

ORIGINAL RESEARCH

Patient Effort in Traumatic Brain Injury Inpatient Rehabilitation: Course and Associations With Age, Brain Injury Severity, and Time Postinjury



Ronald T. Seel, PhD,^a John D. Corrigan, PhD,^b Marcel P. Dijkers, PhD,^c
Ryan S. Barrett, MS,^d Jennifer Bogner, PhD,^b Randall J. Smout, MS,^d
William Garmoe, PhD,^e Susan D. Horn, PhD^d

From the ^aCrawford Research Institute, Shepherd Center, Atlanta, GA; ^bDepartment of Physical Medicine and Rehabilitation, Ohio State University, Columbus, OH; ^cDepartment of Rehabilitation Medicine, Icahn School of Medicine at Mount Sinai, New York, NY; ^dInstitute for Clinical Outcomes Research, International Severity Information Systems, Salt Lake City, UT; and ^eMedstar National Rehabilitation Hospital, Washington, DC.

Abstract

Objective: To describe patients' level of effort in occupational, physical, and speech therapy sessions during traumatic brain injury (TBI) inpatient rehabilitation and to evaluate how age, injury severity, cognitive impairment, and time are associated with effort.

Design: Prospective, multicenter, longitudinal cohort study.

Setting: Acute TBI rehabilitation programs.

Participants: Patients (N = 1946) receiving 138,555 therapy sessions.

Interventions: Not applicable.

Main Outcome Measures: Effort in rehabilitation sessions rated on the Rehabilitation Intensity of Therapy Scale, FIM, Comprehensive Severity Index brain injury severity score, posttraumatic amnesia (PTA), and Agitated Behavior Scale (ABS).

Results: The Rehabilitation Intensity of Therapy Scale effort ratings in individual therapy sessions closely conformed to a normative distribution for all 3 disciplines. Mean Rehabilitation Intensity of Therapy Scale ratings for patients' therapy sessions were higher in the discharge week than in the admission week ($P < .001$). For patients who completed 2, 3, or 4 weeks of rehabilitation, differences in effort ratings ($P < .001$) were observed between 5 subgroups stratified by admission FIM cognitive scores and over time. In linear mixed-effects modeling, age and Comprehensive Severity Index brain injury severity score at admission, days from injury to rehabilitation admission, days from admission, and daily ratings of PTA and ABS score were predictors of level of effort ($P < .0001$).

Conclusions: Patients' level of effort can be observed and reliably rated in the TBI inpatient rehabilitation setting using the Rehabilitation Intensity of Therapy Scale. Patients who sustain TBI show varying levels of effort in rehabilitation therapy sessions, with effort tending to increase over the stay. PTA and agitated behavior are primary risk factors that substantially reduce patient effort in therapies.

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Interdisciplinary traumatic brain injury (TBI) inpatient rehabilitation (IR) is a complex and multifaceted process. The individual and interactive contributions that patient, environment, and

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treatment factors make to outcomes remains understudied and not well understood.^{1,2} Rehabilitation, as all health care fields, faces increasing pressure to deliver high-quality services that maximize outcomes and minimize length of stay (LOS). A key element in the quality service equation is providing patient-centered care that takes into account injury severity and patient strengths; the match of treatments to patients' deficits and desired outcomes; and, importantly, the level of patients' involvement in care. Rehabilitation clinicians often consider the level of patients' behavioral

involvement in their therapies when evaluating treatment effectiveness and outcomes.³ Motivation for treatment is assumed to be a primary determinant of rehabilitation outcomes,⁴ but it is difficult to assess reliably because observers must infer patients' thoughts and intentions.⁵ Few empirical studies have examined patients' level of involvement in either TBI IR specifically or rehabilitation more broadly, and all have differed in the populations sampled, inclusion of persons with cognitive impairment, and nature and frequency of assessment.⁶⁻¹¹

Several constructs with overlapping conceptual definitions that focus on observable behavior have been used to describe patients' involvement in IR, including engagement, participation, and effort. Lequerica et al⁶ used the 15-item Rehabilitation Therapy Engagement Scale weekly during brain injury IR to assess a broad range of patient behaviors, including participation, cooperation, effort, persistence, frustration tolerance, responsiveness, and self-confidence. This sample, consisting primarily of patients with TBI, had engagement total scores that reflected slightly more maladaptive than adaptive behavior in their occupational therapy (OT) and physical therapy (PT).⁶ Pegg et al⁸ used the single-item, 7-point, Rehabilitation Intensity of Therapy Scale¹² to rate patients' level of effort in TBI IR. In an information provision clinical trial with patients who predominately sustained severe TBI and were at a Rancho Level of Cognitive Functioning Scale score ≥ 6 , patients' mean weekly ratings in speech therapy (ST) and PT generally indicated good level of effort.⁸

In a mixed diagnosis, non-TBI study, Kortte et al⁹ used the 5-item Hopkins Rehabilitation Engagement Rating Scale to assess attendance, attitude, participation, and need for prompting in patients receiving IR. Patients with spinal cord injury, hip/knee replacement, stroke, and amputation who had no more than mild cognitive impairments had their engagement for the entire rehabilitation stay rated once at discharge. Scores indicated they were nearly always engaged in their OT and PT sessions.⁹ Lenze et al¹⁰ developed the single-item, 6-point Pittsburgh Rehabilitation Participation Scale to assess patients' session completion, participation, effort, and interest in their IR. In this older adult sample with primarily orthopedic issues, debility, or stroke, patients were rated on average during 8.6 PT or OT sessions over a mean 12.6-day stay and had generally good to very good levels of participation.¹⁰ A modification of the Pittsburgh Rehabilitation Participation Scale was used in a spinal cord injury multicenter study to characterize patient effort in >260,000 IR sessions.¹¹ PT, OT, ST, and therapeutic recreation clinicians gave mostly excellent/engaged and very good/good/active effort ratings and very few fair/passive and poor ratings.¹¹

With regard to factors associated with quality of involvement in patients with TBI in IR, Lequerica et al⁷ found that Agitated Behavior Scale (ABS) scores, assessed once during the admission

week, and duration of posttraumatic amnesia (PTA) explained significant variance in engagement ratings: more agitation and longer PTA were associated with less engagement. In mixed rehabilitation samples, patients' positive affect, denial of illness, negative affect, and depression ratings were correlated with engagement ratings,⁹ and their participation ratings significantly improved from IR admission to discharge.¹⁰

We found no multicenter or large sample studies that described the involvement of patients with TBI in their IR therapies. No study described patients' involvement in IR therapies on a daily basis or used longitudinal, multivariable modeling to evaluate prognostic indicators and their associations with level of patient involvement. The current investigation aimed to extend the research literature by using a prospective, 9-center, longitudinal cohort design to examine patients' daily level of effort during TBI IR OT, PT, and ST sessions. The 3 primary objectives were to (1) evaluate the psychometric properties of the Rehabilitation Intensity of Therapy Scale level of effort rating scale, including distribution of ratings; therapists' rating accuracy; test-retest and interrater stability; and concurrent validity with same session ratings of patients' inattention, low arousal, lack of initiation, and disinterest; (2) describe and assess the course of patients' level of effort in PT, OT, and ST sessions during their rehabilitation stay; and (3) model 6 patient factors (age, time from injury to IR admission, days of IR treatment, brain injury severity, agitation, PTA) to evaluate their effects on daily level of effort ratings.

Methods

Study population

As part of a prospective observational investigation, we studied a cohort aged ≥ 14 years with complicated mild, moderate, and severe TBI from 9 IR centers located throughout the United States.² Participants were enrolled from October 2008 to August 2011 and received interdisciplinary rehabilitation services that typically included psychiatry, nursing, psychology/neuropsychology, case management, PT, OT, ST, and therapeutic recreation. Details of inclusion criteria, procedures, and enrollment rates have been published elsewhere.² Participants were excluded from the present analysis if they had a disorder of consciousness (defined as Rancho Level of Cognitive Functioning Scale score < 4 or FIM cognitive subscale score ≤ 6) for most or all of their stay.¹³ Participants were followed daily from IR admission through discharge. The institutional review board of each site approved center participation; patients who sustained TBI or their authorized proxy provided informed consent.

Measures

The Rehabilitation Intensity of Therapy Scale, a single-item, 7-point, behaviorally anchored rating scale, was used to rate patients' level of effort during each IR PT, OT, and ST individual therapy session in which the patient was given a Rancho Level of Cognitive Functioning Scale score ≥ 4 . Effort is an observable behavioral construct, which is defined as the use of physical or mental energy to do something¹ and is not a synonym for motivation or malingering.¹⁴ Use of physical and mental energy within a rehabilitation therapy context is operationally defined as being attentive and engaged in goal-directed activity, including initiating activity, incorporating therapist feedback, and persevering when

List of abbreviations:

ABS	Agitated Behavior Scale
CI	confidence interval
ICC	intraclass correlation coefficient
IR	inpatient rehabilitation
LOS	length of stay
OT	occupational therapy
PT	physical therapy
PTA	posttraumatic amnesia
ST	speech therapy
TBI	traumatic brain injury

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