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ORIGINAL RESEARCH

# Rasch Analysis of the Coping Inventory for Stressful Situations in Individuals With Moderate to Severe Traumatic Brain Injury

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**Abstract**

**Objective:** To evaluate psychometric properties of the Coping Inventory for Stressful Situations (CISS) in individuals with traumatic brain injury (TBI).

**Design:** Archival study using Rasch analysis.

**Setting:** Postacute rehabilitation hospital.

**Participants:** Adults (N=331) 1 to 15 years after moderate to severe TBI, recruited consecutively.

**Interventions:** Not applicable.

**Main Outcome Measure:** CISS.

**Results:** Indices of unidimensionality and model fit supported the scale's proposed multidimensional structure consisting of Task, Emotion, and Avoidant coping style; 3 unidimensional scales showed better fit than a single combined scale. The 3 scales met Rasch expectations of reliability and separation for persons and items, as well as adequate response category functioning. The scales were generally well targeted but showed some evidence of ceiling effect for Task, and floor effects for Emotion and Avoidant coping; item difficulties did not fully capture extreme ranges demonstrated by some participants, suggesting that measurement of coping after TBI on the CISS would be improved with additional items at low and high ranges of difficulty. Results were generally equivalent for cross-sectional groups representing short-term (1y), intermediate (2y), and long-term (5−15y).

**Conclusions:** The CISS showed good psychometric properties as a measure of coping style among persons with moderate to severe TBI in acute and chronic phases of recovery, and showed evidence of multidimensionality as predicted by theory, consistent with 3 unidimensional scales. Added items tapping broader (or more accessible, less cognitively complex) ranges of coping responses would likely benefit the scale overall and improve correspondence with the response needs of people with TBI.

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Coping style is an aspect of psychological functioning that may influence recovery from traumatic brain injury (TBI).[1-3] Prevailing theories suggest a 3-factor structure of coping style: problem-, emotion-, and avoidance-focused.[4,5] Avoidant and emotion coping styles are associated with relatively poorer functioning, physical health, and subjective well-being than task coping.[5-7] Given the high prevalence of cognitive and emotional deficits, this 3-factor structure of coping style might not well characterize coping among people with TBI.[8]

Cognitive deficits may alter how people think about and engage in managing stressors.[9,10] Cognitive impairments can undermine attention, memory, and executive functions needed for identifying, planning, and implementing complex coping responses necessary for task coping.[11-14] Emotional disturbances, low frustration tolerance, or inertia post injury may favor an

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emotion-focused response to stressors over active, task-focused coping.[15-17] Identifying the need to invoke adaptive action may be disrupted by TBI via impaired awareness of deficits associated with neurologic dysfunction, impaired appreciation of deficits, or denial,[18,19] which may increase the use of avoidant coping strategies.[19]

Most studies of coping style in TBI have falsely assumed that reliability generalizes from psychometric support established for non-TBI populations.[20] Although multiple scales are available to assess coping in general populations (eg, Ways of Coping Questionnaire,[21] COPE),[22] they do not appear to be the strongest options psychometrically[20,23,24] or clinically.[22,25] The Coping Inventory for Stressful Situations (CISS) was developed by Endler and Parker[4] to address psychometric weaknesses of earlier scales. The CISS includes 3 scales to assess task-, emotion-, and avoidance-focused coping, and is shorter than other scales, which is desirable for assessments of people with TBI. Research using traditional psychometric approaches (ie, classical test theory) indicates that the CISS is a reliable, multidimensional, valid measure of coping style among healthy and clinical populations, making it potentially a good choice for examining coping in TBI.[4,7,26,27]

Rasch modeling[28] is well suited to examine the CISS. Rasch models are developed with the goal of establishing an ideal scale with interval-level measurement and examining how well the data fit the ideal model, whereas classical test theory approaches strive to develop a model to describe the data.[29] Rasch analyses also enable examination of scale functioning at item and overall levels, scale dimensionality, and category response functioning.

The primary aim of this study was to use Rasch modeling to improve understanding of how the CISS functions in TBI and whether it functions best in its original form or if alterations might improve its measurement properties. A secondary aim was to evaluate whether time since injury meaningfully affects CISS reliability by using Rasch analyses to assess the psychometric properties separately for respondents in acute versus chronic stages of recovery from TBI. This aim was particularly well suited for Rasch analysis, which affords the opportunity to calculate separate reliabilities for persons and items. Lastly, CISS dimensionality was of interest. Although it was not a primary purpose of the approach, Rasch analysis can provide some information regarding whether the proposed 3-dimensional structure of the CISS holds among respondents with TBI versus a single dimension of coping response, as might be driven by global cognitive impairment.

# Methods

## Participants

A total of 331 adults were recruited consecutively from a large longitudinal study of TBI. All participants had medically documented TBI, received treatment at an affiliated level-1 trauma center within 24 hours of injury, and required inpatient rehabilitation. Persons whose injuries resulted from anoxic encephalopathy, who were non-English speaking, or whose injury severities precluded valid evaluation were excluded.

***List of abbreviations:***

**CISS** **Coping Inventory for Stressful Situations**
**TBI** **traumatic brain injury**

**Table 1** Characteristics of the 331 participants

| Characteristics | Values |
|---|---|
| Age at follow-up (y) | 44.0±13.5 |
| Sex | |
| Women | 61 (18.4) |
| Men | 270 (81.6) |
| Education (y) | 11.9±2.1 |
| Ethnicity | |
| African American | 234 (70.7) |
| White | 87 (26.3) |
| Latino(a) | 5 (1.5) |
| Native American | 3 (0.9) |
| Asian or Pacific Islander | 2 (0.6) |
| Time since injury (y) | 6.1±4.9 |
| GCS (total at emergency department admission) | 9.3 (3−15) |
| Days to follow commands* | 7.2±12.1 |
| Disability Rating Scale | 6.5±2.9 |

NOTE. Values are mean ± SD, n (%), or median (range).
Abbreviation: GCS, Glasgow Coma Scale.
* Days to follow commands is a motor subscale of GCS; days from injury to follow commands.

Participants completed the CISS between 1 and 15 years after TBI (mean ± SD: 6.1±4.9y). The median Glasgow Coma Scale total at admission was 9 (range, 3−15), which corresponds to moderate TBI. Persons with complicated mild injuries with intracranial hemorrhage were included because their neuropsychological profiles are similar to those of individuals with moderate TBI.[30,31] Demographic and injury severity characteristics are shown in table 1.

## Measures: CISS

The CISS[4] is a 48-item self-report measure that uses a 5-point scale (1 [not at all] to 5 [very much]). It provides three 16-item scales (Task, Emotion, Avoidance) to assess specific coping styles, which are scored independently of one another. The Task scale focuses on problem solving, planning, and efforts to alter difficult situations; the Emotion scale focuses on self-oriented responses, fantasizing, or emotions, including efforts to deal with stress; and the Avoidance scale focuses on efforts to relieve stress by distraction with unrelated activities or social interactions.[4] The CISS has well-demonstrated reliability and validity when used in healthy[4] and clinical[27] populations.

## Procedures

The study was approved by the institutional review board. These archival data were collected at scheduled follow-ups of 1, 2, 5, 10, and 15 years post injury. Only 1 CISS per participant contributed to the current dataset. Three cross-sectional time points post injury were examined: 1 year, 2 years, and chronic (≥5y post injury).

## Data analyses

Descriptive statistics and normative scores for the CISS scales were examined; univariate analyses of variance were used to compare the scales across each follow-up time. Rasch analyses were conducted for each of the scales at each follow-up time. Examining the scales at multiple time points post injury affords the opportunity to examine how well the CISS functions psychometrically among