

ORIGINAL ARTICLE

The comprehensive ICF core sets for spinal cord injury from the perspective of occupational therapists: a worldwide validation study using the Delphi technique

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Objective: To validate the International Classification of Functioning, Disability and Health (ICF) core sets for individuals with spinal cord injury (SCI) in the early post-acute and long-term context from the perspective of occupational therapists (OTs).

Setting: International

Methods: OTs experienced in the treatment in SCI were asked about problems, resources and aspects of the environment treated by them, in a three-round electronic mail survey using the Delphi technique. Responses were linked to the ICF by two researchers; kappa coefficient was calculated as statistical measure of agreement.

Results: In total, 67 experts from 27 countries named 2586 different concepts. For the early post-acute context, 223 concepts were linked to ICF categories. Three ICF categories from the component body function, three ICF categories from the component body structures and five ICF categories from the component activities and participation were not represented in the ICF core set for the early post-acute context with an expert agreement of more than 75%. For the long-term context, 205 concepts were linked to ICF categories. Two ICF categories from the component body function, four ICF categories from the component body structures and two ICF categories from the component activities and participation were not represented in the ICF core set with an expert agreement of more than 75%.

Conclusion: OTs addressed a vast variety of problems that they take care of in their interventions in persons with SCI. The Comprehensive ICF core sets covered a high percentage of these problems. Further research is necessary on a few aspects that are not included in the ICF core sets for SCI.

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Introduction

Sustaining a spinal cord injury (SCI) is a devastating event that leads to many changes that are unanticipated, immediate and often permanent. Damage of neural elements of the spinal cord within the spinal column causes impairment or loss of motor and sensory function. This damage is associated to a large range of limitations in activities and restrictions in participation.¹

Occupational therapy is characterized by first focusing on everyday occupations in their clients' life in order to encourage and enable them to take advantage of their resources; second engaging them in daily occupations and

participation, and focusing on the individual with respect to those daily occupations that are meaningful to them individually, given their environment and stage of life. From this background, occupational therapists (OTs) provide services that facilitate health and well-being, enhance function, independence and productivity in the context of people's environment and across their lifespan. OTs work in a variety of institutional, community-based and organizational settings.² As an essential group of professionals, OTs are involved in the treatment of persons with SCI in different healthcare settings. They work as single professionals and within multidisciplinary teams, in which it is important that everyone shares a common understanding of functioning and disability.

The International Classification of Functioning, Disability and Health (ICF)³ provides this common understanding and common descriptive language. The ICF offers a comprehensive

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and universally accepted framework for describing functioning, disability and health in persons with all kinds of health conditions including SCI.³ According to the ICF, the problems associated with a disease or injury include those involving body functions and body structures as well as problems in activities and participation. These problems are the result of an interaction between the direct consequences of the disease or injury and features of the person's life situation, which in the ICF are termed contextual factors and include both environmental and personal factors. The detailed hierarchical structure of the biopsychosocial model of the ICF is presented in Figure 1.

To facilitate the implementation of the ICF into the SCI rehabilitation process, ICF core sets for individuals with SCI in the early post-acute⁴ and the long-term context⁵ have been developed. These ICF core sets are selections of ICF categories relevant to persons with SCI, 162 categories for persons in the early post-acute context and 168 categories for persons in the long-term context. The early post-acute context covers any setting in which the first comprehensive rehabilitation after the acute SCI is provided. The long-term context refers to any setting in which care is provided after ending comprehensive rehabilitation.⁵

The standard methodology for the development of ICF core sets includes collecting evidence from preparatory qualitative and quantitative studies, followed by a formal expert consensus process, which is then followed in turn by a validation phase. A key element of the validation process focuses on whether the problems addressed by health professionals working in a multidisciplinary team are adequately covered in a core set. In the case of SCI, OTs represent an essential professional group involved in the treatment of persons with SCI in different healthcare contexts and from whose perspective ICF core sets need to

be validated.² One specific issue of their content validity is whether the ICF core sets cover the clients' problems that OTs find relevant and take care of their interventions.

The objective of this study is therefore to validate the ICF core sets for SCI in the early post-acute and long-term care contexts from the perspective of OTs.

Methods

Study design

The study was conducted as a worldwide electronic-mail survey applying a three round Delphi technique with invited OTs. The Delphi technique enabled experts to repeatedly access the group, explore the complex issues and obtain consensus.⁶

Recruitment of participants

Persons with training as OTs and experience in the field of SCI were eligible to participate in this study. A worldwide database of experts in SCI was compiled by the ICF Research Branch at the Ludwig-Maximilians University in Munich, Germany within the project 'Development of ICF core sets for Spinal Cord Injury'. This database was the basis for the recruitment in the validation of the ICF core sets in SCI. To recruit additional participants, occupational therapy associations, universities, specialized care units, hospitals and other institutions were identified by internet search and contacted. To determine expertise, author searches were undertaken and personal recommendations followed up. Experts were invited to recommend other OTs with expertise in SCI (snowball sampling). Possible participants received an information pack with study details and were asked to consent in writing, before being enrolled in the study.

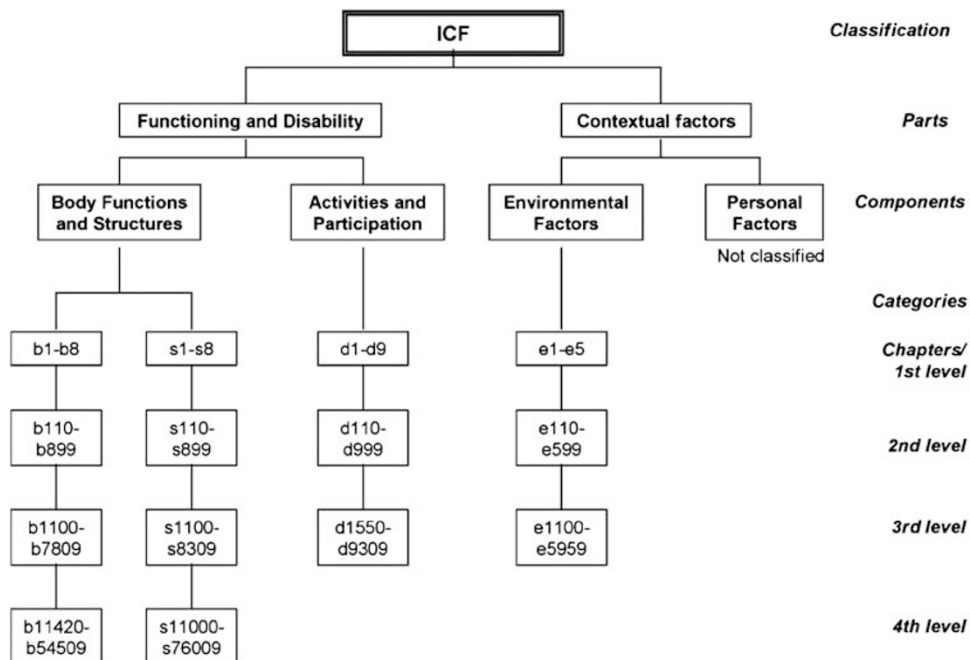


Figure 1 Structure of the ICF.

Delphi process

In the first Delphi round, the experts received an open-ended questionnaire. They were asked to list problems, resources as well as aspects of the environment relevant to the treatment that OTs provide for persons with SCI, first for the early post-acute and second for the long-term context (Figure 2). Answers were tabulated and linked to the ICF⁷ (see below 'Linking'). In addition, experts completed questions on demographic characteristics and professional experience.

In the second Delphi round, experts decided whether to agree that the respective ICF categories represent patients' problems, patients' resources or aspects of their environment that were taken into account for the treatment provided for persons with SCI by OTs.

To maintain participants' motivation, only a selection of the ICF categories from the second round was included in third round. A modified Scree test was applied to identify ICF categories for which consensus was not reached.⁸

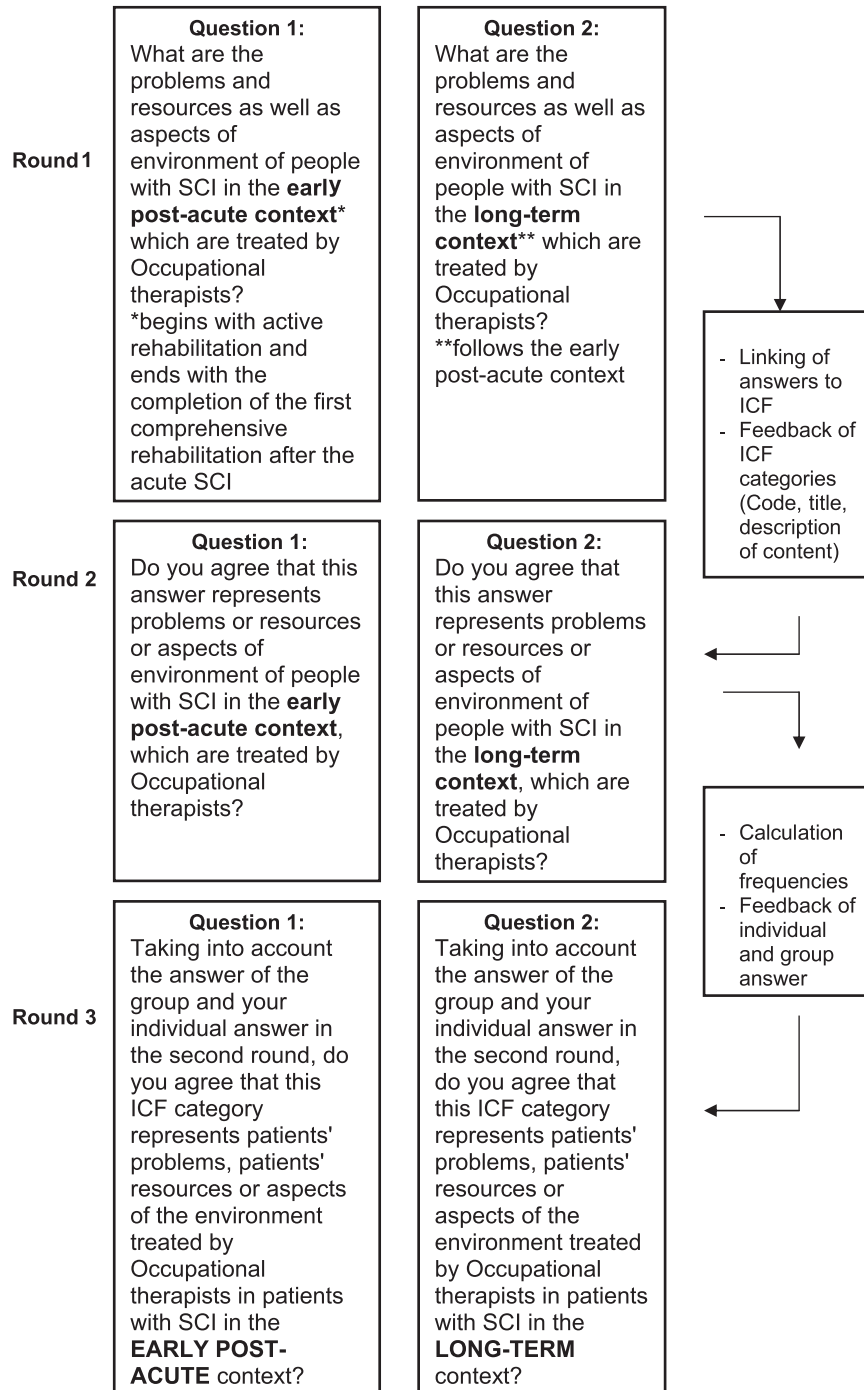


Figure 2 The Delphi Survey.

A graph was plotted containing the percentages of expert agreement for each ICF category. The Scree line was placed on the downward slope. Points close to the Scree line indicated an insufficient endorsement and were included into Delphi round three.

In the third Delphi round, the ratings were tabulated with frequencies of answers from the previous round to inform decisions other experts had made. Experts were requested to reconsider their answers. Within the Delphi process, questionnaires were returned within 3–5 weeks for each round.

Linking

Each response in the first Delphi round was linked to ICF categories by two researchers, according to published linking rules.⁷ Each ICF category was coded with a letter for the components: body functions (b), body structures (s), activities and participation, (d) environmental factors (e) and a code of one to five digits (Figure 1). Disagreements were discussed with supervisors and a joint decision was made. According to the ICF, description personal factors were coded as personal factors. Responses that could not be assigned to ICF categories were coded as not-covered.

Data analyses

Descriptive statistics were used to characterize the sample and frequencies of ratings. Kappa coefficient was calculated with bootstrapped confidence intervals to analyze the agreement between the two researchers linking the participants' answers to the ICF.⁹

ICF categories that reached an agreement of more than 75% among the participants in the final Delphi round were considered for comparison with the comprehensive ICF core set for SCI. As no universal agreement on the level of consensus exists, based on experience from previous studies^{10,11} this cut-off-point was considered to be the appropriate level of consensus to be achieved.

Results

Recruitment

Ten OTs were recruited out of 254 experts in SCI from a worldwide database. An additional 47 experts were suggested by this group and agreed to participate. One hundred forty-six associations were contacted, and newsletters or e-mails were sent to their members. Out of 341 individually invited specialists, 17 agreed to participate. Twelve experts were found by author search, two agreed. Fifty-four institutions were contacted, 7 experts were recruited. Eighty-seven experts were contacted individually and two participated. From the 85 recruited experts, 82 persons out of 27 countries were eligible for inclusion and agreed to participate in the Delphi survey. Table 1 details the attrition of participants between the Delphi rounds, demographics and professional experience.

Delphi process

The Delphi survey was conducted from April- to August-2009. The first-round questionnaires were returned by 92.7%

Table 1 Attrition of participants between the Delphi rounds, and demographics and professional experience of the round 1 participants'

WHO-region countries	Delphi rounds			Demographics				Current professional activity				Professional experience		Expertise in treatment of SCI		Knowledge of ICF	
	Round 1 (n)	Round 2 (n)	Round 3 (n)	Age median (min-max)	Gender female %	Acute care	In-patient care	Out-patient care	Home care	Univer-sity	Other	Professional experience years median (min-max)	Practical experience years median (min-max)	Rate post-acute expertise ^a	Rate long-term expertise ^a	Rate Knowledge ICF ^b	Rate use of ICF ^c
All	76	67	67	40.8 (23-63)	89.5	16	57	20	4	25	8	17.1 (0.5-40)	13.4 (0.5-40)	7.6 (0-10)	7.4 (0-10)	4.7 (0-10)	3.4 (0-10)
African region ^d	3	2	2	39.3 (24-56)	100	0	2	0	0	1	0	13.8 (1.5-26)	4.83 (0.5-9)	6.3 (6-7)	6.7 (5-8)	6 (4-0)	4.7 (2-9)
Region of the Americas ^e	16	13	13	44.4 (26-60)	87.5	1	12	2	1	5	2	21.9 (3.5-39)	20.3 (2-36)	7.9 (4-10)	7.2 (0-10)	3.3 (0-10)	2 (0-8)
Eastern Mediterranean Region ^f	3	3	3	46.7 (45-48)	100	0	0	0	0	3	0	23.3 (21-27)	5.3 (1-10)	3.3 (1-7)	6.7 (1-10)	5.7 (2-10)	4 (1-10)
European region ^g	43	38	38	39.9 (23-63)	93	11	34	11	1	10	1	16.1 (0.5-40)	12.7 (0.5-40)	7.1 (0-10)	7.4 (2-10)	5.2 (0-10)	3.5 (0-10)
South-East Asia region ^h	5	5	5	33.6 (28-38)	60	4	5	4	0	4	2	9.7 (4.5-13)	8.9 (3.5-13)	7.8 (7-9)	7.6 (7-8)	4.6 (0-7)	4.6 (0-7)
Western-Pacific region ⁱ	6	5	5	42 (31-52)	83.3	0	3	3	2	2	3	18.8 (10-30)	14.5 (3-25)	8.7 (8-10)	8.5 (6-10)	6.3 (3-10)	4.8 (0-10)

Abbreviations: ICF, International Classification of Functioning, Disability and Health; SCI, spinal cord injury; WHO, World Health Organisation.

^a0 (no) and 10 (excellent).

^b0 (never heard of the ICF) and 10 (enough knowledge to use the ICF as part of my professional work).

^c0 (never used the ICF) and 10 (use the ICF as part of my professional work).

^dSouth Africa.

^eCanada and United States of America.

^fIran and Tunisia.

^gAustria, Croatia, Denmark, Germany, Iceland, Ireland, Israel, Italy, Lithuania, Malta, Norway, Portugal, Sweden, Switzerland, The Netherlands and UK.

^hBangladesh, India and Thailand.

ⁱAustralia, Taiwan ROC and Viet Nam.

of the participants, one questionnaire was excluded because it was not completed. Four questionnaires were not returned for unknown reasons. One questionnaire was not returned due to sickness. The second-round questionnaire was returned by 88.2% of the experts. According to the Scree test, 110 categories for the early post-acute and 99 categories for the long-term context with inexplicit consensus among the second-round participants were included for the third round. The response rate for the third round was 100%. The questionnaire was provided in the subsequent rounds only to participants who responded in the previous round. Reminders were sent in case there was no reply from the participants.

Linking

In the first Delphi round, 2586 patients' problems, resources or aspects of the environment relevant to treatment of SCI by OT's were identified for the early post-acute and long-term context. The answers were linked to 223 ICF categories for the early post-acute and 205 ICF categories for the long-term context (Tables 2–5). In all, 32 answers were linked to the personal factors; 33 responses for the early post-acute and 22 answers were linked for the long-term context (Table 6). Three responses were found to be not-covered by the ICF, two responses for the early post-acute and three for the long-term context. (Table 7).

The kappa statistics with a bootstrapped confidence interval for the linking was for the early post-acute 0.46 (0.43–0.49) and for the long-term context 0.40 (0.36–0.44).

Representation of OT responses in the comprehensive ICF core sets for SCI

Participants' responses with an agreement of more than 75% in the final round were considered for comparison with the comprehensive ICF core set for SCI.

From the component body functions, 44 categories are part of the ICF core set in the early post-acute, 38 in the long-term context (Table 2). Few responses were linked for the early post-acute context to the third-level categories for example, *b7101 Mobility of several joints*, and in the core set they are represented by the second-level category *b710 Mobility of joint functions*. For the long-term context, answers were linked to the third-level category for example, *b7150 Stability of a single joint*. These categories are represented as second-level category such as *b715 Stability of joint functions*. Three categories with an agreement of more than 75% were not included in the core set for the early post-acute context: *b164 Higher level cognitive functions*, *b1801 Body image* and *b7200 Mobility of scapula*, for the long-term context, two categories were not included: *b1801 Body image* and *b755 Involuntary movement reaction functions*.

From the component body structures, 11 categories for the early post-acute context are included in ICF core set. Several responses were linked to third-level categories. *Structure of the lower leg (s7501)* was represented in the ICF core set as *s750 Structure of the lower extremity*. Nine categories for the long-term context are included in the ICF core set. Few responses for the long-term context linked to third-level categories are

represented in the ICF core set as second-level categories for example, *s7201 Joints of the shoulder regions*, was represented as *s720 Structure of the shoulder region*. Three categories with an agreement of more than 75% were not included in the core set for the early post-acute and four categories for the long-term context are not included in the ICF core set, such as *s760 Structure of the trunk* for the long-term context and for both contexts *s770 Additional musculoskeletal structures related to the movement*, *s7701 Joints* and *s7702 Muscles*.

From the component activities and participation, 83 categories for the early post-acute and 84 in the long-term context are included in the ICF core set (Table 4). In some cases, third-level categories such as *d3600 Using telecommunications devices* and *d3601 Using writing machines* were represented as second-level categories in the core set for the early post-acute context. In the long-term context *d620 Acquisition for goods and services* is represented in the core set as *d6200 Shopping* by the experts. Five categories with an agreement of more than 75% were not included in the core set: *d155 Acquiring skills*, *d170 Writing*, *d177 Making decisions*, *d6504 Maintaining assistive devices* and *d6505 Taking care of plants, indoor and outdoor* for the early post-acute context. Two categories were not included for the long-term context, *d170 Writing* and *d177 Making decisions*.

From the component environmental factors, all ICF categories with an agreement >75% are represented in the ICF core sets, namely 42 categories in the early post-acute and 45 in the long-term context (Table 5).

In all, 32 answers were linked to the not yet developed ICF component personal factors, 23 responses for the early post-acute and 22 responses for the long-term context. The majority of these issues addressed health conditions related to SCI. A few responses described coping strategies for example, realistic goal setting (Table 6). Five issues were not-covered by the core sets (Table 7).

Discussion

We found that the categories of the current versions of the ICF core sets for SCI largely agree with what OTs consider problems, resources and aspect of the environment relevant to their treatment of persons with SCI. However, some ICF categories were not included in the ICF core sets and need to be discussed.

In the component body functions, *b1801 Body image* was named by the participants, but not included in ICF core sets for SCI. The opinion of the participants is consistent with studies, which demonstrated that physical impairments result in a changed body, which affects physical and psychosocial well-being, and performance.^{12,13}

The category *b164 Higher level cognitive functions* was mentioned by the participants. In agreement with previous research, the ICF category *b755 Involuntary movement reaction functions* was considered as relevant not only for the early post-acute context, but also for the long-term context by the participants in our study.^{14,15} Furthermore, the participants highlighted the relevance of *b7200 Mobility of scapula*, which is not included in ICF core sets for the early post-acute context.¹⁴

Table 2 ICF component body functions: percent agreement among participants in the final Delphi round

ICF code			ICF category title	Early post-acute context		Long-term context	
Second level	Third level	Fourth level		ICF core set SCI	Final round n = 67	ICF core set SCI	Final round n = 67
<i>b-Body functions</i>							
b126			Temperament and personality functions	X		X	
b130			Energy and drive functions	X		X	
	b1301		Motivation		85.1		84.6
b134			Sleep functions	X		X	
b152			Emotional functions	X	86.6	X	89.4
	b164		Higher-level cognitive functions		80.3		
	b1801		Body image		83.6		93.9
b210			Seeing functions		16.7		29.2
b235			Vestibular functions		62.1		
	b2350		Vestibular function of position		61.5		
	b2351		Vestibular function of balance		60.6		
b260			Proprioceptive function	X	92.5	X	98.5
b265			Touch function	X	97.0	X	83.1
b270			Sensory functions related to temperature and other stimuli	X	94.0	X	86.2
b280			Sensation of pain		86.6		84.6
	b2800		Generalized pain	X			
		b28010	Pain in head and neck	X	76.1	X	81.8
		b28011	Pain in chest			X	
		b28012	Pain in stomach or abdomen			X	
		b28013	Pain in back	X	89.6	X	92.5
		b28014	Pain in upper limb	X		X	
		b28015	Pain in lower limb	X		X	
		b28016	Pain in joints	X	83.6	X	86.2
	b2803		Radiating pain in a dermatome	X		X	
	b2804		Radiating pain in a segment or region	X		X	
b310			Voice functions	X	21.5		16.4
b320			Articulation functions				17.9
b330			Fluency and rhythm of speech functions				14.9
b410			Heart functions	X	14.9		
b415			Blood vessel functions	X	16.4		
b420			Blood pressure functions		29.9	X	21.5
	b4200		Increased blood pressure	X			
	b4201		Decreased blood pressure	X			
	b4202		Maintenance of blood pressure	X			
b430			Hematological system functions	X			
b440			Respiration functions	X	26.9	X	23.1
b445			Respiratory muscle functions	X	43.8	X	35.8
b450			Additional respiratory functions	X	44.8		31.3
b455			Exercise tolerance functions	X	60.6	X	47.0
	b4550		General physical endurance		94.0		91.0
	b4552		Fatigability				80.3
b510			Ingestion functions	X			
b515			Digestive functions	X	11.9		
b520			Assimilation functions		7.5		3.1
b525			Defecation functions		23.9	X	24.6
	b5250		Elimination of faeces	X			
	b5251		Faecal consistency	X			
	b5252		Frequency of defecation	X			25.4
	b5253		Faecal continence	X			38.8
	b5254		Flatulence	X			
b530			Weight maintenance functions	X		X	
b535			Sensations associated with the digestive system		19.7		15.2
b550			Thermoregulatory functions	X	40.3	X	37.9
b610			Urinary excretory functions	X	13.4	X	10.8
	b6101		Collection of urine		15.2		16.9
b620			Urination functions		34.8		40.3
	b6200		Urination	X		X	
	b6201		Frequency of urination	X		X	
	b6202		Urinary continence	X	31.3	X	37.3
b630			Sensations associated with urinary functions	X	26.9		26.2
b640			Sexual functions	X	37.3	X	40.3
b660			Procreation functions			X	
	b6600		Functions related to fertility				19.7
b670			Sensations associated with genital and reproductive functions	X		X	
b710			Mobility of joint functions	X	94.0	X	96.9

Table 2 Continued

ICF code			ICF category title	Early post-acute context		Long-term context	
Second level	Third level	Fourth level		ICF core set SCI	Final round n = 67	ICF core set SCI	Final round n = 67
b715	b7101		Mobility of several joints		97.0		
			Stability of joint functions	X		X	
b720	b7150		Stability of a single joint				97.0
	b7151		Stability of several joints		95.5		
b730			Mobility of bone functions			X	
	b7200		Mobility of scapula		83.6		
b730			Muscle power functions		94.0	X	89.2
	b7300		Power of isolated muscles and muscle groups	X	94.0		86.2
b735	b7302		Power of muscles of one side of the body	X			
	b7303		Power of muscles in lower half of the body	X			
b735	b7304		Power of muscles of all limbs	X			
	b7305		Power of muscles of the trunk	X			
b735			Muscle tone functions		95.5	X	93.8
	b7351		Tone of muscles of one limb				95.5
b740	b7353		Tone of muscles of lower half of body	X			
	b7354		Tone of muscles of all limbs	X			
b750	b7355		Tone of muscles of trunk	X	88.1		
			Muscle endurance functions	X	91.0	X	84.4
b755			Motor reflex functions	X		X	
	b755		Involuntary movement reaction functions	X	82.1		85.9
b760			Control of voluntary movement functions	X	97.0	X	93.8
	b7600		Control of simple voluntary movements		97.0		87.5
b765	b7602		Coordination of voluntary movements		97.0		92.2
			Involuntary movement functions	X			
b770			Gait pattern functions	X		X	
	b780		Sensations related to muscles and movement functions	X	92.4	X	
b810	b7800		Sensation of muscle stiffness		88.1		
	b7801		Sensation of muscle spasm		85.1		86.2
b820			Protective functions of the skin	X	79.1	X	95.5
	b820		Repair functions of the skin	X	55.2	X	58.2
b830			Other functions of the skin	X		X	
	b840		Sensation related to the skin	X		X	

Abbreviations: ICF, International Classification of Functioning, Disability and Health; SCI, spinal cord injury.

Notes: categories not represented in the ICF core set for SCI for the early post-acute or the long-term context with an agreement by the experts of more than 75% are highlighted in bold.

Categories from the component body structures that are not represented in the ICF core sets for both contexts were *s770 Additional musculoskeletal structures related to movement*, *s7701 Joints* and *s7702 Muscles*. This is supported by research, which shows that OTs must have sound knowledge in joint protection techniques and in ergonomic principles, as they are taking care for movement-related structures in their treatment.^{16,17} Thus, it seems important to include this category in the ICF core sets to assure a comprehensive description of OT interventions.

From the ICF component activities and participation, *d177 Making decisions* and *d175 Problem solving* were mentioned by the participants, but are not represented in the ICF core sets for SCI. In fact, OTs help their clients to select and implement appropriate strategies to overcome challenges of their new situation. Effective problem-solving was found to be a key factor to master their changed life.^{12,13} Furthermore, the ICF categories *d155 Acquiring skills* and *d170 Writing* clearly reflect problems of persons with SCI. For example, persons after forearm tendon transfer surgery need to acquire and learn new skills including writing and to use their 'new hands'.¹⁸ The relevance of topics such as solving problems, making decisions and learning for the professional work in

occupational therapy is supported by professional boards for example, the National Board for Certification in Occupational Therapy.¹⁹ Thus, from the perspective of OTs, an inclusion of those categories in the ICF core sets for SCI might be useful.

As assistive devices are often essential for the clients' participation in every day life,²⁰ the education and training on the use and maintenance of assistive devices is an important part of occupational therapy. Consequently, it could be useful to add *d6504 Maintaining assistive devices* to the ICF core set for the early post-acute context.

The participants also addressed category *d6505 Taking care of plants indoors and outdoor*, which is not considered in the ICF core set for the early post-acute context. The therapeutic relevance of the role of taking care for plants is reported in research. Problems are addressed, such as cognitive reorganization, mental healing, prevocational assessment, recreation, teaching of ergonomics, training of sensory motor function, learning to work with assistive devices and social interaction.²¹ However, it remains questionable why the participants highlighted this category. Further research on this finding is necessary.²²⁻²⁶

Table 3 ICF component body structures: percent agreement among participants in the final Delphi round

ICF code			ICF category title	Early post-acute context		Long-term context	
Second level	Third level	Fourth level		ICF core set SCI	Final round n = 67	ICF core set SCI	Final round n = 67
<i>S-Body structures</i>							
		s12000	Cervical spinal cord	X		X	
		s12001	Thoracic spinal cord	X		X	
		s12002	Lumbosacral spinal cord	X		X	
		s12003	Cauda equina	X		X	
	s1201		Spinal nerves	X		X	
s210			Structure of eye socket		1.5		
s220			Structure of eyeball		3.1		
s430			Structure of respiratory system	X		X	
s540			Structure of intestine		9.1		
s610			Structure of urinary system	X		X	
	s6102		Urinary bladder		15.6		
s710			Structure of head and neck region	X	74.6		63.1
s720			Structure of shoulder region	X	95.5	X	79.7
	s7201		Joints of shoulder region				84.4
s730			Structure of upper extremity	X	87.7		87.5
	s7300		Structure of upper arm			X	
	s7301		Structure of forearm			X	
	s7302		Structure of hand		95.4	X	93.8
		s73021	Joints of hand and fingers		92.3		93.8
		s73022	Muscles of hand		93.9		92.2
s740			Structure of pelvic region	X			
s750			Structure of lower extremity	X	49.3		49.3
	s7500		Structure of thigh			X	
	s7501		Structure of lower leg		43.9	X	44.8
	s7502		Structure of ankle and foot			X	
s760			Structure of trunk	X	86.2		86.2
s770			Additional musculoskeletal structures related to movement		92.4		92.4
	s7700		Bones				41.3
	s7701		Joints		81.3		82.5
	s7702		Muscles		84.4		82.5
s810			Structure of areas of skin	X	89.6		86.4
	s8102		Skin of upper extremity			X	
	s8103		Skin of pelvic region			X	
	s8104		Skin of lower extremity			X	
	s8105		Skin of trunk and back			X	

Abbreviations: ICF, International Classification of Functioning, Disability and Health; SCI, spinal cord injury.

Notes: categories not represented in the ICF core set for SCI for the early post-acute or the long-term context with an agreement by the experts of more than 75% are highlighted in bold.

It is important to mention the interaction across the ICF components. If persons have problems in higher cognitive functions, such as abstraction, insight and judgment, concept formation and mental flexibility, the corresponding activities are also negatively influenced and the treatment process is affected. As categories *d177 Making decisions* and *d175 Problem solving* were mentioned by the OTs on the activity/participation level it seems likely that the work of OTs is on one hand focusing on facilitating the individuals ability to select and implement appropriate strategies and evaluate the results. On the other hand, to facilitate the ability to generate strategies that may be used to resolve problems. Learning ability, effective problem-solving and *d155 Acquiring skills*, *d177 Making decisions* help persons with SCI to overcome challenges of their new situation and was found to be a key factor to successfully participate in the changed life.^{12,13}

However, problems with cognitive functions do not only interfere with OT treatment, but also complicate the treatment process of all involved health professions. As different professions have a different focus on complex and multidimensional problems, like higher-level cognitive functions, the unifying language and framework of the ICF core sets could improve client-orientation and efficiency in the rehabilitation process considering the diverse perspectives of the health professionals.

Personal factors are not yet classified in the ICF. In our survey, a large number of personal factors were identified mainly related to health conditions, age, coping or adapting to the new role. Thus, it could be useful to develop the ICF component personal factors to enable health professionals to comprehensively and systematically describe relevant aspects influencing a patient's functioning and health.

Table 4 ICF component activities and participation: percent agreement among participants in the final Delphi round

ICF code		ICF category title	Early post-acute context		Long-term context	
Second level	Third level		ICF core set SCI	Final round n = 67	ICF core set SCI	Final round n = 67
<i>d-Activities and participation</i>						
d155		Acquiring skills		97.0	X	83.1
d170		Writing		95.5		89.2
d175		Solving problems				84.8
d177		Making decisions		91.0		
d230		Carrying out daily routine	X	92.5	X	89.2
d240		Handling stress and other psychological demands	X		X	
	d2401	Handling stress		87.9		
d330		Speaking		51.5		
d345		Writing messages			X	
d350		Conversation		66.7		
	d3503	Conversing with one person				42.4
d360		Using communication devices and techniques	X	94.0	X	
	d3600	Using telecommunication devices		95.5		95.4
	d3601	Using writing machines		95.5		96.9
d410		Changing basic body position		95.2		95.4
	d4100	Lying down	X	93.9	X	
	d4102	Kneeling			X	
	d4103	Sitting	X	95.5	X	
	d4104	Standing	X	90.9	X	
	d4105	Bending	X	95.4	X	
	d4106	Shifting the body's centre of gravity	X	91.0	X	92.3
d415		Maintaining a body position		91.0	X	90.8
	d4150	Maintaining a lying position		83.6		
	d4153	Maintaining a sitting position	X	91.0		92.3
	d4154	Maintaining a standing position	X	86.6		80.0
d420		Transferring oneself	X	97.0	X	96.9
	d4200	Transferring oneself while sitting		97.0		
	d4201	Transferring oneself while lying		85.1		83.1
d430		Lifting and carrying objects	X	98.5	X	100.0
	d4300	Lifting		98.5		
	d4305	Putting down objects				100.0
d435		Moving objects with lower extremities	X			
d440		Fine hand use		100.0		98.5
	d4400	Picking up	X		X	
	d4401	Grasping	X	100.0	X	98.5
	d4402	Manipulating	X	100.0	X	98.5
	d4403	Releasing	X		X	
d445		Hand and arm use		100.0		98.5
	d4450	Pulling	X		X	
	d4451	Pushing	X		X	
	d4452	Reaching	X	97.0	X	98.5
	d4453	Turning or twisting the hands or arms	X		X	
	d4454	Throwing			X	
	d4455	Catching	X			
d450		Walking		50.7		62.1
	d4500	Walking short distances	X		X	
	d4501	Walking long distances	X		X	
	d4502	Walking on different surfaces	X		X	
	d4503	Walking around obstacles	X		X	
d455		Moving around	X	49.3	X	49.3
d460		Moving around in different locations		83.1		90.8
	d4600	Moving around within the home	X	80.3	X	90.9
	d4601	Moving around within buildings other than home	X	78.8	X	89.4
	d4602	Moving around outside the home and other buildings	X	77.3	X	89.4
d465		Moving around using equipment	X	80.6	X	90.8
d470		Using transportation	X	80.6	X	96.9
	d4700	Using human-powered vehicles		57.6		74.2
	d4701	Using private motorized transportation		73.1		88.1
	d4702	Using public motorized transportation		83.6		81.5
d475		Driving	X	81.8	X	87.7
	d4751	Driving motorized vehicles		77.6		84.6
d510		Washing oneself	X	98.5	X	93.8
	d5100	Washing body parts		98.5		92.3
	d5101	Washing whole body		95.5		92.2
	d5102	Drying oneself		97.0		92.3

Table 4 Continued

ICF code		ICF category title	Early post-acute context		Long-term context	
Second level	Third level		ICF core set SCI	Final round n = 67	ICF core set SCI	Final round n = 67
d520		Caring for body parts	X	95.5	X	92.3
	d5200	Caring for skin		83.6		83.1
	d5201	Caring for teeth		98.5		92.3
	d5202	Caring for hair		98.5		92.3
d530		Toileting		85.1		89.2
	d5300	Regulating urination	X	85.1	X	86.2
	d5301	Regulating defecation	X	83.6	X	84.6
	d5302	Menstrual care	X		X	
d540		Dressing	X	97.0	X	96.9
	d5400	Putting on clothes		97.0		96.9
	d5401	Taking off clothes		97.0		93.8
	d5402	Putting on footwear		97.0		
	d5403	Taking off footwear		95.5		
	d5404	Choosing appropriate clothing		80.6		
d550		Eating	X	98.5	X	93.8
d560		Drinking	X	98.5	X	93.8
d570		Looking after one's health	X	87.9	X	89.4
	d5700	Ensuring one's physical comfort		87.9		
	d5701	Managing diet and fitness				65.1
	d5702	Maintaining one's health		80.6		
d610		Acquiring a place to live	X	68.7	X	72.3
d620		Acquisition of goods and services	X		X	
	d6200	Shopping		86.6		83.1
d630		Preparing meals	X	79.1	X	92.3
d640		Doing housework	X	88.1	X	92.3
	d6400	Washing and drying clothes and garments		83.3		87.7
	d6401	Cleaning cooking area and utensils		81.8		89.1
	d6402	Cleaning living area		86.4		89.2
	d6403	Using household appliances		85.1		
	d6404	Storing daily necessities		76.1		89.6
d650		Caring for household objects			X	80.3
	d6500	Making and repairing clothes		73.1		
	d6501	Maintaining dwelling and furnishings		52.2		
	d6502	Maintaining domestic appliances		43.3		
	d6504	Maintaining assistive devices		79.1		87.7
	d6505	Taking care of plants, indoors and outdoors		80.6		87.7
	d6506	Taking care of animals				79.1
d660		Assisting others	X	70.1	X	85.1
	d6600	Assisting others with self-care		76.1		81.5
d710		Basic interpersonal interactions		64.2		
d720		Complex interpersonal interactions			X	
d750		Informal social relationships			X	
	d7500	Informal relationships with friends		53.0		
d760		Family relationships	X	58.2	X	48.5
d770		Intimate relationships	X	37.3	X	37.3
	d7702	Sexual relationships		38.8		40.3
d810		Informal education		32.8	X	51.5
d820		School education		41.8	X	60.6
d825		Vocational training		43.3	X	64.2
d830		Higher education		37.9	X	57.2
d840		Apprenticeship (work preparation)			X	66.7
		Acquiring, keeping and terminating a job		27.7	X	52.3
	d8450	Seeking employment				58.5
	d8451	Maintaining a job		61.2		73.8
d850		Remunerative employment	X	38.8	X	57.6
	d8501	Part-time employment		40.3		60.6
		Non-remunerative employment		34.3		62.5
d860		Basic economic transactions		54.0		64.1
d865		Complex economic transactions		24.2		29.2
d870		Economic self-sufficiency	X		X	
d910		Community life		64.2	X	71.2
d920		Recreation and leisure	X	82.1	X	86.2
	d9200	Play		80.0		82.5
	d9201	Sports		71.6		83.3
	d9202	Arts and culture		76.1		83.3

Table 4 Continued

ICF code		ICF category title	Early post-acute context		Long-term context	
Second level	Third level		ICF core set SCI	Final round n = 67	ICF core set SCI	Final round n = 67
	d9204	Hobbies		79.1		
	d9205	Socializing		83.3		86.4
d930		Religion and spirituality	X	65.2		62.1
d940		Human rights			X	
d950		Political life and citizenship				56.9

Abbreviations: ICF, International Classification of Functioning, Disability and Health; SCI, spinal cord injury.

Notes: categories not represented in the ICF core set for SCI for the early post-acute or the long-term context with an agreement by the experts of more than 75% are highlighted in bold.

Table 5 ICF component environmental factors: percent agreement among participants in the final Delphi round

ICF code			ICF category title	Early post-acute context		Long-term context	
First level	Second level	Third level		ICF core set SCI	Final round n = 67	ICF core set SCI	Final round n = 67
<i>e-Environmental factors</i>							
	e110		Products or substances for personal consumption	X	25.0	X	
		e1100	Food		23.4		29.7
		e1101	Drugs				21.2
	e115		Products and technology for personal use in daily living	X	94.0	X	93.8
		e1150	General products and technology for personal use in daily living		87.9		90.8
		e1151	Assistive products and technology for personal use in daily living		98.5		96.9
	e120		Products and technology for personal indoor and outdoor mobility and transportation	X	91.0	X	93.8
		e1201	Assistive products and technology for personal indoor and outdoor mobility and transportation		95.5		96.9
	e125		Products and technology for communication	X	95.5	X	95.4
		e1251	Assistive products and technology for communication		91.0		92.3
	e130		Products and technology for education	X	75.8	X	86.2
	e135		Products and technology for employment	X	88.1	X	92.3
	e140		Products and technology for culture, recreation and sport	X	93.9	X	92.3
		e1401	Assistive products and technology for culture, recreation and sport		85.1		
	e150		Design, construction and building products and technology of buildings for public use	X	83.3	X	86.4
		e1500	Design, construction and building products and technology for entering and exiting buildings for public use		85.1		
	e155		Design, construction and building products and technology of buildings for private use	X	95.5	X	89.1
		e1550	Design, construction and building products and technology for entering and exiting of buildings for private use		80.6		90.8
		e1551	Design, construction and building products and technology for gaining access to facilities in buildings for private use		92.4		89.2
	e160		Products and technology of land development		39.4	X	51.5
	e165		Assets	X	23.9	X	
		e1650	Financial assets		20.9		18.5
e2			Chapter 2 natural environment and human-made changes to environment				41.5
	e310		Immediate family	X	83.5	X	87.9
	e315		Extended family	X	72.7	X	71.2
	e320		Friends	X	86.6	X	78.8
	e325		Acquaintances, peers, colleagues, neighbors and community members	X	59.7	X	73.1
	e330		People in positions of authority	X	81.8	X	77.6
	e340		Personal care providers and personal assistants	X	81.8	X	87.7
	e345		Strangers		61.2		
	e355		Health professionals	X	92.5	X	92.3
	e360		Other professionals	X	82.1	X	83.1
	e410		Individual attitudes of immediate family members	X	73.4	X	
	e415		Individual attitudes of extended family members	X	57.6	X	

Table 5 Continued

ICF code			ICF category title	Early post-acute context		Long-term context	
First level	Second level	Third level		ICF core set SCI	Final round n = 67	ICF core set SCI	Final round n = 67
	e420		Individual attitudes of friends	X		X	
	e425		Individual attitudes of acquaintances, peers, colleagues, neighbors and community members	X		X	
	e440		Individual attitudes of personal care providers and personal assistants	X		X	
	e450		Individual attitudes of health professionals	X		X	
	e455		Individual attitudes of health-related professionals			X	
	e460		Societal attitudes	X	59.1	X	57.6
	e465		Social norms, practices and ideologies		62.1	X	60.6
	e510		Services, systems and policies for the production of consumer goods			X	56.3
	e515		Architecture and construction services, systems and policies	X		X	83.1
	e520		Open space planning services, systems and policies				51.5
	e525		Housing services, systems and policies	X	62.1	X	71.2
		e5250	Housing services				54.5
	e530		Utilities services, systems and policies			X	24.6
	e535		Communication services, systems and policies			X	
	e540		Transportation services, systems and policies	X	64.1	X	72.7
		e5400	Transportation services		57.6		
	e545		Civil protection services, systems and policies				25.8
		e5450	Civil protection services				36.4
	e550		Legal services, systems and policies			X	31.8
	e555		Associations and organizational services, systems and policies	X	41.5	X	43.9
		e5550	Associations and organizational services				41.5
	e565		Economic services, systems and policies		31.8		
	e570		Social security services, systems and policies	X	29.2	X	33.8
		e5700	Social security services		27.7		40.0
	e575		General social support services, systems and policies	X	66.7	X	71.4
		e5750	General social support services		70.3		75.0
	e580		Health services, systems and policies	X	80.0	X	83.1
		e5800	Health services		83.3		
	e585		Education and training services, systems and policies		33.3	X	47.0
		e5850	Education and training services		32.3		
		e5852	Education and training policies				47.0
	e590		Labor and employment services, systems and policies			X	57.6
		e5900	Labor and employment services		40.9		
	e595		Political services, systems and policies				29.7

Abbreviations: ICF, International Classification of Functioning, Disability and Health; SCI, spinal cord injury.

The responses not covered by the ICF addressed training and education of the family, personal assistants and careers of persons with SCI. Although these persons are not the targets of the ICF and consequently no categories exist to classify their functioning and health, the ICF recognizes their influence on the persons with SCI in the chapter *e3 Support and relationships* (Table 7).

Concerning methodological limitations and strengths, the following aspects should be considered. The Delphi technique was an appropriate method for this study objective. With a total response rate of 81.7%, the criterion of a minimum 70% response rate was clearly exceeded.⁶ According to the kappa coefficient there was a moderate agreement of the linking researchers.

A potential selection bias cannot be excluded. Random sampling was not possible as no database is available with

sufficient number of the targeted population. The Delphi method rather uses experts in the area of interest.⁶ Furthermore, there are limitations in the external validity. Although experts from all world regions were participating, there was an underrepresentation of the African Region, Eastern Mediterranean Region and South East Asia Region. No experts could be recruited in South or Middle Americas. Health services might not yet be established for SCI. Language barriers might have been another reason as the Delphi survey was conducted in English language only.

Conclusion

This study supports that the comprehensive ICF core sets in SCI are relevant to the clinical practice of OTs and provide a useful basis to describe and classify functioning, health and

Table 6 Responses that were linked to the ICF component personal factors: percent agreement among participants in the final Delphi round

Responses linked to the ICF component personal factors	Final round	
	Early post-acute context	Long-term context
Independence	100.0	98.5
Lifestyle management from a wheelchair		98.5
Realistic goal setting		97.0
Patient involvement into goal setting and treatment planning	97.0	
Overuse syndromes		90.9
Edema	97.0	89.2
Education, knowledge and understanding about SCI	93.9	90.8
Psychological situation, coping abilities	92.4	90.8
Roles effected by SCI	92.5	93.9
Low self esteem	92.3	
Residence, location and type	88.9	90.3
Carpal-tunnel syndrome		86.4
Self-actualization		85.5
Rotator cuff ruptures		84.8
Scoliosis		82.1
Limited knowledge on accessibility and community reentry	86.2	81.3
Possible brain injury	86.2	
Hospital environment	84.4	
Poor recreation	81.3	
Concomitant injuries	90.9	95.5
Depression	79.1	86.6
Fractures	79.1	89.4
Autonomic dysreflexia	86.6	86.6
Overnight care and abilities	86.6	
Patients background	96.9	
Scar management	85.1	
Spinal shock	76.9	
Spirituality	60.0	
Heterotrophic ossification	69.7	80.0
Osteoporosis	56.7	80.6
Osteomyelitis		53.0
Urinary tract infection		44.6

Abbreviations: ICF, International Classification of Functioning, Disability and Health; SCI, spinal cord injury.

Table 7 Responses that are not covered by the ICF: percent agreement among participants in the final Delphi round

Responses that are not covered by the ICF	Final round	
	Early post-acute context	Long-term context
Multiprofessional team for 'coming back home'		97.0
Training and education of personal assistants and careers	89.4	93.8
Family training and education	93.9	93.8

Abbreviation: ICF, International Classification of Functioning, Disability and Health.

disability with a common framework and language. The comprehensive ICF core sets covered a majority of problems treated by OTs in persons with SCI. Further research is necessary on a few aspects not included. Further results on

the validity of the ICF core sets will be available from studies involving perspectives from physical therapists, physicians, psychologists, nurses and social workers.

Conflict of interest

The authors declare no conflict of interest.

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