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Italian translation and reliability of Fist-Sci scale for chronic paraplegic patients: first validation study

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Abstract. *Background and aim of the work*: Lack of trunk control following spinal cord injury implicates a worse quality of life and a higher dependence on caregivers. Physiotherapists, so, need reliable assessments to plan rehabilitation activities; literature proposes several evaluation scales to assess unsupported trunk control in this chronic condition, but studies show poor methodological quality. This study aimed to translate and explore the significance of the Italian version of the "Function in sitting test - spinal cord injury" scale for chronic spinal cord injury patients. *Methods:* A longitudinal cohort study was conducted at Fiorenzuola D'Arda Hospital. After a forward/backward translation of the "Function in sitting test - spinal cord injury" scale in Italian, content and face translational validity, inter-rater reliability was assessed. Patients were recruited by historical tracking of patients who received acute rehabilitation care at Villanova d'Arda Spinal Unit; we considered eligible to the study patients more than twenty years old, with diagnosis of chronic paraplegia, resident in Piacenza province and with Italian language comprehension. Two researchers administered the Function in sitting test - spinal cord injury scale to the same patients at follow-up. *Results:* Ten patients took part in the study; results showed that higher inter-rater correlation coefficient (Pearson's R= 0.89, p= 0.01 Intra-class correlation coefficient= 0.94, p=0.000). Content validity was also excellent (Scale Content Validity Index = 0.91); some experts gave suggestion to better use and improve tool practice, with particular reference to movement quality evaluation. *Conclusion:* Italian "Function in sitting test - spinal cord injury" scale for assessing trunk control in chronic spinal patients appears to be an excellent assessment tool concerning inter-rater reliability. Content validity further confirms the validity of the instrument. (www.actabiomedica.it)

Key words: Spinal cord injury; physiotherapy; trunk control; evaluation scale

Introduction

Spinal cord injury (SCI) is a complex neurological condition, causing complete or partial loss of sensory and/or motor function, resulting from a variety of causative agents, both traumatic and non-traumatic (1); the estimated worldwide incidence rate of SCI ranges between 250,000 and 500,000/year (2,3). Most affected patients are young, between the ages of 15 and 25 years (4), so it is a phenomenon that is of particular concern not only from a global health point of view but also from a social one: the costs of treatment, long-term treatment and economic losses related to the individual's temporary or permanent inability to work represent a significant problem not only for the patient but also for the family, leading to non-negligible psychosocial and professional implications (4-7). Increasingly robust literature shows that

sitting balance is a predictive factor for the functional outcome of the subject with SCI (7), as it has a high impact on residual abilities. Recovery of trunk stability also appears to be third on the list of priorities for the spinal cord patient (8), directly influencing the risk of falling and causing a greater degree of dependence on the caregiver (8).

Our recent systematic review of the literature found that, unlike for patients in the sub-acute rehabilitation phase, to date there is no evaluative gold standard for trunk control for physiotherapists in chronic spinal cord injury population (9). Although the domains to be tested have been widely defined in the various studies (ability to maintain a static seated posture, balance during voluntary movements and recovery after sudden perturbations without the use of the upper limbs), not all the instruments provide for rigorous testing and supporting evidence is scarce (10,11). The scale of most significant interest is the "Function in sitting test - spinal cord injury" scale (FIST-SCI), both for the completeness of the tool and its feasibility in home settings and psychometric properties. FIST- SCI scale is designed for trunk skills assessment in patients with spinal cord injury by physiotherapists; the tool represents a further development of original Function in sitting test (FIST) scale introduced by Palermo et al. (12). The scale allows the quantification of trunk abilities in all patients with paraplegia, irrespective of the level of injury and compatible with residual abilities/assistance needs; administration is possible in both hospital and home settings, and includes a set of fourteen motor tasks divided into three macro-areas:

- Static balance
- Dynamic balance
- Proprioceptive sensitivity

Standard materials to perform the scale are: a cot without back or side supports; an elevator for the feet if the patient cannot place the sole on the floor; a tape; a chronometer.

The process to perform FIST-SCI scale comprise:

- Standard positioning of patient, seating at the edge of the mat, plinth, or standard hospital bed, with proximal thigh (space for three to four fingers to fit between popliteal fossa and mat) in support, hips, and knees flexed to 90°, and feet were flat in support. Thighs should be positioned in neutral hip abduction and adduction and neutral rotation hands resting comfortably unless needed for balance support.
- Administration of static motor tasks, both for maintaining balance against resistance (front, side, rear thrust) and for maintaining sitting position with open/closed eyes (proprioceptive control)
- Administration of active motor tasks, which include rotations of the neck and the entire spinal column, moving on the couch surface, reaching backwards, moving a leg. This second area assess dynamic balance exercised through active muscle contraction

Each item can be rated from a minimum of 0 points (patient cannot perform the task at all) to 4 (patient completely autonomous in performing the task); intermediate scores are awarded if the patient uses upper limbs to complete the task (3 points), or requires minimal/maximum assistance (3/2 points). In Table 1 original FIST-SCI scale by Palermo and Italian translation by our team are reported. The study conducted by Palermo et al. (12) on a chronic SCI population, the current standard for the scale, recommended an in-depth study of the tool. Moreover, there are no non-English language versions of the FIST-SCI. The present study, therefore, aims to translate and explore the significance of FIST-SCI scale in its Italian version, verifying its suitability for the characteristics of the chronic paraplegic patient.

Methods

A longitudinal single cohort study was conducted at Spinal Unit - Rehabilitative Medicine Department of Fiorenzuola D'Arda Hospital.

Table 1. FIST- SCI scale in its original version (first column) and Italian translation (second column).

FIST-SCI Test Item Position as close to the following description, as their range of motion allows. Person seated at the edge of the mat, plinth, or standard hospital bed, with proximal thigh (space for three to four fingers to fit between popliteal fossa and mat) in support, hips, and knees flexed to 90°, and feet were flat in support. Thighs should be positioned in neutral hip abduction and adduction and neutral rotation d hands resting comfortably unless needed for balance support.		**FIST-SCI Test Item** Posizione iniziale: il più vicino possibile a quella descritta di seguito, per quanto concesso dal range of motion del paziente. Paziente seduto sul bordo del lettino, materassino o letto d'ospedale standard, con la coscia prossimale (spazio di tre o quattro dita tra la fossa poplitea e il letto) in appoggio, le anche e le ginocchia flesse a 90°, e i piedi in appoggio. Le cosce devono essere posizionate in assenza di abduzione/adduzione dell'anca ed in assenza di rotazioni; le mani devono esser in posizione di riposo, a meno che non siano necessarie per il mantenimento dell'equilibrio.		Data:	Data:	Data:
Randomly Administered Once	**Anterior Nudge:** superior sternum *Examiner instruction: Without warning, at any time during testing, push participant with light pressure at the superior portion of the sternum.*	Somministrato in modo alternato una volta	**Spinta anteriore:** allo sterno superiore. *Istruzioni per l'esaminatore: Senza preavviso, in qualsiasi momento durante il test, spingere il partecipante con una leggera pressione a livello della porzione superiore dello sterno*			
	Posterior Nudge: between scapular spines *Examiner instruction: Without warning, at any time during testing, push participant with light pressure between scapular spines*		**Spinta posteriore:** tra le spine delle scapole. *Istruzioni per l'esaminatore: Senza preavviso, in qualsiasi momento durante il test, spingere il partecipante con una leggera pressione tra le spine scapolari*			
	Lateral nudge (once on each side at the acromion) *Examiner instruction: Without warning, at any time during testing, push participant with light pressure at the acromion.* **Record lower side and score*		**Spinta laterale** (una per ogni lato, all'acromion) *Istruzioni per l'esaminatore: Senza preavviso, in qualsiasi momento durante il test, spingere il partecipante con una leggera pressione sull'acromion* **Registrare il lato più debole e il punteggio.*			
Static sitting: *Instructions to the patient: "Sit with your hands resting comfortably for 30 seconds."* *Examiner instruction: If it appears that the individual is using their upper extremities for support the tester can ask them to lift their arms up, if possible*		**Seduta statica:** *Istruzioni per il paziente: "Siedi con le mani comodamente appoggiate per 30 secondi."* *Istruzioni per l'esaminatore: se sembra che il soggetto stia usando gli arti superiori come sostegno, l'esaminatore può chiedergli di sollevare le braccia, se possibile.*				

Table 1 (*Continued*)

Table 1. FIST- SCI scale in its original version (first column) and Italian translation (second column). (*Continued*)

Sitting, move head side to side *Instructions to the patient: "Remain sitting steady and tall without using your hands unless you need them to help you balance.* *When instructed "look right," keep sitting straight, but turn your head to the right. Keep looking to the right until I tell you "look left," and then keep sitting straight and turn your head to the left. Keep your head to the left until I tell you, "look straight," and then keep sitting straight but return your head to the center."* *Examiner instruction:*Test administrator will have patient/participant hold each side for 3 seconds*	**Da seduto, muovi la testa da un lato all'altro** *Istruzioni per il paziente: "Rimani seduto e diritto senza usare le mani a meno che non ne avessi bisogno per bilanciarti.* *Quando viene detto "guarda a destra", continua a stare seduto e diritto, ma gira la testa a destra. Continua a guardare finché non ti dico "guarda a sinistra", poi continua a rimanere seduto e dritto e gira la testa a sinistra. Continua a mantenere la testa ruotata a sinistra finché non ti dico "guarda dritto" e poi rimani seduto diritto ma ritorna al centro con la testa."* *Istruzioni all'esaminatore:* Il somministratore del test dovrà mantenere il paziente/partecipante su ciascun lato per 3 secondi.*			
Sitting, eyes closed: *Instructions to the patient: "Close your eyes and remain sitting still with your hands resting comfortably for 30 seconds."*	**Da seduto, occhi chiusi:** *Istruzioni per il paziente: "Chiudi gli occhi e rimani seduto con le mani comodamente appoggiate per 30 secondi"*			
Sitting, lift foot (if one side is preferred, ie. transfer side, lift can be scored on that side) *Instructions to the patient: "Sit with your arms resting comfortably and lift your foot to clear the floor."*	**Da seduto, solleva un piede** (se si preferisce un lato, ovvero quello del trasferimento, il sollevamento può essere valutato su quel lato) *Istruzioni per il paziente: "Siedi con le braccia in posizione comoda, solleva il tuo piede dal pavimento."(*)*			
Turn and touch a spot behind you: *Instructions to the patient: "Turn around and touch the furthest piece of tape that I've placed behind you."* *Examiner instruction (Tape placed in midline, 5 inches (12.7cm) posterior to hips, the subject may turn to the preferred side and use either arm)*	**Girati e tocca un punto dietro di te:** *Istruzioni per il paziente: "Girati e tocca la parte di nastro più lontana che ho messo dietro di te."* *Istruzioni per l'esaminatore (nastro posto sulla linea mediana,5 pollici (12.7cm) posteriormente ai fianchi, il soggetto può girare verso il lato che preferisce ed utilizzare entrambe le braccia)*			
Forward lean: *Instructions to the patient: "Lean forward to unweight your ischial tuberosities/bottom/sitting bones and return to the upright position."*	**Flessione anteriore:** *Istruzioni al paziente: "Piegati in avanti fino a togliere il peso dalle tuberosità ischiatiche/ dai glutei/dall'osso sacro e ritorna in posizione verticale."*			
Lateral lean: *Instructions to the patient: "Lean to the side to unweight the opposite ischial tuberosity/bottom/sitting bone and return to the upright position."* *Examiner instruction: *Repeat on both sides, score lower performance and record side.*	**Inclinazione laterale:** *Istruzioni per il paziente: "Piegati lateralmente fino a togliere il peso dalla tuberosità ischiatica opposta/dai glutei/l'osso sacro e poi ritorna in posizione verticale."* *Istruzioni per l'esaminatore: *Ripetere da entrambi i lati, registrare il lato con prestazione peggiore e registrare il punteggio.*			
Touch dorsum of foot: *Instructions to the patient: "Touch the laces of your shoe and return to the upright position"* *Examiner instruction: *Demonstrate with the dorsum of your middle finger if hand function of the patient/ participant is limited*	**Tocca il dorso del piede:** *Istruzioni per il paziente: "Tocca i lacci delle scarpe e torna in posizione eretta"* *Istruzioni per l'esaminatore: *Dimostrare con il dorso del dito medio se la funzione della mano del paziente/partecipante è limitata..*			

Posterior scooting (2") *Instructions to the patient: "Move backward 2 inches (5.1cm) without using your arms, unless you need them to help you move."*	**Spostamento posteriore:** (2") *Istruzioni per il paziente: "Spostati all'indietro di 2 pollici (5.1cm) senza usare le braccia, a meno che non ne abbia bisogno per muoverti"*			
Anterior scooting (2") *Instructions to the patient: "Move sideways 2 inches (5.1cm) without using your arms, unless you need them to help you move"*	**Spostamento anteriore** (2") *Istruzioni per il paziente: "Spostati anteriormente di 2 pollici (5.1cm) senza usare le braccia, a meno che non ne abbia bisogno per muoverti"*			
Lateral scooting (2") *Instructions to the patient: "Move sideways 2 inches (5.1cm) without using your arms, unless you need them to help you move" Examiner instruction:*Repeat on both sides, score lower performance and record side.*	**Spostamento laterale** (2") *Istruzioni per il paziente: "Spostati lateralmente di 2 pollici (5.1cm) senza usare le braccia, a meno che non nebbia bisogno per muoverti"* *Istruzioni per l'esaminatore:*Ripetere da entrambi i lati, segnare la prestazione inferiore e registrare il lato.*			
Total	**Totale**	/56	/56	/56
Administred by	**Somministrato da:**			
Note/comments	**Note/Commenti:**			
Up to three trials of each test item are allowed *4- Independent- completes the task independently and successfully without the use of upper extremities for balance purposes* **Item 7- able to use upper extremity to assist with leg lift if hip flexor is absent/weak* *3- Upper Extremity Support- unable to complete the task without using upper extremities for support* *2- Supervision, Contact Guard (hands-on assist or cues), Minimal Assistance- able to perform the task with 75%-100% of the effort or work provided by the patient/participant, or there is a safety concern with the patient/participant completes the task without external assistance* *1- Moderate to Maximal Assistance- able to perform the task with 74-25% of the effort or work provided by the patient/participant* *0- Complete Assistance/Dependent/Unable- Patient/participant is unable or refuses to perform or provides less than 25% of the effort or work to complete the task*	*È possibile eseguire fino a tre tentativi per ciascun item* *4- Indipendente- completa il compito in modo indipendente e con successo, senza l'uso degli arti superiori per mantenere l'equilibrio.* **Voce 7- è in grado di utilizzare l'arto superiore per assistere il sollevamento della gamba se il flessore di anca è assente/debole.* *3- Supporto dell'arto superiore- non in grado di completare il compito senza utilizzare l'arto superiore come sostegno.* *2- Supervisione, sostegno fisico (assistenza o indicazioni pratiche), Minima assistenza- è in grado di svolgere il compito fornendo dal 75% al 100% dello sforzo o del lavoro richiesto, o c'è un problema di sicurezza con il paziente/partecipante che raggiunge comunque l'obiettivo senza necessità di assistenza esterna.* *1- Assistenza da moderata a massima- è in grado di svolgere il compito fornendo dal 74% al 25% dello sforzo o del lavoro.* *0- Assistenza completa/dipendente/inabile-il paziente/partecipante non è in grado o si rifiuta di eseguire il compito o fornisce meno del 25% dello sforzo o del lavoro per completare l'attività.*			

The author's permission was preliminarily acquired in the forward/backward translation process (12). Subsequently:

1. Two certified translators independently translated the Fist-SCI scale, using the version proposed by Palermo et al. as a reference (12)
2. A third expert obtained the final synthesis in Italian from both translations.
3. The latter was re-translated into the original language by a third certified translator, and then sent to the author for checking. After comparing two versions in the original language and making the changes recommended by Dr. Palermo, the scale was approved.

Content validity: A group of five experts was selected among Spinal Unit - Fiorenzuola D'Arda

Hospital physiotherapist. Each expert was selected on the basis of following criteria:

- having served in a Spinal Unit for more than ten years
- having served for more than one year as trainee guide for University of Parma- degree course in Physiotherapy in the field SCI rehabilitation

Experts assessed the relevance of items through a dichotomous choice (0= irrelevant item; 1= relevant item). Furthermore, the scale was assessed overall for comprehensibility, clarity and completeness.

Interrater reliability: Two independent researchers administered the scale to patients, simultaneously compiling the items on the same patient. Results obtained were compared at the end of measurements, and following analyses were carried out: Intra-class correlation coefficient (with 95% confidence interval) to estimate inter-rater reliability, Paerson's r to further evaluate positive/negative correlation between raters' scores.

Inclusion criteria were: age over 20 years, residence in the province of Piacenza, diagnosis of chronic paraplegia, and comprehension of the Italian language. Through these inclusion criteria, adult patients were selected, with chronic pathology for more than one year (thus excluding the recruitment of patients with possible further changes in motor skills), who understood the scale language translation, who resided in areas connected to Spinal Unit of Fiorenzuola d'Arda (thus avoiding problems of moving outside the region/province).

Exclusion criteria were: the presence of psychiatric pathologies, chronic neurodegenerative pathology, fractures, dislocations, vertebral instability, skin pressure ulcer, deep venous thrombosis, pregnancy, hospitalization for autonomic dysreflexia in the last three months and pulmonary or cardiovascular impairment. These conditions were excluded since they represent obstacle to active trunk movement or to patient's cooperation in administering the scale.

After an initial explanatory talk and signing the informed consent, patients eligible for the study were registered on a prepared form; each participant was assigned a unique study code. Registered demographic data included: age, gender, injury level and complete/incomplete status of the injury, cause of injury, time since lesion occurrence, current employment status, and sport (if applicable). We continued administering FIST-SCI scale sitting, evaluating the overall score after summing the individual items.

Statistical analysis

Collected data were organized using excel worksheets, and processed using SPSS 20.0 software. Content and face validity were assessed using the Content Validity Index (CVI) consisting of 2 parts:

- I-CVI (Item): CVI of the individual item, which can take values between 0 and 1; if >0.66 the item can be considered acceptable, if <0.66 a revision by the researchers is required.
- S-CVI (Score): representing the average of all coefficients of the individual items.

A value of S-CVI ≥ 0.90 was chosen to affirm that the scale had good content validity.

For inter-rater reliability Pearson's R and Intraclass correlation coefficient (ICC) with 95% confidence interval were determined.

Results

Inclusion and demographic data

Figure 1 shows the screening process of the patients eligible for the study: out of the 24 patients called for the follow-up clinic, 14 refused to participate because they were not interested/no longer residents in the Piacenza area/they did not come for personal reasons, while the remaining ten were assessed according to the inclusion and exclusion criteria, being eligible and therefore enrolled in the study.

Patients analyzed were: 8 men and two women, aged between 40 and 62 years, and lesion age between 2.5 and 32 years, ASIA scale A, B and C. Half of the patients practice a sport and 2 out of 6 were employed. Neurological level was by D5 to D12.

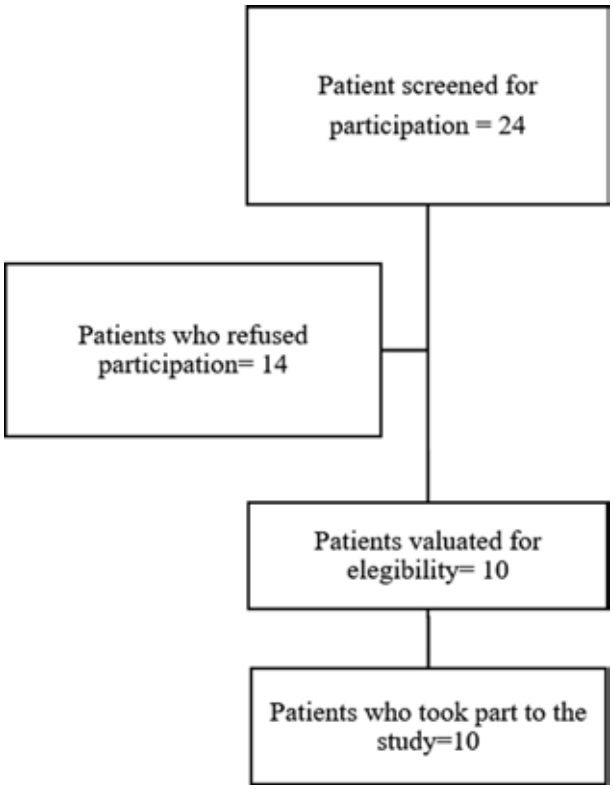

Figure 1. Study participants' selection.

Inter-rater reliability

After administering the scale, both investigators assigned scores, from 0 to 4, to each item, and the results obtained from the overall sum are shown in table 2.

Table 2 details examiners' scores of Italian Fist-Sci for included patients. As shown, for six patients the final score was the same for both researchers, while in 3 cases the overall difference was contained (from 1 to three points); only for patient two the difference was significant (10 points).

Analyzing Pearson's coefficient and comparing the results obtained from the assessments carried out by raters 1 and 2 (G.C.-A.T.), a positive correlation index of 0.899 was obtained. This value proved to be statistically significant (p value= 0.000). The scale's reliability in the Italian version was further highlighted, as the Intra-class correlation coefficient also resulted significant, with a value of 0.942 (p value= 0.000), 95% confidence interval was 0.76-0.98. This value, very close to 1, allows the scale to be considered very reliable when executed by different operators.

Table 2. Final scores obtained with Italian Fist-Sci administration.

	Examiner 1	**Examiner 2**
Patient 1	41/56	41/56
Patient 2	28/56	38/56
Patient 3	45/56	44/56
Patient 4	39/56	36/56
Patient 5	56/56	56/56
Patient 6	53/56	53/56
Patient 7	52/56	52/56
Patient 8	46/56	46/56
Patient 9	46/56	43/56
Patient 10	49/56	49/56

Content validity

For content validity, expert opinion was resumed in table 3.

Experts were allowed to give their opinion on items through a scale with a dichotomous numerical variable 0-1; if they considered the item significant for the purpose they could give a score of 1, if it was not considered significant they could give a score of 0. The column labeled "experts agreement" indicates the number of experts to whom the item is essential, with most of them scoring 5 out of 5. The I-CVI reports the average relevance for the five experts of the individual item: only 6 out of 14 were considered by one experimenter as not relevant, thus the value was 0.8.

The overall S-CVI (0.91) confirmed the hypothesis of high content validity of Italian Fist-SCI; the proportion relevance, finally, showed for 3 out of 5 experts the relevance of all items, while expert 3 (items 8-9-10-14-15 not relevant) and expert 4 (item 6 not relevant) were in disagreement.

Experts made suggestions in order to improve the Italian instrument in future studies; in particular:

- For item 3 suggestion was to find a point with a larger surface area for the administration of the

lateral thrust, as the acromion is an excessively punctiform area.
- Development of an additional system to evaluate the quality of a movement was suggested. According to the experts a neurological level D1 patient has a different mobility and ability to move in all directions than a D12 one.

Discussion

The study was conducted following the STROBE statement (13); to date, our investigation represents the first attempt to validate the FIST-SCI scale in Italian on chronic paraplegic patients.

Our study is in line with the literature, which suggests the identification of a specific and reliable instrument, capable of including all the components of trunk balance control, rapid to be administered to subjects with SCI (14); in this context functional bilateral tasks have been proposed, as directly related to daily life performance (15). Clinical tests, therefore, represent the most widely used tool in routine practice, allowing rapid and inexpensive scoring. Instrumental analyses are possible, but with high costs and often require specific equipment and highly trained staff (16-18). Abou's et al. (15) review underlines that there is a lack in SCI- trunk control scales in high-quality studies; to date Trunk Control Test-spinal cord injury (19), sitting balance measure (20) and the Set of Assessment Tools for Measuring Unsupported Sitting (21) represent the most suitable tools for assessing SCI patients. In particular, the Trunk Control Test-Spinal cord injury introduced by Quinzaños-Fresned et al. (19) on a case series of 177 patients seems to represent the most reliable instrument in terms of criterion, content and construct validity; it must be underlined, however, that the study was not conducted exclusively on chronic patients, thus involving patients with cervical injuries. The inclusion of tetraplegic patients was the main difference also with our study and Palermo's (12) one. Other instruments proposed in the literature have

Table 3. Expert opinion about content relevance of the Italian Fist-Sci scale.

	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Experts agreement	I-CVI
Item 1	1	1	1	1	1	5	1
Item 2	1	1	1	1	1	5	1
Item 3	1	1	1	1	1	5	1
Item 4	1	1	1	1	1	5	1
Item 5	1	1	1	1	1	5	1
Item 6	1	1	1	0	1	4	0,8
Item 7	1	1	1	1	1	5	1
Item 8	1	1	0	1	1	4	0,8
Item 9	1	1	0	1	1	4	0,8
Item 10	1	1	0	1	1	4	0,8
Item 11	1	1	1	1	1	5	1
Item 12	1	1	1	1	1	5	1
Item 13	1	1	0	1	1	4	0,8
Item 14	1	1	0	1	1	4	0,8
Proportion relevance	1	1	0,6428	0,92857	1		
						S-CVI	0,91428

0: non-significant item; 1: significant item. Expert agreement: number of experts who consider the item significant. I-CVI= average of the relevance for the five experts of the single item. S-CVI= Content Validity Index of all scale items according to all experts. Proportional relevance: within the individual judgment, the number of times the item was judged relevant.

inferior reported statistical properties or lack exploration of all domains of sitting balance (22-26).

It must be said, however, that most of the studies focus on groups of patients in intensive rehabilitation settings, in the first months following injury. Often mixed cohorts of acute/chronic patients are enrolled; there is a lack of evidence concerning chronic patient (more than one year after diagnosis), who presents substantial changes: motor recovery, acquisition of greater coping skills through sporting activities, access to robotic extensive rehabilitation, measurement in home setting. In this perspective we addressed the chronic patient alone, testing the properties of a scale that is not yet available in Italian. The Fist- Sci in Italian showed excellent preliminary results: the inter-rater reliability indicated a high correlation between the measurements of two experimenters in both tests, confirming the hypothesis that the standard for examiner instructions, request to the patient and initial position constitutes a fundamental element to obtain an objective scoring. Regarding content validity, however, our investigation's results indicated that FIST-SCI could correctly reflect the phenomenon of interest, although there is some scope for qualitative improvements in measurement accuracy. The practicability of the scale also appears to be extendable to all rehabilitation contexts, requiring only a cot and a tape.

Conclusion

Physiotherapist's work on trunk control in SCI patients remains a fundamental milestone of motor and autonomy recovery, both in acute/subacute settings and in chronic care context. Substantial motor peculiarities of chronic paraplegic patient, in addition to the rapid development of new rehabilitation treatment modalities, often employed in extensive settings (as robotic approach), makes it necessary to expand the possibilities of objective verification of trunk recovery through validated scales. In this perspective, FIST-SCI in the Italian version showed excellent preliminary properties as an instrument for physiotherapists working with chronic spinal cord patients; our hypotheses will have to be further confirmed in larger case series. This study, however, had some limitations: the sample studied was small, and it was impossible to assess intra-rater reliability and re-evaluate the scale later. Moreover, as there was no evaluative standard, it was impossible to calculate criterion validity.

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Institutional Review Board Statement: The study was conducted following the Declaration of Helsinki, and approved by AVEN Ethics Committee 2022/0100187 of 23/02/2022 for studies involving humans. Azienda Usl- Piacenza granted final permission to conduct on 05/04/2022.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

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Conflicts of Interest: All authors declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article.

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