

SHORT COMMUNICATION

## CONCURRENT VALIDITY OF THE COMMUNITY INTEGRATION QUESTIONNAIRE IN PATIENTS WITH TRAUMATIC BRAIN INJURY IN JAPAN

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**Objective:** To examine the concurrent validity of the Community Integration Questionnaire (CIQ) by comparing actual participation in community activities by individuals with traumatic brain injury.

**Design:** Cross-sectional survey.

**Subjects:** A total of 148 community-dwelling patients in Japan with a medical diagnosis of traumatic brain injury.

**Methods:** A postal questionnaire survey examined the relationships between individual's actual participation in community activities (working or attending school; undergoing rehabilitation at home or hospital; other) and productive activities evaluated by the CIQ in the community.

**Results:** Responses were received from 115 subjects (response rate 78%). Total CIQ scores and scores on the 3 subscales of the CIQ significantly differed among the 3 groups based on community participation. Total CIQ scores among individuals in the "working or attending school" group were significantly higher than for individuals in the "undergoing rehabilitation at home or hospital" and "other" groups. In addition, scores on the Productive Activity subscale of the CIQ were significantly higher among the "working or attending school" group than for the other 2 groups.

**Conclusion:** These results suggest that the CIQ has concurrent validity for patients with traumatic brain injury.

**Key words:** traumatic brain injury, community integration, validity.

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### INTRODUCTION

Returning a patient to his or her home and facilitating integration into the community are important goals for all areas of rehabilitation. In particular, community integration is a priority in the treatment and rehabilitation of individuals with traumatic brain injury (TBI) at the participatory (handicap) level (1). However, few studies in Japan have investigated the community integration of individuals with TBI.

Willer and colleagues (2) developed the Community Integration Questionnaire (CIQ) that assesses the handicap of patients with TBI. Since its development, the CIQ has become one of the most widely used indicators of post-TBI outcome.

Previous research has demonstrated that the CIQ has adequate test-retest reliability and internal consistency (1). Regarding inter-rater reliability, moderate to strong correlations have been reported between patients' and family members' responses for all 3 CIQ scales, with the lowest level of agreement reported for the home integration scale (1, 3, 4).

Even though the CIQ has proven useful, Dijkers (4) outlined several limitations associated with the use of the CIQ as a means of assessing community integration. Firstly, the available research has provided limited evidence for the concurrent validity of the CIQ. Using a small sample size of 16, Willer et al. (1) demonstrated that scores on all 3 CIQ scales correlated positively with scores from the Occupation subscale of the Craig Handicap Assessment and Reporting Technique (CHART) (5). However, contrary to expectation, the relationship between CIQ scores and scores on the CHART Social Integration scale was not significant. Dijkers (4) also noted that some of the significant correlations were low. Therefore, further evidence for the concurrent validity of the CIQ is required and would strengthen interpretations of outcomes based on CIQ scores (6).

The purpose of the present study was to examine the concurrent validity of the CIQ by comparing individuals with TBI in terms of levels of actual participation in community activities.

### METHODS

A postal questionnaire survey was sent to individuals with a medical diagnosis of TBI who were living in the northern Kyushu area (population approximately 1 million) of Japan. A cross-sectional study design was applied in order to investigate the relationships between individuals' actual state of participation and their productive activities as evaluated by the CIQ.

#### *Patients*

Subjects were derived from a database of registered all patients with TBI living in the study area and belonging to an association which was managed by the family members of patients with TBI ( $n = 148$ ).

### Questionnaire

Questionnaires were posted to 148 subjects from July to August 2002. The questionnaire consisted of items regarding the subjects' characteristics, impairments due to TBI, physical function, activities of daily living, employment status and social activities, and the CIQ that was translated literally into Japanese. Proxy responses were permitted for subjects who could not independently answer the questionnaire due to severe cognitive dysfunction.

We used the Willer's version of the CIQ and scoring procedures by permission of its authority. This CIQ was designed by Willer and colleagues (2) in order to assess the social role limitations and community interaction of individuals with acquired brain injury, especially TBI. The instrument consists of 15 items and measures community integration according to 3 domains: *home integration, HI* (e.g. meal preparation, housework, child-care), *social integration, SI* (e.g. shopping, visiting friends, leisure activities) and *productive activity, PA* (e.g. full vs part-time work, school, volunteer activities). A CIQ can be completed individually or with the assistance of a family member or caregiver familiar with the individual's health status and social activities. Most items are rated on a scale of 0–2 and the total score is calculated within a range of 0–29 points: *HI* (10 points); *SI* (12 points); and *PA* (7 points). Higher scores represent greater independence and community integration; lower scores represent poorer outcomes. A CIQ that can be administered by self-report, telephone or face-to-face interview has been developed (1).

Several studies have examined the psychometric properties of the CIQ (1, 2, 7). The CIQ shows good test-retest reliability, with scores of *r* (correlation coefficient) = 0.91, 0.93, 0.86, and 0.83 observed for the total CIQ, *HI*, *SI* and *PA* scores, respectively (2). Evidence for discriminant validity was also provided by Willer and colleagues, who observed that the CIQ is able to differentiate between patients with TBI and controls, as well as to differentiate among survivors with 3 different levels of independence (those living independently, those living in the community with support, and those who were institutionalized) (1, 2, 7).

### Statistical analyses

A one-way ANOVA (analysis of variance) was carried out in order to examine the differences in total CIQ and subscale scores among individuals in 3 groups arranged according to level of participation in community activities: (i) working or attending school, (ii) undergoing rehabilitation at home or hospital, (iii) other (inactive). Subsequently, the Scheffe test was performed for *post hoc* analyses.

## RESULTS

Responses were received from 115 subjects (91 men and 24 women) (response rate 78%), and the proxy response was 69%. Table I shows the subjects' characteristics. The subjects' mean age was 37 years. The distribution of age at the time of injury showed double peaks, one in the 20s and one in the 50s, and a mean of 7.5 years had passed since injury. Brain contusion as a result of a traffic accident was the most frequent cause, and one-third of subjects had been in an unconscious state for one month or more. The main physical sequelae were visual disturbance (38%), ataxia (37%) and verbal disorder (35%).

With regard to higher brain dysfunctions, the disability of information processing and learning (86% of the subjects), behavioural disorder (60%), inattention (87%), memory disorder (86%), and emotional disturbance (83%) were seen. Eighty-nine percent of subjects lived at home, and approximately 80% were physically independent. When the states of students as well as workers were regarded as employable, employment rates were 32% at the time of this survey.

The one-way ANOVA of the total CIQ and the 3 subscale scores showed statistically significant group differences in the

Table I. Subject characteristics (*n* = 115)

Characteristic	
Age (years), mean (SD)	37.0 (16.7)
Sex, men/women, <i>n</i> (%)	91 (80)/24 (20)
Duration from onset (years), mean (SD)	7.5 (8.3)
Cause, <i>n</i> (%)	
Traffic accident	81 (70)
Fall	14 (12)
Abuse	3 (3)
Others	17 (15)
Diagnosis*, <i>n</i> (%)	
Brain contusion	80 (70)
Diffuse axonal injury	27 (23)
Epidural haemorrhage	6 (5)
Subdural haemorrhage	12 (10)
Subarachnoid haemorrhage	21 (18)
Injuries to other parts of the body	52 (45)
Impairment*, <i>n</i> (%)	
Visual disturbance	44 (38)
Ataxia	43 (37)
Speech disturbance	40 (35)
Hemiplegia	29 (25)
Epilepsy	25 (22)
Quadriplegia	10 (9)
Paraplegia	2 (2)
Others	47 (41)
None	8 (7)

\*Multiple answers were permitted.

*PA* subscale as well as for total CIQ score (Table II). Based on the Scheffe's test, the total CIQ score for the "working or attending school" group was significantly higher than that of both the "undergoing rehabilitation at home or hospital" and "other" groups. Similarly, the *PA* score of the "working or attending school" group was significantly higher than that of the other 2 groups.

## DISCUSSION

The present study demonstrated that CIQ scores could distinguish between 3 groups of individuals with TBI differentiated by actual independence or level of community participation: "working or attending school" (mean total CIQ score, 15.4), "undergoing rehabilitation at home or hospital" (11.4), and "other" (11.7). In other words, the results of the present study suggest, in part, the concurrent validity of the CIQ.

As expected, scores on both the *HI* and *SI* subscales of the CIQ, among individuals in the "working or attending school" group with higher scores on the *PA* subscale, were higher than scores among individuals in the other 2 groups. This result indicates that the *HI* and *SI* subscales may be predictors of successful return to productive activities, and that people who successfully return to productive activities may function better at home and socially than patients who do not (8). This relationship is reflected by the results of the total CIQ scores in the present study.

We classified subjects with TBI into 3 groups according to their actual participation in the community, particularly their participation in productive activities, because returning to work and education are critical measures of post-TBI independence and

Table II. Differences in total Community Integration Questionnaire (CIQ) and subscales scores among 3 groups of individuals with traumatic brain injury (TBI) differentiated by actual participation. Values are expressed as mean (SD). Fifteen patients with missing values were excluded from this analysis.

CIQ score	Group			p-value (ANOVA)
	Working or attending school n = 32	Undergoing rehabilitation at hospital or home, n = 34	Other n = 34	
Total	15.41 (5.83)*†	11.39 (4.62)	11.70 (4.57)	0.008
Subscale				
Home	3.91 (2.23)	2.91 (2.02)	3.12 (2.29)	0.167
Social	6.80 (2.58)	5.97 (2.38)	5.72 (2.47)	0.205
Productivity	4.10 (1.94)*†	1.86 (1.83)	2.13 (1.58)	<0.001

\*p < 0.05 vs Undergoing rehabilitation at hospital or home (post hoc test by Scheffe).  
 †p < 0.05 vs Other (post hoc test by Scheffe).

community reintegration and also indicate quality of life (9, 10). Survivors of TBI often lose the capacity for competitive employment and other meaningful roles, resulting in decades of unrealized productive activity. Resumption of productive pursuits is considered by many to be a milestone of post-TBI recovery.

In order to evaluate concurrent validity, Willer and colleagues (2) compared the CIQ with the CHART (11), which is a standardized measure of independent living developed for individuals with spinal cord injury, and found variable relationships among subscales. Specifically, the CHART Social Integration subscale did not correlate with any CIQ subscales. Because of the small sample size (n = 16) in Willer’s study, interpretations of the results are ambiguous, indicating no concurrent validity (4) or high concurrent validity (6). The use of a larger sample size (n = 115) in the present study allows us reliably to confirm our interpretation.

Another form of validity of the CIQ has been reported. Willer and colleagues (2) provided evidence for the criterion-related validity of the CIQ, as indicated by relationships between CIQ scores and scores on the CHART. Support for the discriminant validity of the CIQ has been provided by a series of studies. For example, Willer and colleagues (1, 2) found that the CIQ reliably distinguished between patients with brain injury and a group of non-disabled individuals. For the total CIQ score and the 3 subscales, individuals with brain injury achieved lower integration scores than individuals in a non-disabled comparison group. Later, Corrigan & Deming (6) compared retrospective estimates of pre-injury CIQ scores to scores obtained 3 months after rehabilitation discharge. Post-injury, lower scores were noted for total CIQ and the *SI* and *PA* subscales.

Some caution is needed when generalizing the present results. First, the study design that was a questionnaire-survey to the subject could limit the availability to clinical data. Second, the scores of *PA* might be underestimated because volunteer activities are uncommon in the general population in Japan. Third, proxy responses by family members could be a source of information bias. However, as Willer et al. (1) showed that the CIQ had high inter-rater reliability between patients with TBI and their family members, we believe this bias would be small.

In conclusion, the present study provides additional evidence for the concurrent validity of the CIQ in patients with TBI.

However, further research using the CIQ to assess the community integration of patients with TBI is required.

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