could be performed in larger samples in future studies. Nevertheless, it can be concluded that T-SCIM III is a reliable, valid, and easy-to-use tool for patients with SCI.

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Conflicts of interest

There are no conflicts of interest.

References

- Beaton DE, Bombardier C, Guillemin F, Feroz MB (2000). The guidelines for the process of cross-cultural adaptation of self-report measures. *Spine* 25:3186–3191.
- Catz A, Izkovich M, Tamir A, Philo O, Streinberg F, Ring H, et al. (1997). SCIM Spinal Cord Independence Measure: a new disability scale for the patients with spinal cord lesions. Spinal Cord 35:850–856.
- Catz A, Izkovitch M, Steinberg F, Ring H, Ronen J, Spasser R, et al. (2001). The Catz-Itzkovich SCIM: a revised version of the spinal cord independence measure. *Disabil Rehabil* 23:263–268.
- Catz A, Itzkovich M, Tesio L, Biering-Sorensen F, Weeks C, Laranee MT, et al. (2007). A multi-centre international study on the Spinal Cord Independence Measure version III: Rasch psychometric validation. Spinal Cord 45:275–291.
- Cohen ME, Marino RJ (2000). The tools of disability outcomes research functional status measures. Arch Phys Med Rehabil 81:S21–S29.
- Fleiss JI (1981). Statistical methods for rates and proportions. New York: Wiley. Gresham GE, Labi ML, Dittmar SS, Hicks JT, Joyce SZ, Stehlik MA (1986). The Quadriplegia Index of Function (QIF): sensitivity and reliability demonstrated in a study of thirty quadriplegic patients. *Paraplegia* 24:34–44.

- Invernizzi M, Carda S, Milani P, Mattana F, Fletzer D, Iolascon G, et al. (2010). Development and validation of the Italian version of the Spinal Cord Independence Measure III. Disabil Rehabil 32:1194–1203.
- Itzkovich M, Gelenter I, Biering Sorensen F, Weeks C, Laramee MT, Craven BC, et al. (2007). The Spinal Cord Independence Measure (SCIM) version III: reliability and validity in a multi-center international study. *Disabil Rehabil* 29:1926–1933.
- Keith R, Granger C, Hamilton B, Dhervin F (1987). The Functional Independence Measure: a new tool for rehabilitation. In: Eisenberg M, Grzesiak R, editors. *Advances in clinical rehabilitation*. New York: Springer. pp. 6–18.
- Kesiktas N, Paker N, Sencan S, Muslumanoglu L, Issever H (2007). The reliability and validity of the Turkish version of Spinal Cord Independence Measure II. In 46. ISCOS Abstract Book; pp. 262.
- Kucukdeveci AA, Yavuzer G, Elhan AH, Sonel B, Tennant A (2001). Adaptation of the Functional Independence Measure for use in Turkey. *Clin Rehabil* 33:137–144.
- Kuipers P, Kendall MB, Amsters D, Pershouse K, Schuurs S (2011). Descriptions of community by people with spinal cord injuries: concepts to inform community integration and community rehabilitation. *Int J Rehab Res* 34: 167–174.
- Marino RJ, Huang M, Knight P (1993). Assessing selfcare status in quadriplegia: comparison of the quadriplegia index of function (QIF) and the functional independence measure (FIM). *Paraplegia* 31:225–233.
- Meyers AR, Andresen EM, Hagglund KJ (2000). A model of outcomes research: spinal cord injury. Arch Phys Med Rehabil **81 (Suppl 2):**S81–S90.
- Nilsson AL, Sunnerhagen KS, Grimby G (2005). Scoring alternatives for FIM in neurological disorders applying Rasch analysis. *Acta Neurol Scand* 111: 264–273.
- Prysak GM, Andresen EM, Meyers AM (2000). Prevalence of secondary conditions in veterans with spinal cord injury and their interference with life activities. *Top Spinal Cord Inj* 6:34–42.
- Seekins T, Ravesloot C (2000). Secondary conditions experienced by adults with injury related disabilities in Montana. *Top Spinal Cord Inj* **6**:43–53.