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ORIGINAL ARTICLE

Utility of the Mayo-Portland Adaptability Inventory-4 for Self-Reported Outcomes in a Military Sample With Traumatic Brain Injury

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Abstract

Objective: To investigate the psychometric properties of the Mayo-Portland Adaptability Inventory-4 (MPAI-4) obtained by self-report in a large sample of active duty military personnel with traumatic brain injury (TBI).

Design: Consecutive cohort who completed the MPAI-4 as a part of a larger battery of clinical outcome measures at the time of intake to an outpatient brain injury clinic.

Setting: Medical center.

Participants: Consecutively referred sample of active duty military personnel (N=404) who suffered predominantly mild (n=355), but also moderate (n=37) and severe (n=12), TBI.

Interventions: Not applicable.

Main Outcome Measure: MPAI-4

Results: Initial factor analysis suggested 2 salient dimensions. In subsequent analysis, the ratio of the first and second eigenvalues (6.84:1) and parallel analysis indicated sufficient unidimensionality in 26 retained items. Iterative Rasch analysis resulted in the rescaling of the measure and the removal of 5 additional items for poor fit. The items of the final 21-item Mayo-Portland Adaptability Inventory-military were locally independent, demonstrated monotonically increasing responses, adequately fit the item response model, and permitted the identification of nearly 5 statistically distinct levels of disability in the study population. Slight mistargeting of the population resulted in the global outcome, as measured by the Mayo-Portland Adaptability Inventory-military, tending to be less reflective of very mild levels of disability.

Conclusions: These data collected in a relatively large sample of active duty service members with TBI provide insight into the ability of patients to self-report functional impairment and the distinct effects of military deployment on outcome, providing important guidance for the meaningful measurement of outcome in this population.

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Between the first quarter of 2000 and the second quarter of 2012, service members of the U.S. military suffered 253,330 traumatic brain injuries (TBIs), the preponderance of which (n=194,561; 77%) were mild TBI (MTBI) in severity. TBI in this population, with or without comorbid posttraumatic stress disorder, depression, chronic pain, or other common comorbidities, is associated with temporary or persistent physical, cognitive, and emotional

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impairments.[1,2] The downstream consequences associated with TBI include compromised family functioning, decreased social contact, homelessness, and under- or unemployment.[3]

Self-report measures are used extensively in military and veteran health care systems (VHS) to characterize the sequelae of MTBI and assist with treatment planning.[4] Moreover, the unobservable nature of many of the symptoms and consequences of TBI and co-occurring conditions requires that inferences be made from patient performance and self-report. Although self-report of physical, cognitive, emotional, behavioral, and social problems is less directly attributable to brain injury in MTBI than in moderate and severe TBI, this does not alter the usefulness of self-report measures themselves. Despite their importance, self-report measures commonly used in VHS have the following 2 fundamental limitations: (1) the paucity of psychometric study of these measures, particularly in current-conflict military and veteran populations, threatens their validity as information sources for clinical decision-making and determining disability status[5]; and (2) the scope of commonly used self-report measures is limited relative to the breadth of assessment called for in the Department of Defense/Department of Veterans Affairs clinical practice guidelines for MTBI.[6]

The Mayo-Portland Adaptability Inventory-4 (MPAI-4) is a global outcome measure used extensively in postinpatient rehabilitation settings to evaluate participants and outcomes throughout the United States and the world.[7-9] In addition, the MPAI-4 is the standard brain injury rehabilitation outcomes assessment instrument for both the VHS Polytrauma Rehabilitation Centers and the Polytrauma Transitional Rehabilitation Programs. In its original form (Portland Adaptability Inventory) and in subsequent iterations (Mayo-Portland Adaptability Inventory, Mayo-Portland Adaptability Inventory version 2.3, and Mayo-Portland Adaptability Inventory-3), the measure was designed to assess the core construct of global outcome by representing the range of physical, cognitive, emotional, behavioral, and social problems that people may encounter after acquired brain injury, including those resulting from comorbid physical or psychiatric conditions and associated external factors. The MPAI-4 was designed to be rated by professional consensus of a multidisciplinary rehabilitation team but has also been used as a self-report measure. Comparison of professional and self-reports revealed satisfactory internal consistency and rater agreement for the MPAI-4, regardless of rating source, despite some differences between professional and self-report ratings.[10] A manual summarizing much of the development of the MPAI-4 and previous studies can be found at The Center for Outcome Measurement In Brain Injury website (www.tbims.org/combi/mpai).

The broader scope of the MPAI-4 relative to available self-report measures and the evidence supporting its use as a self-report measure suggested that the MPAI-4 could be used to more fully characterize disability after TBI in Department of Defense and VHS settings. The goal of the present study was to evaluate the internal psychometric quality of the MPAI-4 in a sample of active duty military personnel using both classical and item response statistical approaches.

List of abbreviations:

MPAI-m	**Mayo-Portland Adaptability Inventory-military**
MPAI-4	**Mayo-Portland Adaptability Inventory-4**
MRFA	**minimum rank factor analysis**
MTBI	**mild traumatic brain injury**
TBI	**traumatic brain injury**
VHS	**veteran health care systems**

Methods

Participants

The sample was obtained from consecutive referrals to a TBI clinic at the San Antonio Military Medical Center. The referred sample of 404 military personnel (median age, 29y) was largely made up of men (n=377). TBI severity was categorized using the Glasgow Coma Scale score (mild: ≥13, moderate: 9−12, severe: ≤8) obtained in review of the medical record or retrospective self-report of loss of consciousness (mild: ≤30min, moderate: ≤24h, severe: >24h) and duration of retrograde or posttraumatic amnesia (mild: <24h, moderate: ≤7d, severe: >7d) obtained in a semi-structured clinical interview. Those with alteration in the mental state or focal neurologic deficits at the time of the injury (dazed, disoriented, confused) were classified as having MTBI. Furthermore, those with positive neuroimaging findings who otherwise met criteria for MTBI were classified as having moderate TBI. Severity of TBI in the sample was predominantly mild (n=355) but also included moderate (n=37) and severe (n=12) injuries. Time since injury was variable, ranging from 1 to 5712 days (mean ± SD, 590.6±827.4; median, 232). Of the 404 patients, 320 sustained a deployment-related TBI. Subjects included active duty, reserve component, and National Guard service members. The study was approved by the Institutional Review Board at the San Antonio Military Medical Center.

Measure

The MPAI-4 consists of 30 items designed to assess commonly occurring limitations after TBI. It is divided into 3 subscales: ability index, adjustment index, and participation index. Most items are rated on a 5-point scale (0−4) ranging from normative function to severe limitations. Some items, particularly on the participation index, are anchored to more discrete behaviors and activities (eg, percentage of time/occurrences).

Procedure

Patients were administered the MPAI-4 via a computer kiosk at the time of intake to the outpatient brain injury clinic at San Antonio Military Medical Center. The MPAI-4 was administered as part of a larger battery of clinical outcomes given routinely to new patients.

Analyses

The data set was screened and found to be complete and without out-of-range values, which may perhaps be attributable to the favorableness of computer-administered outcomes assessments to patients.[11-13] Ranges of percentage of responses by category were as follows: category 0 (18%−66.2%), category 1 (9.9%−30.6%), category 2 (5.7%−23.2%), category 3 (3.5%−26.9%), and category 4 (1.2%−49.9%). All factor analyses were conducted with FACTOR version 8.02.[14,a] All Rasch analyses were conducted with WINSTEPS version 3.72.313[b] using the Masters partial credit model. All other analyses were conducted with SPSS