

Which assessment tools address the categories of the Brief ICF Core Set for Hand Conditions?

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Hand Therapy
2015, Vol. 20(3) 75–87
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DOI: 10.1177/1758998315586276
hth.sagepub.com



Abstract

Introduction: The purpose of this study was to explore whether assessment tools address aspects that are relevant according to the Brief ICF Core Set for Hand Conditions (BICF-CS).

Methods: Assessment tools meant to assess functioning and/or environmental factors in adults with hand conditions were reviewed. MEDLINE and CINAHL databases, previously published reviews, the book *Clinical Assessment Recommendations of the ASHT*, and websites of assessment tools were used for the content comparison and linking to the 23 categories of the BICF-CS. The updated version of the linking rules was applied by two reviewers.

Results: Forty-six assessment tools, known within the areas of hand therapy and hand surgery, were linked to the 23 categories of the BICF-CS. Regarding *Body functions and body structures*, the categories that were most frequently addressed were b730 “Muscle power functions,” b280 “Sensation of pain,” b710 “Mobility of joint functions,” and s730 “Structure of upper extremity.” Regarding *Activities and Participation*, d440 “Fine hand use” was addressed mostly and 25 assessment tools (with a total of 146 items) were linked to this category. Regarding *Environmental Factors*, only one assessment tool was identified that could be linked to two categories. Fifteen points of discussion were encountered in the linking process.

Conclusions: Content comparison of 46 assessment tools revealed that 19 of the 23 categories of the BICF-CS were addressed. The environmental factors were hardly addressed.

Keywords

Hand therapy, outcome assessment, linking, ICF, hand conditions, hand injuries

Date received: 18 February 2015; accepted: 17 April 2015

Introduction

Persons with a hand injury or hand disorder (i.e., hand condition) may experience impairments, activity limitations, and participation restrictions. A variety of day-to-day activities may be limited, such as self-care and domestic life. In clinical practice, assessment tools are increasingly used to evaluate, for instance, a person’s body functions, self-care abilities, and environmental factors, domains that are described in the International Classification of Functioning, Disability, and Health (ICF).

The ICF was introduced in 2001 by the World Health Organization as a means to address human functioning from a biopsychosocial perspective.¹ It provides a common language for members from various health care professions to describe individual functioning, disability, and health.¹ According to the ICF,

functioning comprises the components “Body Functions” and “Body Structures” as well as “Activities and Participation.” The contextual environmental and personal factors are also considered within

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the biopsychosocial perspective, although the “Personal Factors” have not yet been classified. Each component is composed of categories and subcategories providing more than 1400 ICF (sub)categories altogether.¹ To enhance its applicability in clinical practice and research, ICF Core Sets are needed.² ICF Core Sets list certain aspects taken from the entire classification that are relevant for the description of functioning of individuals being treated in specific settings or with specific health problems, such as hand conditions.^{2,3} The Brief and Comprehensive ICF Core Sets for Hand Conditions⁴ have been adopted at the international ICF consensus conference in May 2009.^{5,6} During this conference, from a subset of ICF categories based on preparatory studies, 23 experts selected a total of 117 categories for a Comprehensive Core Set and 23 categories for a Brief Core Set: the Comprehensive (CICF-CS) and Brief (BICF-CS) Core Set for Hand Conditions, respectively. These core sets can serve as a useful tool to guide hand therapists, hand surgeons, rehabilitation physicians, and researchers in the assessment of a patient’s functioning and health in both clinical practice and scientific studies.

The BICF-CS and CICF-CS provide an evidence-based selection of functional aspects and environmental factors that should be considered among patients with hand injuries or hand disorders. Thus, these core sets can be used to determine how well available assessment tools address all relevant aspects of human functioning in individuals with hand conditions. The aim of this study was, therefore, to provide content comparison of assessment tools, known within the area of hand surgery and hand rehabilitation, with the 23 categories of the Brief ICF Core Set for Hand Conditions (BICF-CS).

Methods

Literature review

For instruments that assess body functions and structures (impairments), activity (limitations), and/or participation (restrictions) information was gathered. The literature concerning assessment tools that address activity (limitations) and participation (restrictions) in patients with hand conditions was systematically reviewed as reported in previous publications.^{7,8} The MEDLINE and CINAHL databases, the book *Clinical Assessment Recommendations* of the American Society of Hand Therapists,⁹ and (if existent) websites of assessment tools were used to collect more detailed information about the assessment tools such as content descriptions, administration manuals, and scoring forms. Publications already reporting about a particular assessment tool with respect to the ICF were also reviewed.^{10–16}

Assessment tools

Assessment tools included were either observational instruments or questionnaires meant to assess functioning and/or environmental factors in adults with hand conditions. The definitive list consisted of assessment tools that are commonly used in hand conditions and that are sufficiently described in literature.^{8,9} Observational instruments are performance tests and include (1) pegboard tests measuring only fine hand use; (2) instruments measuring only fine hand use by picking up, manipulating, and placing different objects; and (3) instruments measuring single tasks (and fine hand use) by scoring executed tasks. Questionnaires include patient reported outcome measures and questionnaires that can be completed by hand therapist and patient together. Biomedical and laboratory tests, such as X-rays or electromyography, were not considered.

Linking process

Two independent reviewers (physical therapy students (St.W. and C.G.) who had been trained for this study) applied the updated version of the linking rules to map the content of the included assessment tools to the 23 BICF-CS categories¹⁷ (Table 1). The decision on the ICF categories to be linked to the items of a certain instrument was based on the description, scoring form, and test manual as well as on the definitions of the ICF categories.¹ In the first step of the linking process, the content of each item and, if applicable, its response options (response scale) were determined using the standardized linking rules. Item content was referred to as the meaningful concept(s) addressed by a particular item of an assessment tool.¹⁷ The meaningful concept within each item of every single instrument was then, in the second step, linked to the most specific BICF-CS category. If an item was considered to address more than one meaningful concept or if it was specified by examples, each concept was separately linked to a BICF-CS category. For example, “Button a shirt or blouse” was linked to *d440 Fine Hand Use* as well as to *d5 Self-Care*.

The ICF has a hierarchical structure. Each chapter of the classification consists of first-, second-, and third-level categories—in some chapters even of fourth-level categories—which represent the single units of the classification system. A lower level category provides information in a more precise way, thus, shares the attributes of its higher level category but not vice versa. For example, the category *b2 Sensory functions and pain* reflects the first (highest) level, *b280 Sensation of pain* represents the second level, *b2801 Pain in body part* corresponds with the third level, and *b28014 Pain in upper limb* corresponds with the fourth level. The CICF-CS consists of more third- and fourth-level

Table 1. Linking rules.

Specific rules for the linking of health status

- a. Identify all meaningful concepts within each item
- b. Link all response options if they contain meaningful concepts
- c. Interval of time (during the last week) is not linked to the ICF
- d. Meaningful items explained by examples, both item and examples are linked. The linked examples will be put within parentheses

Updated linking rules, to be applied after having used the four specific rules

1. Before one links meaningful concepts, one should acquire knowledge of the conceptual and taxonomical fundamentals of the ICF, chapters, domains, and categories of the classification
2. Each meaningful concept is linked to the most precise ICF category
3. Do not use the so-called other specified ICF categories. If the content of a meaningful concept is not named in the corresponding ICF category, the additional information is documented
4. Do not use the so-called unspecified ICF categories, but to the lower level category
5. If the information provided by the meaningful concept is not sufficient for making a decision about the most precise ICF category it should be linked to, the meaningful concept is assigned nd (not definable)
Special cases of this rule:
–Meaningful concepts referring to health in general, physical health or mental health, are assigned: nd-gh, nd-ph or nd-mh (not definable—general health, not definable—physical health, not definable—mental health)
–Meaningful concepts referring to quality of life in general are assigned nd-qol (not definable—quality of life)
6. If the meaningful concept is not contained in the ICF, but it is clearly a personal factor, it will be assigned as pf (personal factor)
7. If the meaningful concept is not contained in the ICF and it is clearly not a personal factor, it will be assigned as nc (not covered)
8. If the meaningful concept refer to a diagnosis or a health condition, it will be assigned hc (health condition)

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

categories than the BICF-CS. Thus, it was helpful to use the CICF-CS as a reference in the linking process. If needed, a particular assessment tool was first linked to the third- or fourth-level category of the CICF-CS. Then, it was decided whether this tool could be linked to a first- or second-level category of the BICF-CS.

In the case of disagreement between the two reviewers, a third reviewer (LvdV-S) was involved to reach consensus. Whenever the reviewers agreed that they were not able to link an item to a BICF-CS category, or whenever their linking differed from that of previous studies, discussion points were noted.

Results

Regarding all assessment tools, the available information (such as publications, manuals, scoring forms) was sufficient and could be used in the linking process. Table 2 shows the results of this process. Forty-six assessment tools known within the areas of hand surgery and hand rehabilitation could be linked to 19 categories of the BICF-CS. As can be concluded from this table, only 4 of the 23 BICF-CS categories remained unaddressed. These were: *b810* “Protective functions of the skin,” *s120* “Spinal cord and related structures,” *s720* “Structure of shoulder region,” and the

environmental factor *e1* “Products and technology.” Body Functions most frequently addressed were *b730* “Muscle power functions,” *b280* “Sensation of pain,” and *b710* “Mobility of joint functions.” Of the Body Structures, only *s730* “Structure of upper extremity” was covered. With regard to the component activities and participation, *d440* “Fine hand use” was addressed mostly and 25 assessment tools (with a total of 146 items) were linked to this category. The Michigan Hand Outcomes Questionnaire (MHOQ) and the Disabilities of the Arm, Shoulder, and Hand questionnaire (DASH) covered most of the functional aspects of the BICF-CS ($n = 14$) with an almost complete overlap. The only exception was that the MHOQ included “Structure of upper extremity” (*s730*), whereas the DASH included “Carrying out daily routine” (*d230*). The categories of the BICF-CS that were not addressed by the DASH or the MHOQ (i.e., *b715*, *b760*, *b810*, *s120*, *s720*, *e1*, *e3*, *e5*) were covered only by one (a different instrument per category as can be seen in Table 2) or by no instrument at all. Regarding environmental factors, only the Patient Evaluation Measure (PEM) could be linked to the categories *e3* “Support and relationships” and *e5* “Services, systems and policies.” Fifteen discussion topics were encountered in the linking process (Table 3).

Table 2. Results of the linking process: An overview of the item content of assessment tools, related to the 23 categories of the Brief ICF Core Set for Hand Conditions (BICF-CS).

		Categories of the Brief ICF Core Set for hand conditions and items per category																								
		b152	b265	b270	b280	b710	b715	b730	b760	b810	s120	s720	s730	d230	d430	d440	d445	d5	d6	d7	d840–	d859	e1	e3	e5	
		Emotional functions																								
		Touch functions																								
		Sensory functions related to temperature and other stimuli																								
		Sensation of pain																								
		Mobility of joint functions																								
		Stability of joint functions																								
		Muscle power functions																								
		Control of voluntary movement functions																								
		Protective functions of the skin																								
		Spinalcord and related structures																								
		Structure of shoulder region																								
		Structure of upper extremity																								
		Carrying out daily routine																								
		Lifting and carrying objects																								
		Fine hand use																								
		Hand and arm use																								
		Self – care																								
		Domestic life																								
		Interpersonal interactions and relationships																								
		Work and employment																								
		Products and technology																								
		Support ad relationships																								
		Services, systems and policies																								
		Total																								
Total number of items	Number of different concepts	Total number of linked categories																								
Instruments		b152	b265	b270	b280	b710	b715	b730	b760	b810	s120	s720	s730	d230	d430	d440	d445	d5	d6	d7	d840–	d859	e1	e3	e5	
(a) Overview results of all instruments																										
Total number of instruments linked to this category	5	7	7	9	9	9	1	13	1	0	0	0	5	1	11	25	15	16	9	4	7	0	1	1	0	1
Total number of items linked to this category	12	13	26	81 (49 + 32)	20	3	25	1	0	0	0	10	1	20	146	76	59	29	6	20	0	5	2	0	5	2
(b) Instruments mainly measuring body functions and structures																										
Ab-Adductometer	2	1																								
Blood pressure cuff	2																									
Circumference measure (finger)	4												4													
Goniometer	1																									
Jamar dynamometer	1																									
Kapandji I–10	3																									
Manual muscle testing (MMT)	1																									
McGill Pain Questionnaire	49	6	5	1	49																					
Moberg Pick Up Test	3																									
Pinch Gauge	3																									
Pollexograph	1																									

(continued)

Table 2. Continued

		Categories of the Brief ICF Core Set for hand conditions and items per category																								
		b152	b265	b270	b280	b710	b715	b730	b760	b810	s120	s720	s730	d230	d430	d440	d445	d5	d6	d7	d840–d859	e1	e3	e5		
		Emotional functions	Touch functions	Sensory functions related to temperature and other stimuli	Sensation of pain	Mobility of joint functions	Stability of joint functions	Muscle power functions	Control of voluntary movement functions	Protective functions of the skin	Spinalcord and related structures	Structure of shoulder region	Structure of upper extremity	Carrying out daily routine	Lifting and carrying objects	Fine hand use	Hand and arm use	Self – care	Domestic life	Interpersonal interactions and relationships	Work and employment	Products and technology	Support ad relationships	Services, systems and policies		
Instruments	Total number of items	Total Number of linked categories																								
		Total Number of different concepts																								
Rotterdam intrinsic Hand Myometer (RIHM)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Semmes Weinstein Monofilament Test	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Shape Texture Identification Test (STI)	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
Two-Point Discrimination Test (static/moving)	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
Vigori-meter	3	1	1	1	1	1	1	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Visual Analogue Scale (Pair)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Volumeter	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
Wire tracing method	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
(c) Pegboard tests																										
Functional Dexterity Test (FDT)	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
Grooved Pegboard Test	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
Nine-Hole Peg Test	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
Purdue Pegboard Test	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	

(continued)

Table 2. Continued

Categories of the Brief ICF Core Set for hand conditions and items per category			
	b152 b265 b270 b280 b710 b715 b730 b760 b810 s120 s720 s730 d230 d430 d440 d445 d5 d6 d7 d840–d859 e1 e3 e5		
	Emotional functions Touch functions Sensory functions related to temperature and other stimuli Sensation of pain Mobility of joint functions Stability of joint functions Muscle power functions Control of voluntary movement functions Protective functions of the skin Spinalcord and related structures Structure of shoulder region Structure of upper extremity Carrying out daily routine Lifting and carrying objects Fine hand use Hand and arm use Self – care Domestic life Interpersonal interactions and relationships Work and employment Products and technology Support and relationships Services, systems and policies		
Instruments	Total number of items	Total number of linked concepts	Total
(d) Instruments measuring fine hand use by handling different objects			
Box and Block Test (BBT)	1	3	1
Minnesota Manual Dexterity Test (MMDT)	2	3	1
Moberg Pick Up Test ²	3	2	2
O'Neill Hand Function Assessment	8	4	4
Rosenbusch Test of Finger Dexterity	1	3	1
(e) Instruments measuring single tasks (and fine hand use) by scoring tasks			
Arthritis Hand Function Test (AHFT)	11	8	5
Jebsen–Taylor Hand Function Test (JTHF)	7	7	2
Radboud Skills Test (RST)	10 + 3	6	5
Sequential Occupational Dexterity Assessment (SODA)	12 + 12 × 2	8 + 2	4

(continued)

Table 2. Continued

		Categories of the Brief ICF Core Set for hand conditions and items per category																									
		b152	b265	b270	b280	b710	b715	b730	b760	b810	s120	s720	s730	d230	d430	d440	d445	d5	d6	d7	d840–	d859	e1	e3	e5		
		Emotional functions	Touch functions	Sensory functions related to temperature and other stimuli	Sensation of pain	Mobility of joint functions	Stability of joint functions	Muscle power functions	Control of voluntary movement functions	Protective functions of the skin	Spinalcord and related structures	Structure of shoulder region	Structure of upper extremity	Carrying out daily routine	Lifting and carrying objects	Fine hand use	Hand and arm use	Self – care	Domestic life	Interpersonal interactions and relationships	Work and employment	Products and technology	Support ad relationships	Services, systems and policies			
Instruments	Total number of items	Number of different concepts																								Total	
		of linked categories																								of linked categories	
Smith Hand Function Evaluation (SHFE)	15	6	3					1								14	6										
Sollerman Hand Function Test	20	7	4											1	15	8	2										
Southampton Hand Assessment Procedure (SHAP)	12 + 14	7	4											1	12 + 9	8	2										
TEMPA—Upper Extremity Performance Test for Elderly	9	5	3												8	5	1										
Upper Extremity Function Test (UEFT)	11	7	3												5	2	4										
(f) Questionnaires																											
Australian/Canadian Osteoarthritis Hand Index (AUSCAN)	15	20	7			5	1							2	5	5	2	2									
Canadian Occupational Performance Measure (COPM)	9	40	4												1	2	1	1									

(continued)

Table 2. Continued

Instruments	Total number of items		Number of different concepts		Total number of linked categories		Categories of the Brief ICF Core Set for hand conditions and items per category																								
	14	13	9	8	b152	b265	b270	b280	Mobility of joint functions	Stability of joint functions	Muscle power functions	Control of voluntary movement functions	Protective functions of the skin	Spinalcord and related structures	Structure of shoulder region	Structure of upper extremity	Carrying out daily routine	Lifting and carrying objects	Fine hand use	Hand and arm use	Self – care	Domestic life	Interpersonal interactions and relationships	Work and employment	Products and technology	Support ad relationships	Services, systems and policies				
Cold Intolerance Symptom Severity Questionnaire (CISS)																															
Disabilities of the Arm, Shoulder and Hand questionnaire (DASH)	38	81	14	1	1	1			5	1	1						1	3	3	6	3	5	2								5
Michigan Hand Outcomes Questionnaire (MHOQ)	57 (2 × 20 + 17)	52	14	7	4	2			7	8	4						8	4	14	10	10	9	2								10
Patient Evaluation Measure (PEM)	19	22	9	1	1	1			3	1	1						1														1
Patient Rated Wrist Hand Evaluation (PRWHE)	17	24	9	2					5								1	2	1	3	3	3									1
Subjective Hand Function Scoring System (HFS)	25	27	5															2	14	10	11	3									
Upper Extremity Functional Scale	8	9	4																1	4	2	2									

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

Table 3. Discussion topics among the reviewers being involved in the linking process per category or item.

Category or construct	Clarification and points of discussion
b710—Mobility of joint functions and grip strength measurement	It was discussed whether someone who has maximum muscle power, but does not achieve the full range of motion, would be able to receive a maximum score during grip strength measurement. The ICF does not describe clearly if mobility of joint functions (b710) had to be added. It was decided to make a comment on top of the instrument, to explain that while the main goal of the instrument is testing the muscle power, one needs mobility to accomplish maximum grip strength
b760, Control of voluntary movement functions	Control of voluntary movement functions could be added to almost every question that refers to a function of one's hands or arms. To prevent an extensive linking, it was decided to link an assessment tool to the category b760 Control of voluntary movement functions only if the question refers to a very specific task that requires precise control of the movement
Cold intolerance	The specific category b5501 to describe cold intolerance (b5501—maintenance of body temperature, including cold tolerance) was not included in neither the Brief nor the Comprehensive ICF Core Set for Hand Conditions. b5501 would be the most accurate choice to describe the functions involved in the maintenance of body temperature, which includes heat and cold (in)tolerance. However, in absence of this category, it was decided to link “cold intolerance” to b270 (sensory functions related to temperature and other stimuli), as sensitivity to cold came closest to the concept of cold intolerance
b810—Protective functions of the skin	Using inspection, one could also evaluate b810—protective functions of the skin, as this category focuses on the forming of callus, ulcers, bedsores, hardening, or insulating of the skin, which can be seen and evaluated while inspecting the patient. None of the instruments was linked to this category
s120-Spinal cord and related structures and b415—blood vessel functions	The category s120 and b415 can refer to the underlying cause of the impairments that are evaluated in several instruments (such as the Carpal Tunnel Questionnaire or the Semmes–Weinstein Monofilament Test). However, the spinal cord or blood vessel function itself is not evaluated in these instruments. Evaluation of the spinal cord would require an MRI or a similar method. s120 and b415 itself is not linked to any of the instruments if only the consequences are evaluated
d170—Writing	This is not a Brief ICF Core Set category. The ICF description of d170-writing is “Using or producing symbols or language to convey information” and this category is part of chapter I “Learning And Applying Knowledge” of the ICF. In tests or questionnaires that are used in hand therapy the item “writing” refers to the skills or dexterity of the hand. As the category d170 writing only covers the cognitive development of writing, it was decided to link the item “writing” of the instruments to the category d440 fine hand use in questions about writing
d230—Carrying out daily routine	Because of uncertainties concerning the definition of carrying out daily routine and its relation to activities of the daily living, both the ICF category description and the ICF research group were consulted. It was concluded that this ICF category is concerned with the planning of one's activities rather than with carrying out the activities themselves. d220 Undertaking multiple tasks includes carrying out the activities. Consequently, those items of the instruments that are concerned with carrying out activities could not be linked to this category. However, one of the questionnaires, the DASH, includes one item that focused indeed on the effect of the injury or problem on the planning of the daily activities and was therefore linked to this category
Pegboard test	Regarding pegboard tests, it was decided to link the category d440 fine hand use only once per task, independently on how many pegs have to be placed or removed. The Purdue Pegboard Test contains four different tasks and therefore is linked to the category d440 four times

(continued)

Table 3. Continued

Category or construct	Clarification and points of discussion
d4402—grasping versus d430—lifting and carrying objects	It was uncertain to what extent grasping is covered within the category lifting and carrying objects. Whenever an object can be held in several ways and thus does not require a developed grasping skill, only the category lifting and carrying objects was added. Whenever the question described an activity that obviously required a grasping skill both categories were added
d440—Fine hand use (Brief ICF Core Set) versus d550—eating versus d630—preparing meals (Comprehensive ICF Core Set)	Some difficulties arose concerning linking questions about eating skills. For example, it was often asked if someone could accomplish cutting with knife and fork. It was unclear when it was necessary to link both the categories d440-fine hand use and d5-selfcare (including eating). It was decided to add fine hand use only when the question was about the skills that are required to use cutlery (Arthritis hand function test: cutting with knife and fork). If the question contained words that referred to food, then d5 (eating) and/or d6 (including preparing meals) were also added, depending on whether the question referred to the preparation of food or its consumption
Pouring water: d4453—Turning or twisting the hands and arms versus d4401—grasping versus d560—drinking (all categories from the Comprehensive ICF Core Set)	Some assessment tools contain questions about pouring water. There was some doubt concerning the question whether grasping is necessary to pour water. It was decided that pouring can be accomplished in many ways and does not always require a developed grasping skill. After all, one can hold a jug in many ways, and a person without a developed grasping skill is also able to pour water from a jug. Thus, only turning or twisting the hands and arms was added to questions which concern pouring. However, already in other studies instruments have been linked and then the category drinking has been added to questions about pouring. This category was probably linked because pouring can be seen as a preliminary activity to drinking. However, pouring does not necessarily lead to drinking. It was decided not to link the category drinking, and thus d5 Self-care (Brief Core Set), to those questions
Not definable (nd) versus specific activity or fine hand use: other specified (d4408)	A lot of assessment tools contain questions referring to specific activities or movements (typing, shaking hands, using tools). It proved to be difficult to describe those activities or movements using the categories of the Brief or Comprehensive ICF Core Set. It was decided to use Nd or fine hand use: other specified to link those items, following the linking rules from Cieza et al.
“Swelling”—circumference measure (finger) and volume meter	The aspect swelling in arms and hands is not covered by the ICF. Swelling was linked as not defined. However, instruments circumference measure (finger) and volume meter are linked to s730 structure of upper extremity
“Recreation and leisure” (COPM)	Some items could not have been linked to the BICF-CS, for example, the items including concepts concerning “recreation and leisure,” which is included in d920 recreation and leisure of the ICF. This category is not part of the BICF-CS
One item scored for right and left hand	In case 1 item had to be scored for both the right and the left hand, the specific category has been linked twice

Note: BICF-CS, Brief ICF Core Set for Hand Conditions; ICF, International Classification of Functioning, Disability, and Health; DASH, Disabilities of the Arm, Shoulder, and Hand questionnaire; COPM, Canadian Occupational Performance Measure.

Discussion

This study provides an overview of the item content of 46 assessment tools, known within the area of hand surgery and hand rehabilitation, and compares this content to the 23 categories of the Brief ICF Core Set for Hand Conditions (BICF-CS). The results showed that 19 of the 23 BICF-CS categories were addressed by the included assessment tools.

The area of Activities and Participation was well represented by the various assessment tools. Twenty-seven instruments (60%) could be linked to one or

more categories of this ICF domain. Although this finding suggests that the impact of hand conditions on a broad range of activities of daily living is well addressed clinically, outcome assessments in clinical practice and research focus on body functions rather than on activities and participation.^{11,12,18,19} An explanation for this discrepancy might be that assessment tools such as goniometers or dynamometers are readily available in most clinical settings, whereas instruments to measure activities are less easily available or relatively unknown. Furthermore, only recently, a first consensus was aimed on which assessment tools

should be used to assess activities and participation in patients with hand conditions.²⁰ This could be the reason that these latter assessment tools are not yet implemented in clinical practice and research.

An important additional finding of this study is that environmental factors were hardly addressed by the included assessment tools. From the reviewed instruments, only one instrument captured two of the three environmental factors included in the BICF-CS. The PEM includes several items addressing “medical attention by one or various specialists” and was therefore linked to the categories *e3* “Support and relationships” and *e5* “Services, systems and policies.” According to the biopsychosocial understanding of disability and health, environmental factors dynamically interact with an individual’s functioning.¹ However, it seems that these factors are hardly formally assessed in the current clinical practice of hand therapy. Interventions primarily aim to improve body functions and structures, even though it is important to consider abilities and activities that are relevant to a patient’s daily life performance as well. In this context, therapists need to know which environmental aspects (e.g., assistive products, family support, or climate) influence a patient’s daily life performance either in a facilitating or in a complicating way. Environmental factors should, therefore, be an integral part of the overall functional assessment. They need to be taken into account in the decision-making process with regard to a patient’s treatment to provide client-centered care. Thus, more assessment tools should be (developed and) implemented in daily clinical practice that address the impact of an individual’s environment on his or her daily life performance.

It is important to realize that the ICF distinguishes two qualifiers (or constructs) for the ICF domain Activities and Participation: “Capacity” and “Performance.” Capacity refers to an individual’s ability to execute a task or an action in a standardized environment, while performance refers to the activities that an individual executes in his or her daily-life environment. Neither information concerning the extent to which an item refers to activities, to participation, or to both, nor information about whether an item addresses this ICF domain from the perspective of capacity or performance is addressed in the existing linking rules. This might be an aspect of possible improvement of these rules in the future.

Whereas most tests of “Body Functions and Structures” address only one (b- or s-) category, many assessment tools that evaluate “Activities and Participation” address more than one (d-)category. Based on the results of this study, we suggest to use guiding principles for selecting assessment tools as described by Fekete et al. (2011) such as redundancy (the overlap between instruments with respect to

underlying ICF categories), efficiency (the number of items that address the domain of interest in relation to the total number of items), level of detail of information (the number of items assessing a single ICF category and the response scale), and feasibility (issues important for researchers and issues relevant for participants).²¹

Although the BICF-CS is very useful for the content comparison of different assessment tools, we encountered several discussion topics per category or item during the linking process (see Table 3). In addition, it should be mentioned that many items were linked to *d440* “Fine hand use.” This ICF category includes third-level categories, such as picking up, grasping, manipulating, and releasing. The BICF-CS does not contain those third-level categories separately, however, to improve discrimination between assessment tools of fine hand use, these third-level categories should be used.

Additionally, it was noticed that in linking items to the ICF, more options can be possible. The number of concepts that was identified for a particular item varied from one to four (e.g., pain, hand/wrist, pain in hand/wrist, daily activities). Furthermore, it was sometimes unclear whether one or two concepts had to be scored when an item was applicable to both the right and the left hand. Occasionally, it was discussed *which* concept(s) were applicable. For example, is the item “doing up buttons” referring to *fine hand use* (*d440*), to *dressing* (*d5*), or to both? In previously published studies^{15,16,22} comparable uncertainties arose. In a content comparison of clinical, occupation-based instruments, the Functional Dexterity Test (FDT) and the Jebsen–Taylor Hand function Test (JTHT) were differently linked to the ICF.¹⁶ For the FDT only one time score has to be noted that is needed to pick up, manipulate, and release 16 pegs on a pegboard. The JTHT also contains several items that include the scoring of time needed to pick up and release a number of objects. As a result, the FDT was linked to *d440* (*d4400* and *d4402*) 16 times, whereas the JTHT was linked to *d440* (*d4400*, *d4401*, and *d4402*) only once.¹⁶ Hence, caution must be taken in selecting an assessment tool for clinical practice or scientific research if based only on one study. We, therefore, suggest that the linking rules are adjusted in the future. In addition, linking instruments to the ICF should preferably be done by at least two reviewers.

Another discussion topic mentioned in Table 3 addresses some domains that were missing, such as oedema and cold intolerance. During the consensus conference in 2009, there were some differences in the knowledge of and familiarity with the ICF codes, definitions, and terminology. For example, “Cold-intolerance” was seen as being part of “Sensitivity to temperature” by some participants and as part of

“Thermoregulatory functions” by others. These differences have influenced the categories that were included in the BICF-CS.⁶

Although an ICF Core Set indicates what aspects should be addressed to describe an individual’s functioning and which environmental factors should be considered, some category definitions might be complemented, for example “b265-Touch functions” and “b270-Sensory functions related to temperature and other stimuli” which might include terms such as “stereognosis” and “threshold detection.” In addition, to apply an ICF Core Set in clinical practice, it needs to be defined how its aspects should be assessed. As an ICF Core Set refers to a classification system, it does not provide this information.^{5,6}

The most adequate assessment tools to address individual functioning and environmental factors in patients with hand conditions have not yet been determined.^{20,23} Consequently, there is no standardized or universally accepted core set of assessment tools to be used in hand surgery or hand rehabilitation.^{7,24–28} Since professionals are stimulated to make use of the same assessment tools, reliable and validated instruments to assess (and preferably predict) patients’ functioning and to evaluate outcomes of different interventions are required. The increasing number of instruments developed during the last decades has made it difficult to select the best tools, however, the results of the present study can be used in a consensus process to determine which instruments should be used.

Strengths and limitations

This is the first study to relate the item content of 46 assessment tools that are available to assess body functions and structures as well as activities and participation in patients with hand conditions to the 23 categories of the BICF-CS. The applied method adhered to the updated version of the ICF linking rules. On the other hand, the results highlight some points of discussion in applying these rules and, thus provide indications for their improvement. Some differences between the present results and those of other studies may be due to differences in the interpretation and application of the linking rules. In addition, the assessment tools in this study were linked to the BICF-CS for hand conditions and not, as in other studies, to the ICF itself. As a consequence, some concepts might have been linked to another level category (e.g., second instead of third or fourth level) in comparison with other studies. Another methodological limitation is that this study only used information written in the English, German, and Dutch languages, discarding assessment tools published in other languages. Lastly, we restricted ourselves to the analysis of item content

independent of the psychometric properties of the included instruments. This latter aspect has been investigated for instruments assessing activities and participation in previous work of our group.⁷ This clinimetric review revealed that none of the 23 instruments had satisfactory results for *all* clinimetric properties according to the quality criteria. This means that therapist should be aware that selecting assessment tools based only on the content comparison in this study might still result in the collection of unreliable or invalid data. Thus, further improvement of existing instruments or development of new instruments is needed to cover all the clinimetric properties needed for valid and reliable assessments in patients with hand conditions.

Conclusion and recommendations

This study has related the item content of 46 assessment tools within the area of hand surgery and hand rehabilitation to the 23 categories of the BICF-CS for hand conditions. The results can support decisions on which instruments are most appropriate for assessing human functioning and environmental factors in patients with hand conditions, taking into account test properties such as redundancy, efficiency, level of detail, and feasibility. The results of this ICF linking study are currently used in a European Delphi study of the HandART–*Hand Assessment Recommendations for Therapy* project.²² The aim of this project is to reach European consensus on the selection of a core set of assessment tools to assess “Body Functions and Structures” and “Activities and Participation” in patients with hand conditions according to the BICF-CS.

Acknowledgements

The authors acknowledge Sacha ten Wolde and Charlotte Gruben for their contribution to this study.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Conflict of interest

None declared.

References

1. World-Health-Organization. *ICF: International Classification of Functioning Disability and Health*. Geneva: World Health Organization, 2001.
2. Stucki G and Grimby G. Applying the ICF in medicine. *J Rehabil Med* 2004; Jul;(44 Suppl): 5–6.
3. Cieza A, Ewert T, Ustun TB, et al. Development of ICF Core Sets for patients with chronic conditions. *J Rehabil Med* 2004; (44 Suppl): 9–11.

4. ICF Research Branch. ICF Core Set for Hand Condition (Brief and Comprehensive), <http://www.icf-research-branch.org/icf-core-sets-projects/other-health-conditions/development-of-icf-core-sets-for-hand-conditions.html>, 2010.
5. Rudolf Klaus-Dieter, Sandra Kus, Michaela Coenen, et al. Report on the International ICF Consensus Conference on the ICF core sets for hand conditions. *Hand Therapy* 2010; 15: 73–76.
6. Rudolf KD, Kus S, Chung KC, et al. Development of the International Classification of Functioning, Disability and Health core sets for hand conditions—results of the World Health Organization International Consensus process. *Disabil Rehabil* 2012; 34: 681–693.
7. Ven-Stevens van de LA, Munneke M, Terwee CB, et al. Clinimetric properties of instruments to assess activities in patients with hand injury: a systematic review of the literature. *Arch Phys Med Rehabil* 2009; 90: 151–169.
8. Ven-Stevens van de L, Munneke M, Spauwen PHM, et al. Assessment of activities in patients with hand injury: a review of instruments in use. *Br J Hand Ther* 2007; 12: 4–14.
9. Casanova JS (ed). *Clinical assessment recommendations*. 2nd ed. Chicago: American Society of Hand Therapists, 1992.
10. Fairbairn K, May K, Yang Y, et al. Mapping Patient-Specific Functional Scale (PSFS) items to the International Classification of Functioning, Disability and Health (ICF). *Phys Ther* 2012; 92: 310–317.
11. Jerosch-Herold C, Leite JC and Song F. A systematic review of outcomes assessed in randomized controlled trials of surgical interventions for carpal tunnel syndrome using the International Classification of Functioning, Disability and Health (ICF) as a reference tool. *BMC Musculoskelet Disord* 2006; 7: 96.
12. Kus S, van de Ven-Stevens LA, Coenen M, et al. What is our knowledge of functioning and disability in hand conditions based on? *Arch Phys Med Rehabil* 2011; 92: 1326–1332.
13. Noonan VK, Kopec JA, Noreau L, et al. Comparing the content of participation instruments using the international classification of functioning, disability and health. *Health Qual Life Outcomes* 2009; 7: 93.
14. Squitieri L, Reichert H, Kim HM, et al. Application of the brief international classification of functioning, disability, and health core set as a conceptual model in distal radius fractures. *J Hand Surg Am* 2010; 35: 1795–1805.
15. Stamm T, Geyh S, Cieza A, et al. Measuring functioning in patients with hand osteoarthritis—content comparison of questionnaires based on the International Classification of Functioning, Disability and Health (ICF). *Rheumatology* (Oxford) 2006; 45: 1534–1541.
16. Stamm TA, Cieza A, Machold KP, et al. Content comparison of occupation-based instruments in adult rheumatology and musculoskeletal rehabilitation based on the International Classification of Functioning, Disability and Health. *Arthritis Rheum* 2004; 51: 917–924.
17. Cieza A, Geyh S, Chatterji S, et al. ICF linking rules: an update based on lessons learned. *J Rehabil Med* 2005; 37: 212–218.
18. MacDermid JC. Measurement of health outcomes following tendon and nerve repair. *J Hand Ther* 2005; 18: 297–312.
19. Gummesson C, Atroshi I and Ekdahl C. The quality of reporting and outcome measures in randomized clinical trials related to upper-extremity disorders. *J Hand Surg Am* 2004; 29: 727–734.
20. Ven-Stevens van de LAW, Linde H van der, Selles RW, et al. Which instruments should be used to assess impairments and activity limitations in patients with hand conditions: the HandART Delphi study. Congress of the European Federation of Societies for Hand Therapy, Paris, France, 2014.
21. Fekete C, Boldt C, Post M, et al. How to measure what matters: development and application of guiding principles to select measurement instruments in an epidemiologic study on functioning. *Am J Phys Med Rehabil* 2011; 90: S29–S38.
22. Drummond SA, Ferreira Sampaio R, Cotta Mancini M, et al. Linking the disabilities of arm, shoulder, and hand to the International Classification of Functioning, Disability, and Health. *J Hand Ther* 2007; 20: 336–343.
23. Ven-Stevens van de LA, Graff M, Spauwen PHM, et al. HandART: Hand assessment recommendations for therapy, oral presentation. Congress of the European Federation of Societies for Hand Therapy, Oslo, Norway, 2011.
24. Amadio PC. Outcome assessment in hand surgery and hand therapy: an update. *J Hand Ther* 2001; 14: 63–67.
25. Bucher C and Hume KI. Assessment following hand trauma: a review of some commonly employed methods. *Br J Hand Ther* 2002; 7: 79–84.
26. Cano SJ, Browne JP, Lamping DL, et al. The patient outcomes of surgery-hand/arm (POS-Hand/Arm): a new patient-based outcome measure. *J Hand Surg [Br]* 2004; 29: 477–485.
27. Dowrick AS, Gabbe BJ, Williamson OD, et al. Outcome instruments for the assessment of the upper extremity following trauma: a review. *Injury* 2005; 36: 468–476.
28. Heras PC, Burke FD, Dias JJ, et al. Outcome measurement in hand surgery: report of a consensus conference. *Br J Hand Ther* 2003; 8: 70–80.