

The Community Integration Questionnaire Revisited: An Assessment of Factor Structure and Validity

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ABSTRACT. Sander AM, Fuchs KL, High WM Jr, Hall KM, Kreutzer JS, Rosenthal M. The Community Integration Questionnaire revisited: assessment of factor structure and validity. *Arch Phys Med Rehabil* 1999;80:1303-8.

Objective: To investigate the factor structure and concurrent validity of the Community Integration Questionnaire (CIQ), using a large sample of persons with traumatic brain injury (TBI).

Design: Principal components analysis with varimax rotation was performed on CIQ items completed through interview with patients at 1 year after injury. Correlational analyses compared CIQ scores to scores on other widely used outcome measures.

Setting: Outpatient clinics affiliated with four TBI Model System rehabilitation centers funded by the National Institute on Disability and Rehabilitation Research.

Participants: Three hundred twelve patients with medically documented TBI who were enrolled in the TBI Model Systems Project. The majority of patients were Caucasian males with severe TBI.

Main Outcome Measures: CIQ; Functional Independence Measure (FIM); Functional Assessment Measure (FAM); Disability Rating Scale (DRS).

Results: Three factors emerged: Home Competency, Social Integration, and Productive Activity. The financial management item was moved from Social Integration to Home Competency, and the travel item was moved from Productive Activity to Social Integration. Each CIQ scale score showed significant correlations in the expected direction with the FIM+FAM and DRS items.

Conclusions: The results provide further evidence for the validity of the CIQ and improve the scoring system. The factor structure is clinically and theoretically meaningful. The subscale and total scores show significant relationships with other widely used measures of outcome. Future research should focus on increasing the range of questions, accounting for changes from preinjury functioning, and obtaining normative data on the new factors.

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AS ADVANCES IN medical management have increased survival rates after traumatic brain injury (TBI), more persons are surviving with disabilities.¹ The need for accurate assessment and prediction of outcome to assist in rehabilitation planning has become increasingly important. Managed health care requires greater accountability from rehabilitation programs, increasing the importance of outcome measures as a means of program evaluation. Unfortunately, few reliable and valid outcome measures exist. Measures such as the Functional Independence Measure (FIMSM)^{2,3} and the Disability Rating Scale (DRS)⁴ are sensitive to improvements in physical and cognitive status during acute rehabilitation, but such measures have limited ability to track long-term changes in vocational and psychosocial functioning.⁵

In response to the limitations of traditional outcome measures, Willer and colleagues⁶ developed the Community Integration Questionnaire (CIQ). The CIQ was developed to assess handicap, as defined by the World Health Organization (WHO).⁷ WHO defines handicap as a limitation, resulting from impairment or disability, that leads to an inability to perform normal age-, sex-, and culture-appropriate roles. The CIQ was designed to assess handicap in three domains: within the home, in social interactions, and in productive activities, including work, school, and volunteer activities. Development of the questionnaire began with generation of items by a panel of experts.⁶ The resulting 47 items were administered to a pilot sample of 49 community-dwelling persons who had sustained moderate to severe brain injury. Responses were subjected to principal components analysis with varimax rotation, with items forced into three factors representing the target domains of interest. Thirty-two of the original items were dropped from the questionnaire because they did not load significantly on any of the three factors. The final version of the CIQ consisted of 15 items comprising three scales: Home Integration, Social Integration, and Productive Activity.

Studies investigating the psychometric properties of the CIQ have provided preliminary evidence for its reliability and validity. Evidence for discriminant validity was provided by Willer and colleagues,^{6,8} who found that persons with brain injury had lower scores on all 3 CIQ scales compared to nondisabled persons. CIQ scores also differentiated between persons living independently, those living in the community with support, and those who were institutionalized. CIQ Total scores and scores on the Social Integration and Productive Activity Scales have also been shown to discriminate between preinjury functioning and functioning at 3 months after rehabilitation discharge.⁹ Regarding interrater reliability, moderate to strong correlations have been reported between patients' and family members' responses for all three CIQ scales, with the least amount of agreement reported for the Home Integration Scale.^{8,10,11}

Since its development, the CIQ has become one of the most widely used indicators of outcome after traumatic brain injury.

Although the CIQ has proved useful, limitations exist. A primary concern is the original development and factor analysis. In a recent review of the CIQ, Dijkers¹² questioned the reduction of items from 47 to 15 based on a factor analysis with an extremely small sample size of 49. Statisticians have recommended a sample size of approximately 10 subjects per variable, with a total sample size of 300 considered to be "good."¹³

A further criticism relates to the CIQ's concurrent validity.¹² Willer⁸ demonstrated that scores on all three CIQ scales correlated positively with scores from the Occupation subscale of the Craig Handicap Assessment and Reporting Technique (CHART).¹⁴ Contrary to expectation, the relationship between CIQ scores and scores on the CHART Social Integration scale were not significant. Dijkers¹² noted that some of the significant correlations were low. Further evidence of concurrent validity would strengthen interpretations of outcome based on CIQ scores.

The purpose of the present investigation was twofold: (1) to examine the factor structure of the CIQ using a large sample of 312 persons with TBI, and (2) to examine the CIQ's concurrent validity by comparing CIQ scores to two widely used and well-validated measures of outcome, the Functional Assessment Measure (FAM) and the DRS.

METHOD

Subjects

Subjects were 312 patients who were enrolled in the National Institute on Disability and Rehabilitation Research (NIDRR) Model Systems Research and Demonstration Project between September 1989 and January 1996. Patients were enrolled at one of four Model Systems Centers representing geographically distinct regions of the country. Criteria for inclusion in the project were: diagnosis of TBI resulting in admission to the emergency department of a Model System hospital within 8 to 24 hours of injury; age of ≥ 16 yrs; receipt of acute care and inpatient rehabilitation within the Model System; residence in a designated catchment area; and provision of informed consent by the patient or a relative. For the present study, subjects were selected from the Model Systems data base if they had CIQ data available at the 1-year postinjury follow-up.

Demographic characteristics of the sample are reported in table 1. Generally, the sample was demographically similar to those of the general TBI population. The exception was a substantially higher percentage of African American patients relative to the general population. The majority of patients had sustained severe TBI (mean Glasgow Coma Scale [GCS] score on admission to the emergency department, 8.43 ± 3.80).

Instruments

CIQ. The CIQ is a 15-item questionnaire designed to quantify an individual's integration into home and family life, social activity, and productive activity.⁶ Most items are rated on a scale of 0 to 2, with 2 representing greater independence and integration. Previous factor analysis yielded three subscale scores: Home Integration (10 points); Social Integration (12 points); and Productive Activity (7 points).⁶ A total score is also calculated, with a range of 0 to 29 points possible. Two versions of the CIQ are available, one for completion by patients and another for completion by a family member. Test-retest reliability for both versions has ranged from .83 to .97 for the CIQ Total and Subscale scores.⁶ Evidence for discriminant validity has been produced, as described above.^{6,8,9} The sensitivity of the CIQ Total score for detecting the types of long-term deficits present after injury has been questioned. Hall and colleagues⁵ found that half of their sample of 132 persons with TBI reached

Table 1: Demographics for the Total Sample

Sex	
Male	75%
Female	25%
Ethnicity	
Caucasian	54%
African-American	39%
Asian/Pacific Islander	1%
Hispanic	6%
Marital status	
Single	52%
Married	25%
Separated/divorced	21%
Widowed	2%
Education	
<High school	32%
High school or GED	33%
Trade School or some college	26%
Associate's degree	2%
Bachelor's degree or higher	7%
Current employment	
Unemployed	58%
Competitively employed	24%
Student	11%
Homemaker	3%
Retired	2%
Volunteer work	1%
Other	2%
Living Status	
Alone	10%
Spouse	23%
Parent	38%
Others	29%
Residence	
Private home or apartment	92%
Institution (eg, nursing home, hospital)	8%

the level of nondisabled persons on the Home and Social Integration Scales by 2 years after injury. In contrast, the Productive Activity Scale showed greater sensitivity, with only one in five persons achieving the average score for nondisabled persons. Hall and colleagues proposed that differences in sensitivity between the scales argues for the use of subscale scores rather than a composite score when describing outcome.

DRS. The DRS is a 30-point scale assessing patients' progress in eight areas of functioning including: eye opening; verbalization; motor response; level of cognitive ability for feeding, toileting and grooming; overall level of independence in functioning; and employability.⁴ Higher scores represent lower levels of functioning. The first six areas assess impairment and disability, as defined by WHO.⁷ The questions are likely to be more sensitive to difficulties experienced early after injury, but less sensitive at 1 year postinjury. The last two items, assessing overall dependence and employability, are similar to the CIQ in measuring handicap. Such items are likely to be more sensitive to long-term difficulties. The DRS items assessing overall independence and employability were selected to serve as a basis for assessing the concurrent validity of the CIQ in the current study. Previous studies have demonstrated good interrater reliability and validity for the DRS.^{4,15-17}

FIM and FAM. The FIM is an 18-item rating scale assessing functioning in basic physical and cognitive abilities.^{3,18} Items are rated on a scale of 1 (total assistance, ie, patient performs less than 25% of task) to 7 (complete

independence). Rasch analysis has revealed two main factors or traits underlying FIM items, a motor factor and a cognitive factor.^{18,19} Good interrater reliability and validity have been demonstrated for the FIM.²⁰⁻²² The FAM expanded the original FIM to include 12 additional items relating to cognitive and psychosocial difficulties after TBI.²³ Although the FIM+FAM was designed to measure disability rather than handicap, a few of the items could be considered to measure handicap, especially when assessed at 1 year postinjury. For the current study, three items from the FIM+FAM were utilized: Community Access, Social Interaction, and Employability. These items were chosen because they assess areas of handicap that are measured by the CIQ.

Procedure

As part of the Model Systems project, patients were contacted for interview and evaluation at yearly follow-up intervals. The CIQ was administered as an interview by a trained staff member. Two versions of the CIQ were administered, one to the patient and one to a family member or someone who knew the patient well. Only data provided by the patient at the 1-year postinjury follow-up was used for this analysis. Previous research conducted with the Model Systems sample has demonstrated moderate to almost perfect agreement between patients' and family members' responses to individual CIQ items.¹¹ When possible, interviews were conducted in person. In cases where patients were unable to come for an appointment, telephone interviews were conducted.

Scoring and Statistical Analyses

Consistent with the original CIQ scoring procedure, items on the Home Integration and Social Integration Scales were scored from 0 to 2, with the exception of the item "Do you have a best friend?" which was scored dichotomously (0,2). The item "Who cares for children in the home?" was deleted from the main analysis, since for more than half of the sample ($n = 187$) the response was "Not applicable—no children in the home."

For the Productive Activity Scale, the work item was coded either as 0 (not working), 1 (working part time), or 2 (working full time). The school and volunteer work variables were recoded in the same way. Persons who were retired ($n = 21$) were not included in the analysis.

After eliminating the item on child care, principal components analysis with varimax rotation was performed on the remaining 14 items. All analyses were conducted using SAS version 6.12 for Windows.^a

RESULTS

Factor Analysis

In the initial factor extraction, three components with eigenvalues greater than 1 emerged, and these were retained for rotation. Both oblique and orthogonal rotations were performed. The results of the oblique rotation showed modest correlations between two of the factors ($ICC = .35$) while the remaining correlations were very low ($ICC, .04$ to $.13$). Our judgment, based on these findings, was that orthogonal rotation was appropriate for clarity of factor interpretation. Together, the three factors accounted for 51% of the variance in the set of variables (Factor 1 = 30%; Factor 2 = 13%; Factor 3 = 8%). Final communality estimates (h^2) are shown in table 2. The variance in each variable accounted for by the three factors was greater than or equal to 30%.

Factor loadings were deemed significant if the magnitude of the variable loading was greater than or equal to .40 for a given factor. Using this criterion, six variables had significant loadings on Factor 1, six on Factor 2, and three on Factor 3 (table 2).

Table 2: Factor Loadings for CIQ Items in Total Sample ($n = 312$)

Item	Factor 1	Factor 2	Factor 3	h^2 *
Who shops for necessities in the household?	.83 [†]	.14	.01	.70
Who prepares meals?	.85 [†]	.02	-.02	.72
Who does everyday housework?	.77 [†]	-.01	.08	.61
Who plans social arrangements?	.67 [†]	.21	-.06	.50
Who looks after personal finances?	.70 [†]	.20	-.10	.54
Frequency of shopping	.44 [†]	.42 [†]	.17	.39
Frequency of leisure activities	.19	.67 [†]	.25	.54
Frequency of visiting friends or relatives	.24	.67 [†]	.21	.55
Who do you participate in leisure activities with?	.01	.66 [†]	.01	.43
Do you have a best friend?	-.07	.52 [†]	-.25	.34
Frequency of travel outside the home	.27	.65 [†]	.00	.50
Work	.24	.34	-.63 [†]	.57
School	.02	.32	.49 [†]	.34
Volunteer work	.04	.09	.60 [†]	.37

* h^2 = percent of variance in the variable accounted for by all 3 factors.

[†] Significant factor loadings ($\geq .40$).

All the items loaded significantly on at least one factor. Notably, the shopping frequency item had significant loadings on Factors 1 and 2. Based on the item content, the following factor labels were assigned: Factor 1, Home Competency; Factor 2, Social Integration; and Factor 3, Productive Activity.

Table 3 shows the means and standard deviations for the total CIQ score and for each of the subscale scores. To illustrate possible ceiling or floor effects, table 3 also shows the percentage of the sample that obtained minimum and maximum scores on each of the scales. The Productive Activity Scale had the greatest sensitivity at both ends of the distribution, with very few subjects obtaining the maximum score, while over one-third obtained the minimum possible score. In contrast, very few persons with TBI obtained the lowest possible score on the Home Competency and Social Integration Scales. However, these scales appeared able to detect impairment, since less than one fourth of the sample obtained the maximum possible score. Notably, scores on the Social Integration Scale were negatively skewed, with the majority of the sample (78%) obtaining scores in the higher range (score >5). In contrast, scores on the Productive Activity Scale were positively skewed, with more than half of the subjects (61%) scoring in the lower range (0 to 2).

Concurrent Validity

Using the factor structure determined by the above analyses, we calculated CIQ scale scores according to Willer's procedure⁶ of adding individual item scores to yield totals for the Home Competency and Social Integration Scales. Based on the new factor structure, our decision was to include the finances

Table 3: CIQ Total and Subscale Scores

	Total Possible Maximum Score	Mean	Standard Deviation	% Cases Obtaining Minimum Score	% Cases Obtaining Maximum Score
Total	25	14.26	5.52	.3	.3
Home Competency	10	5.23	3.20	5.8	15.1
Social Integration	10	7.17	2.44	1.3	20.8
Productive Activity	5	1.87	1.69	39.1	1.9

The minimum possible score is 0 for the total score and for each of the subscales.

item on the Home Competency Scale, while the item on frequency of travelling was included on the Social Integration Scale. The item on shopping frequency was not included, because it showed equivalent loadings on two factors. Following Willer's procedure, scores on the work, school, and volunteer items were weighted to yield the Productive Activity Scale score.

Spearman rho correlation coefficients were computed to assess the relationship between the CIQ factor scores and the FIM+FAM and DRS items selected to measure handicap. The correlation coefficients are shown in table 4. A Bonferroni correction procedure was used to control type I error, and the alpha level representing significance was set at .003. Each of the CIQ scale scores showed significant relationships, in the expected direction, to each of the DRS and FIM+FAM items. The correlations between the CIQ and DRS scores were negative because the DRS is scored in a reverse direction, with higher scores representing greater handicap. The CIQ Home Competency Scale showed moderate correlations with the other measures, with the exception of the weak relationship noted with the FIM Social Interaction Scale. The weakest relationships were noted for the CIQ Social Integration Scale. The Productive Activity Scale showed a stronger relationship with the DRS and FAM Employability Scales than with the other DRS and FIM+FAM items. The CIQ Total Score was related most strongly to the DRS and FAM Employability Scales, and was moderately related to the other measures. Again, the weakest relationship was between the CIQ Total Score and the FIM Social Interaction Score.

DISCUSSION

Factor Structure

The current analyses yielded a factor structure for the CIQ that was similar to Willer's original findings.⁶ Table 5 compares the original factor structure with that used in the present study.

Several explanations may account for the differences in the findings. Because of Willer's small sample size, it is possible that those results did not reflect an accurate and stable factor structure, and since the sample was not described in terms of demographics and injury-related variables, its comparability to our present sample is unknown. The comparability of the methodologies is also unclear because details of the original factor analysis were not thoroughly described. Although Willer reported using Principal Components Analysis with varimax rotation, criteria for significant factor loading and item rejection were not reported.

The factor structure in the present study conforms to theoretical expectations. Financial responsibility appears to have more in common with other homemaking responsibilities than with social activity. Originally, Factor 1 was labeled "Home Integration." Our recommendation, based on the current results, is to label Factor 1 as "Home Competency." All items appear to relate to the patients' competency to manage

Table 5: Comparison of This Study's CIQ Factor Structure With That of Willer⁶

CIQ Item	Scale on Which Item Loaded	
	In Willer's Study ⁶	In This Study
Who shops for necessities in the household?	Home Integration	Home Competency
Who prepares meals?	Home Integration	Home Competency
Who does everyday housework?	Home Integration	Home Competency
Who plans social arrangements?	Home Integration	Home Competency
Who cares for children in the home?	Home Integration	Not included in our analysis
Who looks after personal finances?	Social Integration	Home Competency
Frequency of Shopping	Social Integration	Home Competency & Social Integration (We recommend excluding.)
Frequency of Leisure Activities	Social Integration	Social Integration
Frequency of Visiting Friends or Relatives	Social Integration	Social Integration
Who do you participate in leisure activities with?	Social Integration	Social Integration
Do you have a best friend?	Social Integration	Social Integration
Frequency of travel outside the home	Productive Activity	Social Integration
Work	Productive Activity	Productive Activity
School	Productive Activity	Productive Activity
Volunteer Work	Productive Activity	Productive Activity

Differences from Willer and colleagues' original factor analysis are shown in bold type.

their own affairs, including managing household chores, planning social arrangements, and managing their own finances. As in the previous sample, the current Factor 2 appears to contain items pertaining to "Social Integration." Frequency of travel outside the home is highly related to social integration in the current sample, in contrast to Willer's finding that travel was related to productive activity. The item on shopping frequency was an ambiguous item, loading equally well on Factors 1 and 2. The ambiguity is likely related to the wording of the question, which does not specify shopping for necessities versus leisure shopping. Even if reworded, the item is likely to overlap with the shopping-for-necessities question on the Home Competency Scale or with the leisure activities item on the Social Integration Scale. Since it does not appear to yield unique information, we recommend dropping the frequency-of-shopping item from the CIQ.

In the current sample, Factor 3 appeared to be the weakest, was the last to emerge in the analysis, and accounted for only 8% of the total variance. Factor 3 was also defined by the lowest number of items (3) with significant loadings. Additional items may improve the ability to measure the hypothesized "Productive Activity" construct. Greater evidence of construct validity could be obtained by including in the factor analysis items representing productive activity from other outcome measures such as the Craig Handicap Reporting and Assessment Technique.

A final point of importance concerns the inclusion of the item "Who cares for children in your home?" which loaded on the Home Integration Scale in the original sample. Willer did not

Table 4: Correlation of CIQ Scores With FIM+FAM and DRS Items

	Community Integration Scales			CIQ Total Score
	Home Competency	Social Integration	Productive Activity	
DRS Level of Functioning	-.46	-.25	-.33	-.47
DRS Employability	-.43	-.37	-.58	-.58
FAM Community Access	.46	.27	.30	.47
FIM Social Interaction	.24	.27	.26	.34
FAM Employability	.42	.41	.57	.60

All values are significant at $p < .003$.

Table 6: New Scoring System for the CIQ

Home Competency Scale

1. Who shops for groceries and other necessities in your household?
 - Yourself alone (2 points)
 - Yourself and someone else (1 point)
 - Someone else (0 points)

Score the following items in the same way:

2. Who usually prepares meals in your household?
3. Who usually does normal everyday housework?
4. Who usually looks after your personal finances, such as banking and paying bills?
5. Who usually plans social arrangements such as get-togethers with family and friends?

Add items 1 to 5 for Total Home Competency Score: Maximum = 10

Social Integration Scale

How many times per month do you participate in the following activities outside your home?

6. Leisure activities, such as movies, sports, restaurants
 - Never (0 points)
 - 1 to 4 times (1 point)
 - 5 or more times (2 points)
7. Visiting friends or relatives
 - Never (0 points)
 - 1 to 4 times (1 point)
 - 5 or more times (2 points)
8. When you participate in leisure activities, do you usually do this alone or with others?
 - Mostly alone (0 points)
 - Mostly with friends who have brain injuries (1 point)
 - Mostly with family members (1 point)
 - Mostly with friends who do not have brain injuries (2 points)
 - With a combination of family and friends (2 points)
9. Do you have a best friend in whom you confide?
 - Yes (2 points)
 - No (0 points)
10. How often do you travel outside the home?
 - Almost every day (2 points)
 - Almost every week (1 point)
 - Seldom/never (less than once per week) (0 points)

Add items 6 to 10 for total Social Integration Score: Maximum = 10

Productive Activity Scale

11. Please choose the answer below that best corresponds to your current work situation (during the past month):
 - Full time (>20 hours per week)
 - Part time (≤20 hours per week)
 - Not working, but actively looking for work
 - Not working, not looking for work
 - Not applicable, retired due to age
12. Please choose the answer that best corresponds to your current school or training program situation (during the past month):
 - Full time
 - Part time
 - Not attending school or training program

Table 6: New Scoring System for the CIQ (Cont'd)

13. In the past month, how often did you engage in volunteer activities?
 - Never
 - 1 to 4 times
 - 5 or more times

Use the following system to obtain the Productive Activity Scale Score:

- 0 = Not working, not looking for work AND not going to school, AND no volunteer activities
- 1 = Volunteers 1 to 4 times per month AND not working, not looking for work AND not in school
- 2 = Actively looking for work AND/OR volunteers 5 or more times per month
- 3 = Attends school part time OR works part time
- 4 = Attends school full time OR works full time
- 5 = Works full-time AND attends school part-time OR attends school full-time AND works part-time

report how many people in his sample responded “not applicable” to the item because they had no children in the home. In the current analyses, the child item was excluded, since over half of the sample did not have children. No one would disagree that the ability to care for one’s children is an important aspect of community integration after TBI. However, the current CIQ scoring system provides no way to analyze the child item. Persons who have no children automatically receive two fewer points on the Home Integration Scale and the total score than persons who have children. To account for this problem, the scoring procedure should be based on the mean of item responses for each scale, rather than on a summative scoring procedure. Since the current widely accepted scoring procedure is summative, it is recommended that the child item not be included when calculating scores.

Sensitivity of the Subscale Scores

The new CIQ subscale scores appeared to be sensitive to the types of impairments experienced by persons with TBI at one year after injury. There does not appear to be a substantial floor effect. Very few people obtain the minimum score on the Home Competency and Social Integration Scales. Slightly more than one third of the sample scored 0 on the Productive Activity Scale. However, rather than being a limitation of the measure, the scores reflected the difficulty in returning to work and school that is common after TBI.

The CIQ subscales also do not appear to have a substantial ceiling effect at 1 year postinjury. Less than one fourth of the sample obtained the maximum possible score on the Home Competency and Social Integration Scales, while less than 2% achieved the maximum possible Productive Activity score. It is noteworthy that ceiling effects were investigated in regard to the absolute subscale scores. In a previous study, Hall⁵ found that ceiling effects were not evident when the scores of persons with TBI were compared to the maximum possible score for each subscale. However, ceiling effects were noted for the Home Integration and Social Integration Scales when persons with TBI were compared to a nondisabled sample. Comparisons of the new subscales to a normative sample will be necessary to further investigate possible ceiling effects.

Concurrent Validity

Previous research has provided limited evidence for the CIQ’s concurrent validity. Using a sample size of 16, Willer⁶ found significant correlations between the CHART Occupation

subscale and the CIQ Total score and all three scale scores. No significant relationships were noted between the CHART Mobility and Social Integration scales and any of the CIQ scales. Using a larger representative sample, the present study provides stronger evidence for the concurrent validity of the CIQ. Each of the three CIQ scales and the total score were related to selected items from two widely used measures of disability and handicap, the Disability Rating Scale and the Functional Independence Measure+Functional Assessment Measure. The majority of correlations were in the moderate range (ICC, .40 to .60).

At first glance, the lack of specificity in the relationships between the CIQ, DRS, and FIM+FAM may seem surprising. For example, the CIQ Home Competency Scale was related to the DRS and FIM+FAM Employability items, but the relationships can be explained by the fact that the DRS and FIM+FAM Employability items are more global. They define employability as return to previous levels of productive activity, which may include homemaking, academic pursuits, or work. In contrast, the CIQ separates homemaking activities from other productive activities, which may unfairly penalize persons who were homemakers before the injury or persons who work full time and have a spouse who performs household duties. Taking preinjury functioning into account is important in addressing this issue.

The weakest relationship was between the CIQ scales and the Social Interaction item from the FIM. This relationship parallels Willer's finding of a weak relationship between CHART Social Integration scores and CIQ scores. The CIQ Social Integration Scale appears to measure a different construct than either the CHART or the FIM. This is not surprising given the different focus of items on the three questionnaires. While the CIQ Social Integration score focuses primarily on frequency of social activities, the CHART focuses on the number of persons in the patients' social network and the FIM focuses on the appropriateness of social interactions. Previous research has shown that the social network size for persons with brain injury shrinks over time,^{24,25} often due to inappropriate social skills. Although they may be involved in social activities, such activities typically involve one or two family members. A limitation of the CIQ may be insensitivity to this typical reduction in network size.

CONCLUSIONS

The present study provides additional evidence for the validity of the CIQ, showing its factor structure to be clinically and theoretically meaningful and its total and subscale scores to be significantly related to other widely accepted measures of outcome, including the FIM+FAM and the DRS. A major result of the present study was the development of an improved scoring system for the CIQ. Scoring for the newly structured subscales is shown in table 6.

We have several suggestions to improve the use of the CIQ. The questions on the Social Integration and Productive Activity Scales assess a relatively narrow range of functioning. Inclusion of questions to assess additional aspects of social functioning and productive activity would improve the questionnaire. As Dijkers¹² suggested, the measure could also be improved by adding a question to assess preinjury status for each item on the CIQ. One possibility for future research is to use a change score, representing the difference between preinjury and postinjury functioning. Finally, collection of normative data on the newly structured subscales will be important. Separate norms for gender, ethnicity, and marital status are recommended to account for variability in outcome that is present in the non-disabled population.

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