ORIGINAL ARTICLE

Development of the Participation Assessment With Recombined Tools–Objective for Use After Traumatic Brain Injury

Gale G. Whiteneck, PhD, Marcel P. Dijkers, PhD, Allen W. Heinemann, PhD, Jennifer A. Bogner, PhD, Tamara Bushnik, PhD, Keith D. Cicerone, PhD, John D. Corrigan, PhD, Tessa Hart, PhD, James F. Malec, PhD, Scott R. Millis, PhD

ABSTRACT. Whiteneck GG, Dijkers MP, Heinemann AW, Bogner JA, Bushnik T, Cicerone KD, Corrigan JD, Hart T, Malec JF, Millis SR. Development of the Participation Assessment With Recombined Tools–Objective for use after traumatic brain injury. Arch Phys Med Rehabil 2011;92:542-51.

Objective: To develop a new measure, the Participation Assessment With Recombined Tools–Objective (PART-O), based on items from 3 participation instruments.

Design: Instrument development based on survey research.

Setting: Community.

Participants: Adults (N=400) with traumatic brain injury (TBI) 1 to 15 years postinjury, recruited from 8 TBI Model Systems (TBIMS).

Interventions: None.

Main Outcome Measure: Community Integration Questionnaire version 2; Participation Objective, Participation Subjective; Craig Handicap Assessment and Reporting Technique; PART-O.

Results: Using Rasch rating scale analysis to evaluate the psychometric properties of participation items drawn from 3 instruments, a set of 24 items was developed that covered a broad range of participation content and formed a measure with person separation of 2.47, person reliability of .86, item spread of 4.25 logits, item separation of 11.36, and item reliability of .99. Items were well targeted on the sample with only 1 item misfitting. The PART-O showed expected relationships with measures of impairment, activity limitations, and subjective well-being.

Conclusions: The 24-item PART-O is an acceptable measure of objective participation for persons with moderate and severe TBI. It has been adopted as the measure of participation in the TBIMS.

Key Words: Brain injury, chronic; Interpersonal relations; Outcome assessment, health care; Psychometrics; Questionnaires; Rehabilitation; Reproducibility of results; Role; Social adjustment.

WITH THE PUBLICATION of the ICF, the World Health Organization attempted to differentiate "health-related states," or more specifically disablement, into separate domains. Impairment (or its positive counterpart, Body Functions and Structures) is distinguished from Activity Limitations (activities) and Participation Restrictions (participation). Participation is defined as "involvement in life situations,"[1(p14)] whereas participation restrictions are defined as "problems an individual may experience in involvement in life situations."[1(p14)] The construct of participation restrictions has much in common with the concept of handicap as it was used in the forerunner of the ICF, the *International Classification of Impairments, Dis-*

List of Abbreviations

CHART	Craig Handicap Assessment and Reporting Technique
CHART-SF	Craig Handicap Assessment and Reporting Technique–Short Form
CIQ	Community Integration Questionnaire
CIQ-2	Community Integration Questionnaire version 2
DRS	Disability Rating Scale
GCS	Glasgow Coma Scale
GOS	Glasgow Outcome Scale
GOS-E	Glasgow Outcome Scale–Extended
ICF	*International Classification of Functioning, Disability and Health*
M2PI	Mayo-Portland Participation Index
PART-O	Participation Assessment With Recombined Tools–Objective
POPS	Participation Objective, Participation Subjective
PTA	posttraumatic amnesia
SRS	Supervision Rating Scale
TBI	traumatic brain injury
TBIMS	Traumatic Brain Injury Model Systems

From Craig Hospital, Englewood, CO (Whiteneck); Department of Rehabilitation Medicine, Mount Sinai School of Medicine, New York, NY (Dijkers); Department of Physical Medicine and Rehabilitation, Feinberg School of Medicine, Northwestern University, Chicago (Heinemann); Rehabilitation Institute of Chicago (Heinemann), Chicago, IL; Ohio State University, Columbus, OH (Bogner, Corrigan); Rusk Institute for Rehabilitation Medicine–NYU Langone Medical Center, New York, NY (Bushnik); JFK Johnson Rehabilitation Institute, Edison, NJ (Cicerone); Moss Rehabilitation Research Institute, Elkins Park, PA (Hart); Rehabilitation Hospital of Indiana, Indianapolis, IN (Malec); and Wayne State University School of Medicine, Detroit, MI (Millis).

Supported by the National Institute on Disability and Rehabilitation Research through Traumatic Brain Injury Model System (TBIMS) awards to the Rocky Mountain Regional Brain Injury System (grant nos. H133A020510, H133A070022); New York TBIMS (grant nos. H1331020501, H133A070033); Ohio Regional TBIMS (grant nos. H133A020503, H133A070029); Northern California TBIMS (grant nos. H133A020524, H133A070038); JFK Johnson Rehabilitation Institute TBIMS (grant nos. H133A020518, H133A070030); The Moss TBIMS (grant nos. H133A020505, H133A070040); Rehabilitation Research and Training Center on the Community Integration of Individuals With Traumatic Brain Injury (grant no. H133B30038); and Rehabilitation Research and Training Center on Measuring Rehabilitation Outcomes and Effectiveness (grant no. H133B040032).

No commercial party having a direct financial interest in the results of the research supporting this article has or will confer a benefit on the authors or on any organization with which the authors are associated.

Correspondence to Gale G. Whiteneck, PhD, Director of Research, Craig Hospital, 3425 S Clarkson St, Englewood, CO 80113, e-mail: *gale@craig-hospital.org*. Reprints are not available from the author.

Published online March 2, 2011 at www.archives-pmr.org

0003-9993/11/9204-00401$36.00/0
doi:10.1016/j.apmr.2010.08.002

abilities, and Handicaps,[2] and with social disability, a concept used in psychiatric rehabilitation.[3] Participation in turn has much in common with social health, social adjustment, and social or community reintegration, all of which refer to modal or acceptable levels of functioning in social roles and relationships. Linkages between concepts and the issues involved in measurement of these value-laden concepts have been discussed previously.[4]

In medical rehabilitation, participation and related concepts have been measured in a number of ways, using a variety of well-developed and ad hoc instruments. The most commonly used instruments are the CHART or CHART-SF in research and other applications for persons with spinal cord injury[5,6] and the CIQ, used in persons with TBI.[7,8] In stroke research, various "instrumental activities of daily living" instruments are popular, including the Frenchay Activities Index[9] and the Nottingham Extended Activities of Daily Living scale.[10] They contain items reflecting participation in one's household, as well as the wider social and economic world, with a focus on the amount of time spent, frequency of performing certain activities, and number of people with whom interactions occur. These instruments vary in their emphasis on each of the 9 domains of activities and participation specified as ICF chapters: Learning and Applying Knowledge; General Tasks and Demands; Communication; Mobility; Self-care; Domestic Life; Interpersonal Interactions and Relationships; Major Life Areas (education, work, economic life); and Community, Social, and Civic Life,[1] but all have items relevant to at least 4 or 5 of these domains.[11] Resnick and Plow[12] reported that the Mayo-Portland Adaptability Inventory version 4 linked to all 9 ICF activity and participation chapters, and Lexell et al[13] identified specific concordant linkages of ICF participation chapters and descriptors to items of the Mayo-Portland Adaptability Inventory version 4 Participation Index.

Although a few studies, including 2 using TBI samples, have used multiple participation instruments,[14-16] in most work, only 1 has been used, and there is limited information about the comparative strengths and limitations of the commonly used participation instruments.[4] When the TBIMS[17] started a 5-year cycle of research in 2002, the participation measure that had been used since the early 1990s, the CIQ, was removed from routine data collection at annual follow-up to make resources available for other purposes. However, the current authors, all TBIMS researchers, agreed that assessment of participation is crucial to understanding the long-term effects of TBI and TBI rehabilitation and believed that modern psychometric methods would allow the creation of a self-report questionnaire that could be administered by means of telephone along with other TBIMS data elements. A Participation Special Interest Group within the TBIMS included the developers of 4 frequently used participation measures: CHART/CHART-SF,[5,6] CIQ/CIQ-2,[7,8,18] POPS,[19] and the Mayo-Portland Participation Index (M2PI) from the Mayo-Portland Adaptability Inventory (MPAI-4).[20] The Participation Special Interest Group decided to collect CHART, CIQ-2, POPS (objective scale), and M2PI data for a large cohort of TBIMS participants to create a composite participation measure that would (1) incorporate the strengths of the legacy instruments, (2) be psychometrically sound, and (3) be administered easily by means of telephone to people with moderate to severe TBI.

This report describes the development and preliminary testing of this measure, which was named PART-O. "Objective" refers to the fact that although participation as a status can in principle be observed by an outsider, "subjective" aspects of participation that reflect the priorities, satisfactions, and desires for change can be determined only by people with disability themselves.[21] Participation Assessment With Recombined Tools–Subjective, also developed by the Participation Special Interest Group,[22] is described elsewhere.

METHODS

Development of a Combined Instrument

To meet the study objective/design of new instrument development, a pool of items was formed by combining the CHART, CIQ-2, and POPS; interviewers completed the M2PI.

Characteristics of component measures. The CIQ was developed by Willer et al[7,8] for use in the TBIMS project. Consumers and experts in TBI research specified items in 3 subscales: home integration, social integration, and productive activities. A revised version of the CIQ[18] was used in the current project that addresses a number of shortcomings.[23] The CIQ-2 consists of 36 items, supplementing the 15 CIQ items with 21 questions about sharing of household activities, social and recreational activities, the nature of school involvement and place of work, and participation in such activities as Internet use and clubs/organizations.

The CHART was developed to assess the degree of participation restrictions reported by respondents compared with the level of participation in the general population.[5] The *International Classification of Impairments, Disabilities and Handicaps*[2] provides the conceptual framework; its 32 items are scored in six 100-point subscales: Cognitive Independence,[24] Physical Independence, Mobility, Occupation, Social Integration, and Economic Self-sufficiency. A score of 100 shows participation equivalent to that of most of the nondisabled general population. A 19-item short form was developed and used with spinal cord injury, TBI, stroke, multiple sclerosis, burn, amputee, and other impairment groups.[6] Questions on the self-report CHART are designed to tap quantitative aspects of participation by asking for hours spent in various types of participation, frequencies of engaging in community activities, counts of interactions with family and friends, and so on. High subject-proxy agreement has been reported.[25] This study used 17 CHART-SF items, omitting the economic subscale.

The POPS was developed to gather information about both objective aspects of participation and the subjective evaluation of level of and satisfaction with participation.[19] The POPS is unique in the following 3 aspects: (1) it focuses solely on activities, (2) the metric is duration or frequency of activity, and (3) all measured activities are intrinsically social, part of household or occupational functioning, or recreational activities occurring in community settings. The 26 items are summed within 5 subscales: Domestic Life; Interpersonal Interactions and Relationships; Major Life Areas; Transportation; and Community, Recreational, and Civic Life, in parallel to the ICF domains. Items were derived in part from CHART, CIQ, and other measures. This study used the 26 objective items of the POPS.

The M2PI consists of 8 items that comprise a subset of the Mayo-Portland Adaptability Inventory. This index correlates highly with the entire inventory, which in turn has well-established validity and other psychometric properties.[20,26,27] In contrast to other participation instruments used in this project, raters evaluate the degree of limitations in the areas of initiation, self-care, social contact, recreation, employment, transportation, household management, and financial management. For the present study, M2PI ratings were completed by interviewers after they had administered items from the CIQ-2, CHART, and POPS. Interviewers had access to participants' responses to these earlier items and, in some cases, clinical information, but also could rely on all other information that