Mapping Functional Communication Measurements for Traumatic Brain Injury to the WHO-ICF

Représenter les mesures de communication fonctionnelle des traumatismes cranio-cérébraux par rapport à la CIF

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Abstract

Traditional impairment-based cognitive communication assessments do not adequately capture the complex functional communication problems of individuals with traumatic brain injury (TBI). There are three objectives of this paper. The first objective is to review the World Health Organization's International Classification of Functioning and Disability's (ICF) conceptual framework. The second objective is to describe the use of the ICF to conceptualize the functional communication abilities of individuals with TBI. The third objective is to discuss findings from a mapping analysis of three functional communication measures to the components of the ICF. The three measures include the American Speech-Language Hearing Association Functional Assessment of Communicative Skills (ASHA FACS) (Frattali, Thompson, Holland, Wohl, & Ferketic, 1995), the Communication Activities of Daily Living (CADL-2) (Holland, Frattali, & Fromm, 1999), and the Functional Assessment of Verbal Reasoning and Executive Skills (FAVRES) (MacDonald, 1998). The findings from the mapping are reported and their relevance to clinical practice is discussed. Finally, suggestions are provided regarding the use of the WHO-ICF framework by speech-language pathologists when they determine which functional communication activities are important to individuals with TBI, and which measurement tools most accurately reflect the functional communication abilities of individuals with TBI.

Abrégé

Les évaluations classiques des troubles cognitifs de la communication ne reflètent pas de manière adéquate les troubles complexes de communication fonctionnelle des personnes ayant subi un traumatisme cranio-cérébral (TCC). Le présent article vise trois objectifs. Le premier consiste à passer en revue la Classification internationale des fonctionnalités, incapacités et états de santé (CIF) de l'Organisation mondiale de la santé (OMS). Le deuxième cherche à décrire comment utiliser la CIF pour conceptualiser les habiletés de communication fonctionnelle des personnes ayant subi un TCC. Le troisième vise à discuter des résultats d'une analyse de représentation de trois mesures de la communication fonctionnelle par rapport aux composants de la CIF. Ces trois mesures comprennent l'évaluation fonctionnelle des capacités de communication (FACS) de l'*American Speech-Language Hearing Association (*Frattali, Thompson, Holland, Wohl et Ferketic, 1995), les activités de communication du quotidien (CADL-2) (Holland, Frattali, & Fromm, 1999) et l'évaluation fonctionnelle du raisonnement verbal et des compétences d'exécution (FAVRES) (MacDonald, 1998). Les résultats de la représentation y sont présentés et leur pertinence vis-à-vis de l'exercice clinique y est abordée. Enfin, l'article fournit des suggestions sur l'utilisation du cadre de la CIF de l'OMS par des orthophonistes afin de déterminer quelles activités de communication fonctionnelle sont importantes pour les personnes ayant subi un TCC et quels outils de mesure reflètent le mieux les habiletés de communication fonctionnelle de ces personnes.

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According to results from Statistics Canada's Canadian Community Health Survey there currently are over 51,000 Canadians who sustained a brain injury (Statistics Canada, 2006). The Ontario Brain Injury Association (OBIA, 2001) estimates that over 18,000 Ontarians of all ages sustain a traumatic brain injury (TBI) yearly, and of these, 12,046 are classified as mildly impaired, 1,317 as moderately impaired, and 1,610 as severely impaired. The College of Audiologists and Speech-Language Pathologists, in their published Professional Practice Guideline for Cognitive Communication Disorders (CASLPO, 2002), reports that "Given the estimated incidence of traumatic brain injury in Ontario, combined with the research data on those with residual cognitive-communication impairments, it is estimated that over 11,000 individuals per year in Ontario will require speech-language pathology intervention for cognitive-communication impairments" (CASLPO, p. 5). Data from the United States show an incidence rate of traumatic brain injury (TBI) of 200 cases per 100,000 persons or about 500,000 new cases per year (Sohlberg & Mateer, 2001). These figures exceed the incidence for both stroke and epilepsy (Sohlberg & Mateer, 2001). TBI occurs twice as frequently in men than in women (Beukelman & Yorkston, 1991; Sohlberg & Mateer, 2001). In terms of age, the highest frequency of TBI occurs in children under 5 years of age, those 15 to 24 years old and adults over the age of 65 (Beukelman & Yorkston; Ylvisaker, Szekeres & Feeney, 2001).

Individuals with TBI often suffer cognitive-communication impairments. Cognitive-communication problems refer to difficulties in communication such as listening, speaking, writing, reading and social interaction (pragmatics) that are the result of underlying cognitive impairments due to neurological damage (Body, Perkins, & McDonald, 1999). These underlying cognitive impairments include deficits in attention and memory systems and processes, learning, linguistic access, retrieval and organizational processes, problem solving, reasoning, executive functions, awareness, and insight, among others. Cognitive-communication impairment is a common sequela following TBI. Functional cognitive-communication skill is defined as "the ability to receive or convey a message, regardless of the mode, to communicate effectively and independently in a given environment" (ASHA, 1990, p. 2). Examples of real world activities where functional communication difficulties can be experienced include completing school-based homework, maintaining a job, volunteering, and socializing with friends and family, among others. Successful functional communication is dependent on a number of contextual factors, such as the environments in which individuals live, their interpersonal supports and relationships, the services and systems available to them and personal factors such as social background, lifestyle and educational background, to name a few.

The assessment and treatment of functional cognitive-communication disorders is within the scope of practice of speech-language pathologists (CASLPO, 2002). However, speech-language pathologists who work with adults with TBI face multiple challenges in assessment. While adults with TBI frequently perform adequately on standardized tests of communication administered in clinical environments, they and their caregivers often report problems with functional communication. Following TBI, "individuals re-entering the community, often pass the test, but fail at life" (MacDonald & Johnson, 2005, p. 895). The typical clinical assessment protocol for cognitive communication in adults with TBI often does not include assessment of the functional communication challenges they face outside the clinical environment. Rather, the focus tends to be on the assessment of the cognitive systems and processes that support their communication (Gillis, 1996).

Larkins, Worrall and Hickson (2000) stated that there are three main reasons that a functional approach to the rehabilitation of adults with cognitive-communication problems should be undertaken. Firstly, the majority of individuals with TBI are young with many years to function in society. Secondly, cognitive communication disorders frequently are persistent and long-standing. Thirdly, with advanced medical technologies and procedures, and increasing health care knowledge, there are increased numbers of adults with TBI who survive their injuries. The increased survival rates contribute to rising rehabilitation costs. An additional reason is that a functional approach to rehabilitation is linked theoretically, conceptually and clinically to cognitive-communication problems inherent in TBI. Functional approaches to rehabilitation often focus on reintegrating individuals with TBI back into their communities because the majority are young and just beginning to develop social roles and to assume community responsibilities (Larkins, Worrall, & Hickson, 2004).

The WHO-ICF Framework

The International Classification of Functioning, Disability and Health (ICF) (WHO, 2001) is a scientific tool that provides a detailed and standardized framework for describing and comparing the health of individuals. The WHO-ICF framework is based on a biopsychosocial model that integrates medical and social models to describe disability and health. The ICF is organized into two parts that include 1) Functioning and Disability and 2) Contextual factors (see Figure 1). Both of these parts, in turn, are categorized into two components. The first part, Functioning and Disability, includes the components of a) body structure and function, and b) activities and participation. The second part, Contextual factors, includes the components of a) environmental factors and b) personal factors. The ICF framework, therefore, describes human health along three levels: body part/body function (body structure and function); person (activity); and person in a societal role (participation). The interactions among environmental and personal factors and the components of body structure and function and activity and participation characterize the state of an individual's level of functioning

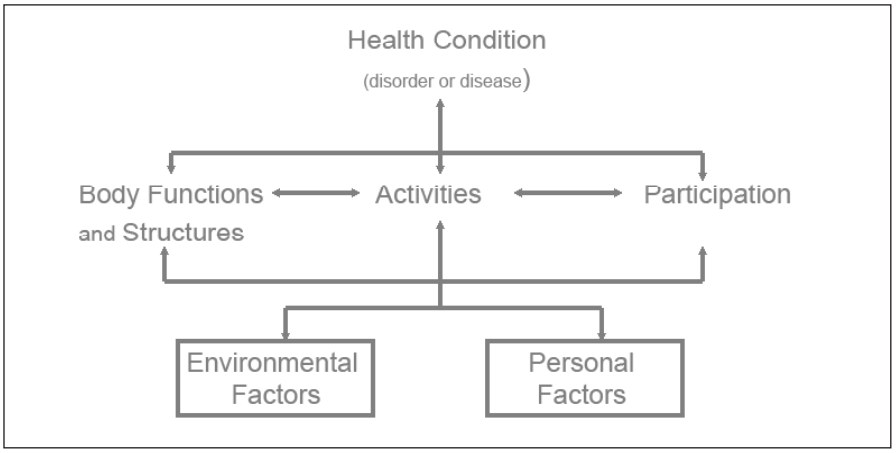

Figure 1. World Health Organization International Classification of Functioning, Disability and Health (2001)

and disability.

Body structure includes the anatomical parts of the body (i.e., organs, limbs and their components) whereas body function refers to the physiological and psychological systems of the body. The activities and participation components of the ICF describe an individual's functional abilities (i.e., how well they function in the real world). Activities refer to the execution of actions or tasks by individuals, and participation is defined as involvement in life situations (WHO, 2001). Both the activity and participation components can be described in positive and negative terms using the following terminology: activity limitations (i.e., difficulties in carrying out activities), and participation restrictions (i.e., problems encountered in engaging in life situations).

Qualifiers are used to describe further the functioning at body, person and societal levels (WHO, 2001). Within the body structure and function domains, qualifiers identify the presence and severity of impairment. Within the activity and performance domains, performance and capacity qualifiers describe how individuals manage in their current environment including whether assistive devices or personal assistance are used. The capacity qualifier operationalizes how individuals function in a standardized environment (e.g., an individual's capacity without the use of personal assistance or assistive devices) (WHO, 2001). The differences between capacity and performance provide valuable information about how the environment in which individuals exist can be modified to facilitate optimal performance.

Contextual factors, on the other hand, refer to the complete background (i.e., existence and lifestyle) of individuals. The factors are grouped into two components: environmental factors and personal factors. Environmental factors refer to individuals' physical, social, and attitudinal environments and can be organized at two levels: individual (immediate environment) and societal (social structures, community or society systems). Environmental factors can be positive (facilitator) or negative (barrier) in terms of the impact they have on functioning. Personal contextual factors include the circumstances and experiences of the individuals' lives and any additional characteristics that are not part of a health condition (e.g., race, gender, age, social background and education). Examples include race, gender, age, social background and education. While not part of the ICF classification, personal factors are recognized as important influences on individuals' functioning and disability (WHO, 2001).

The WHO-ICF and Functional Communication Measurement in TBI

A key issue in cognitive-communication assessment of adults with TBI is the need to examine functional communication beyond the level of impairment. While there are a large number of standardized tests of communication in adults with TBI at the impairment level (i.e., body structure and function), there are few standardized tests of functional communication for the components of activity and participation. There also is an urgent need for ecologically valid measures that predict functioning in societal roles (MacDonald & Johnson, 2005).

The ICF is an excellent framework within which to describe functional communication abilities associated with TBI. The ICF is "important to speech language pathologists because it links communication to broader life skills" (Threats & Worrall, 2004, p. 57) and demonstrates the "centrality of communication to all human functioning" (Threats & Worrall, p. 57).

According to Threats and Worrall (2004), there are some clinicians who view their practice within narrowly defined aspects of speech and language domains which, in turn, minimizes contributions of the profession to broader areas of daily living where communication plays key roles. The ICF framework is structured ideally to help practitioners consider communication along a continuum, with impairments of body structures and functions representing the basic underpinnings of a communication disorder that influence individuals' abilities to engage in functional communication activities and to participate in society (Davidson & Worrall, 2002). Contextual factors (environment and personal factors) that are thought to have little impact (restricted context) at the level of communication impairment, however, can have increasingly greater influence (unrestricted context) when assessing communicative participation (Davidson & Worrall, 2002). Communication is linked intimately and inextricably to many of the activity and participation

domains of the ICF framework (Byrne & Orange, 2005; Eadie, 2003; Larkins, Worrall, & Hickson, 2000; Threats & Worrall, 2004; Worrall, McCooey, Davidson, Larkins, & Hickson, 2002). Examples of these links include learning and applying knowledge, self-care, domestic life, interpersonal interactions and relationships, major life areas and community, social and civic life, among others.

The American Speech, Language and Hearing Association (ASHA, 2001) supports the use of the WHO-ICF framework in their scope of practice for speech-language pathologists because "the overall objective of speech-language services is to optimize an individual's ability to communicate and/or swallow in natural environments and thus improve quality of life" (ASHA, 2001, p. 26). ASHA advocates the use of the ICF framework because it is recognized internationally and has, as its emphasis, a focus on functional activity outcomes (Threats, 2003). It also is of interest that the College of Audiologists and Speech-Language Pathologists of Ontario (CASLPO) states that the underlying philosophy of their Professional Practice Guidelines for Cognitive-Communication Disorders is consistent with the WHO-ICF framework. Moreover, CASLPO asserts that the WHO terminology should be used in any analysis of cognitive-communication skills (CASLPO, 2002). A review of the URL websites of other Canadian national, provincial and territorial professional associations and licensing bodies revealed that none currently has a position paper or best practice guidelines for cognitive-communication disorders or the use of the WHO-ICF within the context of functional communication and TBI.

Members of the Academy of Neurological Communication Disorders and Sciences (ANCDS), an organization dedicated to promoting quality research and services for individuals with neurogenic-based communication disorders, recently reviewed and evaluated evidence related to standardized and non-standardized assessments of cognitive-communication of adults with TBI. Committee members developed guidelines for speech-language pathologists practicing with individuals who have TBI. In their report, titled 'Practice Guidelines for Standardized Assessment for Persons with Traumatic Brain Injury', the ANCDS members outlined a process to evaluate assessment tests. Sub-committee members surveyed speech-language pathologists in the United States as well as publishers and distributors of test materials, reviewed test manuals, critiqued published literature and gathered expert opinion in the field. Sub-committee members identified a small number of tests (N=31) of cognitive-communication suitable for individuals with TBI. The sub-committee members' systematic review of the 31 tests included examination of the reliability and validity properties using standards set by the Agency for Health Care Policy Research (Turkstra, et al., 2005). Following close scrutiny and analyses, sub-committee members identified seven standardized norm-referenced tests that met the majority of the psychometric criteria. Of these seven tests, only four incorporated research about the target population's daily communication needs and two of these included consumer feedback about ecological validity into the design. Their findings suggest these tests are suitable for assessment at the level of activity/participation within the WHO-ICF framework.

The purpose of this brief report is to present the results of an exercise in which two functional communication assessment tools for TBI identified by the ANCDS Sub-Committee were mapped onto the WHO-ICF framework. These included the American Speech-Language-Hearing Association Functional Assessment of Communicative Skills (ASHA FACS) (Frattali, Thompson, Holland, Wohl, & Ferketic, 1995) and the Communication Activities of Daily Living (CADL-2) (Holland, Frattali, & Fromm, 1999). A third recently published test, the Functional Assessment of Verbal Reasoning and Executive Skills (FAVRES), was included in the current mapping, based on the recommendations of Turkstra, Coelho, and Ylvisaker (2005). The Functional Independence Measure (FIM) (State University of New York At Buffalo Research Foundation, 1993), while identified by the ANCDS Sub-committee as meeting most of the published criteria, was not selected for the mapping exercise because the communication evaluation items were judged by the authors of this paper to be restricted in scope and its rating scale not sensitive to reflect functional improvements in communication (Turkstra et al., 2005). The current authors for the mapping task identified a potential fourth measure, endorsed by the ANCDS Sub-Committee, titled The Behavioral Rating Inventory of Executive Function (BRIEF) (Gioia, Isquith, Guy, & Kenworthy, 2000). However, this measure targets a pediatric population, and was not considered relevant to the primary focus of this paper, adults with TBI.

Description of the Functional Communication Measures

The American Speech and Hearing Association Functional Assessment of Communication Skills for Adults (ASHA FACS) (Frattali, Thompson, Holland, Wohl, & Ferketic, 1995) addresses functional communication across four domains: Social Communication; Communication of Basic Needs; Reading, Writing, Number Concepts; and Daily Planning. There are four qualitative dimensions: adequacy, appropriateness, promptness and communication sharing. Measurement of the 43 functional communication items is based on a 7-point Likert scale of Communication Independence, where 1 = *does not do*, 3 = *does with moderate to maximal assistance*, 5 = *does with minimal to moderate assistance* and 7 = *does*. The ASHA FACS takes approximately 20 minutes to administer and information about an individual's functional communication abilities is gathered through observation by the speech-language pathologist over a minimum of three contacts with the individual. It possesses high interrater reliability for scoring (0.72 to 0.84). It also has high external validity with the Western Aphasia Battery Aphasia Quotient (Kertesz, 1982) (0.73), the FIM (State University of New York at Buffalo Research Foundation, 1993) (0.72 to 0.86) and Scales of

Cognitive Ability for Traumatic Brain Injury (SCATBI) (Adamovich & Henderson, 1992) severity scores (0.78).

The Communication Activities of Daily Living - Second Edition (CADL-2) (Holland, Frattali, & Fromm, 1999) is a measure of functional communication abilities of adults who have brain damage. While the first edition of the CADL was intended originally for adults with aphasia, a validity study of the CADL-2 showed its relevance for assessment of individuals with TBI. Standardization of the CADL-2 was completed on a sample 175 individuals with neurogenically based communication disorders, 20 to 96 years of age. Within this sample, there were 131 subjects with a medical diagnosis of stroke and 29 subjects with traumatic brain injury. The purpose of this test is to assess activity-level communication performances. Reliability of the CADL-2 is consistently high across three types of test error (content, .93; time, .85; and scorer, .99). It also possesses moderately high criterion-related validity, based on its correlation with the Western Aphasia Battery Aphasia Quotient score (r - .66, $p < .01$). The CADL-2 data are gathered via role-playing where patients are required to respond to real-life scenarios depicted through pictures and questions. For example, after being shown a series of pictures depicting a trip to the doctor's office, patients must respond to questions such as location and time of an appointment, describing the purpose of the visit, completing a form, among other questions.

The Functional Assessment of Verbal Reasoning and Executive Strategies (MacDonald, 1998) is a recently developed standardized test designed for assessment of subtle cognitive-communication impairments secondary to acquired brain injury (ABI). It measures complex communication, verbal reasoning, and executive functioning. It consists of four verbal reasoning tasks, each of which is presented within the context of a novel situation such as work, family gatherings or social situations. Examples of tasks include planning an event and making a decision. Scores for each subtest are derived for time, accuracy, rationale, strengths and weaknesses and analysis of sub-skills. A normative study of N=52 adults with ABI and N=101 normal adults revealed significant differences ($p < .01$) between the ABI and control groups in total test scores for all three types of scores (accuracy, time and reasons). Interrater-rater reliability was obtained by comparing the scores of two speech-language pathologists on test results for 20 participants (10 ABI, 10 control). Kappa statistics for the accuracy of scoring and the reliability of scoring were .81 and .85, respectively, well above the traditional acceptable value of .70 (MacDonald, 2005).

Method - Mapping Procedure

The scoring guidelines and test forms of the three selected tests were used in the mapping procedure. Each test item from each of the three tests was reviewed separately by the first author (JH). Each test item was mapped onto the domains of the WHO-ICF framework, that is, body structure and function, activities and participation. Items were categorized or mapped onto the WHO-ICF components following a protocol similar to that conducted by Ostensjo, Bjorbaekmo, Carlberg, and Vollestad (2006) in their ICF-based mapping procedure on the Pediatric Evaluation of Disability Inventory (PEDI). Moreover, the definitions of each of the components of the WHO-ICF and corresponding definitions of coded items (e.g., communication, speech, etc.) were used to inform the mapping process. Items were linked with only one of theWHO-ICF components based on mutual agreement by the two authors. The second author (JBO) reviewed all of the mappings conducted by the first author.

Results

Tables 1, 2 and 3 display the results from content analyses of each test relative to the WHO-ICF components of body structure and function, activity and participation and environmental factors. Assigning test items exclusively to a unique ICF part or component was challenging. The assignment of test, questionnaire or checklist items to an ICF component or part was identified originally by the WHO authors as a hurdle in the development of the ICF framework. As a potential resolution to part of this challenge, the WHO authors provided four options about how to relate the activity and participation constructs. The first is to consider activity and participation as unique constructs with no conceptual overlap. The second option is to consider the constructs as possessing partial overlap. The third option is to designate detailed domains as activity and broad category titles as participation. The fourth and final option is to consider the two constructs as unified, overlapped constructs (WHO, 2001). For the purposes of our analyses, Option 2 guided our test item categorization (i.e., test items could be interpreted as both activity and participation items), recognizing that many items could be assigned simultaneously within both components.

The assignment of test items outlined in Tables 1, 2 and 3 shows that the majority was classified within the activity and participation components of the ICF. Many of the specific test items also were found to link with both the body structure and function and the activity and participation components. This shows that many of the items that comprise these three functional assessment tools address both impairment and functional levels of cognitive-communication. A review of the specific domains within the ICF components of body structure and function and activity and participation suggest that simultaneous mapping of test items to several of the life areas also is possible. However, for the purposes of our analyses, items within each functional communication measure were linked to the most precise ICF component because the components are thought to represent a continuum of increasing complexity of communication, with body structure and function representing one end while activities and participation reflected the other anchor. There was strong point-by-point percent agreement (greater than 90%) between the authors of this paper on the assignment of all test items to the ICF components.

The data in Tables 1, 2 and 3 also illustrate that

Table 1

Mapping ASHA FACS Items onto WHO-ICF Components and Contextual Factors

ASHA FACS Subtests	Body structure/ function	Activity	Participation	Context: Environment	Context: Person
I Social Communication					
1.Refers to familiar people by name.			X	X	
2. Requests information of others.			X	X	
3. Explains how to do something.		X	X	X	
4. Expresses agreement/ disagreement.		X	X	X	
5. Exchanges information on the phone.			X	X	
6. Participates in group conversation.			X	X	
7. Answers yes/no questions.		X	X	X	
8. Follows simple verbal directions		X	X	X	
9. Understands non-literal meaning and inference.		X	X	X	
10. Smiles or laughs at lighthearted comments.			X	X	
11. Understands non-literal meaning and inference.		X	X	X	
12. Understand conversations when they occur in noisy		X	X	X	
13. Understand what's heard on TV and radio.		X	X	X	
14. Understand facial expressions.		X	X	X	
15. Understands tone of voice.		X	X	X	
16. Initiates communication with other people.			X	X	
17. Adds new information on a topic in a conversation.			X	X	
18. Changes topics in conversation.			X	X	
19. Adjusts to a change in topic by conversational			X	X	
20. Recognizes his/her own communication errors.		X	X	X	
21. Corrects his/her own communication errors.		X	X	X	
II Communication of basic needs					
22. Recognizes familiar faces.		X	X	X	
23. Recognizes familiar voices.		X	X	X	
24. Makes strong likes or dislikes known.		X	X	X	
25. Expresses feelings		X	X	X	
26. Requests help when necessary			X	X	
27. Makes needs or wants known.		X	X	X	
28. Responds in an emergency.		X	X	X	
III Reading, Writing, Number Concepts				X	
29. Understands simple signs.		X		X	
30. Uses common reference materials.		X		X	
31. Follows written directions.		X		X	
32. Understands basic printed material.		X		X	
33. Prints/writes/types name.		X		X	
34. Fills out short forms.		X		X	
35. Writes messages.		X	X	X	
36. Understands signs with numbers.		X		X	
37. Makes basic money transactions.		X	X	X	
38. Understands simple units of measurement.		X		X	
IV Daily Planning				X	
39. Knows what time it is.		X		X	
40. Dials telephone numbers.		X	X	X	
41. Keeps scheduled appointments.		X	X	X	
42. Uses a calendar for time-related activities.		X		X	
43. Follows a map.		X		X	

Table 2
Mapping communicative activities of daily living - 2 items onto WHO-ICF Components and contextual factors

CADL-2 Subtests	Body Structure/ Function	Activity	Participation	Context: Environment	Context: Person
1. Greeting			X		
2. Verbal Instruction			X		
3. Recognizing/providing own name			X		
4. Recognizing/providing address			X		
5. Providing information re work			X		
6. Providing information about speech difficulties			X		
7. Telling time		X	X		
8. Reading a menu			X		
9. Reading a bus schedule		X	X		
10. Comprehending meaning in pictures (what to wear)		X	X		
11. Producing verbal message			X		
12. Comprehending meaning in pictures		X			
13. Receiving/producing written message (invitation)		X			
14. Telling time/problem solving (predict time of next appt).		X			
15. Reading building directory		X			
16. Recognizing general signs (elevator sign)		X			
17. Recognizing sign		X			
18. Producing verbal message to question (receptionist)			X		
19. Comprehending verbal instruction (receptionist)			X		
20. Request to fill out form		X	X		
21. Producing written message(fills out form)		X			
22. Producing verbal response (describes problem)			X		
23. Comprehending spoken message (inaccuracy)			X		
24. Reading medicine label		X			
25. Comprehending/producing verbal message (Maintaining health)			X		
26. Reading signs (washrooms)		X			
27. Reading numeric signs (speeding)		X			
28. Problem solving (driver should slow down)		X			
29 Reading signs (railroad crossing).					
30. Producing written message (grocery list)		X			
31. Reading labels (soup can)		X			
32. Reading labels (hazardous sign)		X			
33. Calculating (applying knowledge re calculating to buy a drink)		X			
34. Calculating (applying knowledge re calculating to buy medicine)		X			
35. Reading signs (to find location in a store)		X			
36. Producing verbal message (request info of store clerk)			X		

Continued on page 141

Table 2 (continued)
Mapping communicative activities of daily living - 2 items onto WHO-ICF Components and contextual factors

CADL-2 Subtests	Body Structure/ Function	Activity	Participation	Context: Environment	Context: Person
37. Identification white laces (comprehension)					
38. Reading a map		X			
39. Reading yellow pages		X			
40. Reads phone directory		X			
41. Places a call		X			
42. Producing verbal message (requests temp. information)		X	X		
43. Verbal problem solving		X			
44. Producing verbal message (on 911)			X		
45. Reading signs		X			
46. Receiving written message (reading newspaper headline)		X			
47. Receiving written message (reading calendar/recalling previous activity)		X			
48. Recognizing facial expressions		X			
48b Recognizing gestures		X			
48c Recognizing gestures		X			
49. Comprehension of figurative language,(picture)		X			
50. Conversation--ending a conversation			X		

Table 3
Mapping Functional Assessment of Verbal Reasoning and Executive Functioning (FAVRES) Items onto WHO-ICF Components and Contextual Factors

FAVRES Subtests	Body Structure/ Function	Activity	Participation	Context: Environment	Context: Person
Task 1: Planning an Event		X	X		
Task 2: Scheduling		X	X		
Task 3: Making a Decision		X	X		
Task 4: Building a Case		X	X		

Legend:

Body Structure: are anatomical parts of the body such as organs, limbs and their components.
Body Function: are physiological functions of body systems (including psychological functions).
Activity: is the execution of a task or action by an individual.
Participation: is involvement in a life situation.
Environment factors: physical, social and attitudinal environment in which people live and conduct their lives
Person factors: includes age, race, gender, educational background, personality, coping styles and lifestyle

**Note:* For the purpose of the analysis, test content items were linked to the most precise ICF category.

the ASHA FACS is the only measure that includes environmental factors relative to functional communication. Environmental factors are incorporated into the method in which test data are collected (i.e., observation of the individual in a variety of naturalistic environments). The CADL-2 and the FAVRES, on the other hand, are tests that involve simulation and role-playing. They were rated as contextually independent because they are intended to be administered within a standardized, controlled clinical setting. Standardizing the environment in which test data are collected increases between- and within-participant reliability. The benefit of increased reliability, however, is offset by the low ecological validity of the data, that is, data that do not necessarily represent a clear picture of individuals' functional abilities in multiple contexts within which everyday communication occurs. The naturalistic environments in which data for the ASHA FACS must be collected address the performance qualifier of the ICF which describes what individuals do in their environment (WHO, 2001). It is important to note, however, the crucial importance of conducting observations and assessments in multiple environments and numerous contexts in order to obtain a range of cognitive-communicative performances of individuals with TBI. This point is expanded further in the discussion section.

Discussion

Impairment-based communication assessments traditionally have been used by speech-language pathologists in their practices with adults with TBI largely because of their availability and the relatively straightforward manner in which they can be administered, scored and interpreted (Threats, 2003). The assessment of body structure and function alone, however, does not provide an adequate picture of the everyday communication abilities of adults with TBI. Additionally, while a combination of impairment-based and activity and participation-based measures provides a comprehensive picture of communication for adults with TBI, consideration must also be given to how cognitive-communication is influenced by the environment and other personal factors.

The challenge of assigning functional communication test items to each of the components and parts of the WHO-ICF framework and to the domains within these components reflects the complexity of communication and its fundamental role to human functioning. The findings from our analyses suggest that the WHO-ICF can be a useful framework within which to conceptualize and to analyze functional communication measures. Our findings demonstrate, however, that assignment is not always straightforward, with the resulting categorization of functional communication test items to both activity and participation components.

There were challenges in assigning functional communication items from the three tests to the more detailed activity and participation domains of the WHO – ICF. These problems were similar to those encountered by others who conducted a similar ICF-based analysis on the Pediatric Evaluation of Disability Inventory (PEDI) (Ostensjo, Bjorbaekmo, Carlberg, & Vollestad, 2006). The definitional elements of the Communicative Activity domain of the WHO – ICF do not provide sufficient breadth within which to link the functional test items used in this study. For example, several functional communication items could have been linked with equal validity to other activity and participation areas such as Learning and Applying Knowledge, Self Care, and Performing Tasks and Major Life Activities. This cross-linking exemplifies the multiple and complex interactions functional communication has with many life activities.

It is important to note that the WHO-ICF framework provides a useful theoretical conceptualization within which to observe and to assess individuals' performances in multiple environments (e.g., school, work, home, socially, etc.) and numerous contexts (e.g., teachers, co-workers, family, friends, unfamiliar people, etc.). In the case of individuals with TBI it is imperative to consider that family members' ratings of their relative's cognitive-communication may reflect only a narrow range of skills. For example, family members may be evaluating cognitive-communicative performances under highly supportive, less complex environments that optimize communicative success. Clinicians must be cognizant of the need to obtain and to assess the cognitive-communicative performances of individuals with TBI under independent and challenging circumstances (e.g., interactions with unfamiliar people, in the presence of few external cognitive and communicative supports, etc.). Such a comprehensive perspective would advance the ecological validity of family members' ratings and assessments and establish a substantial foundation of data upon which to develop clinically meaningful goals and strategies.

Conclusions and Future Directions

The prevalence and incidence figures of adults with TBI, both nationally and internationally, emphasize the growing need to offer comprehensive, effective, valid and functionally useful rehabilitation programs. The use of the currently available impairment-based communication assessment measures by S-LPs does not capture adequately the complex functional cognitive-communication abilities or problems of individuals with TBI. There is an expanding need for valid functional communication assessments that reflect the broad range of communication activities, abilities and problems of individuals with TBI and their participation within society. Assessment at all levels of the ICF is crucial. There is an imperative to develop and to conduct systematic analyses of the cognitive-communicative performances of individuals with TBI in all areas of the ICF (i.e., impairment; activity/participation; and environment and contextual factors). Moreover, reliable and valid functional communication assessment measures must be able to take into consideration environmental and personal factors. In this regard the WHO-ICF offers a comprehensive, universal framework

for looking at the complex role communication plays in the lives of patients with TBI. The WHO-ICF framework has the potential to be of central importance to S-LPs who work with adults with TBI. Using the framework, S-LPs can link functional communication to activities of daily living and help answer questions regarding which WHO-ICF constructs are most relevant to the communication functioning of their patients with TBI. Further, S-LPs can determine which of the constructs are being measured by items from a particular functional communication assessment test. The WHO-ICF also has the potential to assist S-LPs in determining which assessment items incorporate qualifiers such as capacity (standardized environment) and performance (natural environment) which are important for considering whether a environment is facilitative or acts as a barrier to functional communication.

Further research is required to investigate what functional communication activities are important to individuals with TBI and to their multiple communication partners (e.g., family, friends, teachers, co-workers, etc.), to what degree these activities compare to existing functional communication test measures, and how test items map onto the detailed levels of each of the domains of the WHO- ICF framework. This information will prove valuable for S-LPs who work with adults with TBI, assisting them in evidence-based clinical decision-making, improving face-validity of assessment protocols, optimizing intervention strategies, and enhancing patients' quality of everyday life. Finally, S-LPs also must work to identify and to test empirically WHO-ICF based strategies thought to be supportive of cognitive-communication in TBI. In this regard, S-LPs can address a wide range of clinic and 'real world' considerations and contexts captured by the comprehensive framework inherent in the WHO-ICF.

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