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ORIGINAL ARTICLE

Examining the Function In Sitting Test for Validity, Responsiveness, and Minimal Clinically Important Difference in Inpatient Rehabilitation

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Abstract

Objectives: To determine the responsiveness of the Function In Sitting Test (FIST), compare scores at admission and discharge from inpatient rehabilitation (IPR) with other balance and function measures, and determine the minimal clinically important difference (MCID).

Design: Prospective, nonblinded, reference-standard comparison study.

Setting: Four accredited inpatient rehabilitation units.

Participants: Population-based sample of adults (N = 125) with sitting balance dysfunction, excluding persons with spinal cord injury, significant bracing/orthotics, and inability to perform testing safely.

Interventions: Not applicable.

Main Outcome Measures: FIST, FIM, and Berg Balance Scale (BBS) at admission and discharge, and Global Rating of Change for function and balance at discharge.

Results: The FIST demonstrated good to excellent concurrent validity with the BBS and FIM at admission and discharge (Spearman ρ = .71−.85). Significant improvement ($P<.000$; 95% confidence interval [CI], 10.73−15.41) occurred in the FIST from admission (mean ± SD: 36.81±15.53) to discharge (mean ± SD: 49.88±6.90). The standard error of measurement for the FIST was 1.40, resulting in a minimal detectable change of 5.5 points. The receiver operator characteristic curve differentiated participants with meaningful balance changes (area under the curve, .78; $P>.000$; 95% CI, .66−.91), with a change in FIST score of ≥6.5 points designating the MCID. Findings support the strong responsiveness of the FIST during IPR as evidenced by the large effect size (.83), standardized response mean (1.04), and index of responsiveness (1.07).

Conclusions: In this study, the FIST correlated well with balance and function measures (concurrent validity) and was responsive to change during IPR. A clinically meaningful change was indicated by an increase in score of ≥6.5 points.

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Sitting balance is an important requisite for functional activities and is frequently impaired after neurologic insult.[1] Studies[2-4] indicate that sitting balance is a substantial predictor of functional recovery after stroke and brain injury. Sitting balance at hospital admission is a strong predictor of standing balance and functional recovery at discharge from inpatient rehabilitation (IPR).[1,5,6] Early sitting balance ability is also predictive of walking outcomes 6 months poststroke.[2] However, there are no criterion assessments to specifically measure seated postural control. Commonly used clinical balance tools incorporate limited items specifically related to sitting balance or do not isolate sitting balance abilities.[7-11] The Trunk Impairment Scale,[12] Sitting Balance Scale,[13] Functional Reach Test,[14,15] and Trunk Control Test[16,17] may only capture limited functional aspects and are not validated in IPR. Common clinical practice for sitting balance

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assessment includes use of global ratings, a description of sitting performance, or both, but there are reliability issues and a lack of consensus using these qualitative assessments.[18] The Function In Sitting Test (FIST) was developed to provide an objective measure of sitting balance.[7]

The FIST, designed as a short test of sitting balance after acute stroke, consists of 14 functional sitting tasks quantifying performance while addressing the complex interactions between postural control and function.[7] The FIST demonstrates excellent intra- and interrater reliability with minimal online training, can be administered at the bedside or in the therapy gym, and generally takes less than 10 minutes to administer and score.[19-21] The 14 FIST test items consist of static sitting balance (sitting quietly, eyes closed, turning head, lifting foot), reactive nudges (lateral, anterior, posterior), dynamic balance (pick up item from floor, forward reach, pick up item from behind, lateral reach), and seated scooting (lateral, anterior, posterior). The FIST bridges gaps between simple observations about sitting balance and balance measures more heavily weighted toward standing balance or gait. By incorporating common functional movements, the FIST measures sitting at the activity level within the *International Classification of Functioning, Disability and Health* framework,[22] something increasingly needed to plan treatment and assess rehabilitation outcomes.[23-25]

Qualifying diagnoses for admission to IPR include diseases or disorders of the central nervous system, such as stroke and traumatic brain injury.[26,27] Individuals with these commonly encountered diagnoses often have difficulty with sitting balance and are working on recovery of balance.[15,28,29] Clinicians need an objective, reliable, and valid clinical measure to assess sitting balance abilities in IPR. The clinical outcome measure can then be used to design appropriate treatments and monitor balance outcomes during rehabilitation. Previous research supported the reliability of the FIST, as well as its construct, content, and concurrent validity in adults with neurologic dysfunction in acute care.[7,19] Research is needed to validate the FIST in IPR. Additionally, the ability of the FIST to detect change over time has not been examined. Therefore, the objectives of this study were (1) to evaluate concurrent validity by comparing FIST performance with other accepted measures of balance and function; (2) to examine the responsiveness of FIST scores during IPR; and (3) to estimate the minimal clinically important difference (MCID) in the FIST.

Methods

Design

A prospective, reference-standard comparison design was used.[30] Four accredited Commission on Accreditation of Rehabilitation Facilities IPR centers in different regions of the United States participated in this study with approval of their institutional review boards. Standardized methodological procedures were applied across sites. The a priori power analysis showed that a

List of abbreviations:

BBS **Berg Balance Scale**
CI **confidence interval**
ES **effect size**
FIST **Function In Sitting Test**
GRC **Global Rating of Change**
IPR **inpatient rehabilitation**
MCID **minimal clinically important difference**
MDC **minimal detectable change**
ROC **receiver operator characteristic**
SRM **standardized response mean**

Table 1 Participant demographics

Characteristics		No.	%
Medical diagnosis (n=125)	Stroke	80	64
	Cancer and/or tumor resection	12	9.6
	Traumatic brain injury	12	9.6
	Nontraumatic brain injury	5	4.0
	Deconditioning	2	1.6
	Guillain-Barré syndrome	2	1.6
	Hydrocephaly	2	1.6
	Encephalitis	2	1.6
	CIDP	2	1.6
	Arteriovenous malformation	1	0.8
	Multiple sclerosis	1	0.8
	Parkinson's disease	1	0.8
	Hemicolectomy	1	0.8
	Medically complex with falls	1	0.8
	Cardiac condition, not specified	1	0.8
Comorbidities, no. reported by body system involved (n=463)*	Cardiovascular system	180	38.9
	Neurologic system	78	16.9
	Endocrine system	52	11.2
	Other (visual, hemopoietic, integumentary, hepatic)	41	8.7
	Musculoskeletal system	40	8.6
	Renal/genitourinary system	28	6.0
	Gastrointestinal system	26	5.6
	Pulmonary system	18	3.9
TBI severity rating (n=12)†	Mild	2	1.6
	Moderate	4	3.2
	Severe	6	4.8
Discharge disposition (n=125)	Home	32	25.6
	Home with assist	61	48.8
	Skilled nursing facility	21	16.8
	Acute care	3	2.4
	Assisted living/board and care	3	2.4
	Subacute rehab	3	2.4
	Transitional living	2	1.6
Cognitive, affective, memory deficits impairing use of GRC scales (at discharge) (n=120)	Yes	36	30
	No	84	70

Abbreviations: CIDP, chronic inflammatory demyelinating polyneuropathy; TBI, traumatic brain injury.
* Participants could have multiple comorbidities in the same body system.
† TBI severity ratings based on initial Glasgow Coma Scale score: severe, ≤8; moderate, 9–12; mild, 13–15.