

ORIGINAL ARTICLE

Reliability and Responsiveness of the Activities of Daily Living Computerized Adaptive Testing System in Patients With Stroke



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Abstract

Objective: To examine the intrarater reliability, interrater reliability, and responsiveness of the Activities of Daily Living Computerized Adaptive Testing system (ADL CAT) in patients with stroke.

Design: One repeated-measures design (at an interval of 7d) was used to examine the intrarater reliability and interrater reliability of the ADL CAT. For the responsiveness study, participants were assessed with the ADL CAT at admission to the rehabilitation ward and at discharge from the hospital.

Setting: Eight rehabilitation units.

Participants: Three different (nonoverlapping) groups of patients (N=157) were recruited. Fifty-five and 42 outpatients with chronic stroke participated in the intrarater and interrater reliability studies, respectively; 60 inpatients who had recently had a stroke participated in the responsiveness study.

Interventions: Not applicable.

Main Outcome Measure: ADL CAT.

Results: The intraclass correlation coefficient values were .94 and .80 for the ADL CAT in the intrarater reliability and interrater reliability studies, respectively. The classical test theory–based minimal detectable change values were 6.5 and 9.5 for the ADL CAT in the intrarater reliability and interrater reliability studies, respectively. The Kazis' effect size and standardized response mean of the ADL CAT were moderate (.62–.73).

Conclusions: The ADL CAT has good intrarater reliability and interrater reliability in outpatients with chronic stroke, and sufficient responsiveness in inpatients with stroke undergoing inpatient rehabilitation. Further investigations on the responsiveness of the ADL CAT in outpatients are needed to obtain more evidence on the utility of the ADL CAT.

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Stroke is a major cause of disability in activities of daily living (ADL) among the elderly.¹⁻³ Assessing ADL is important for clinicians in planning ADL interventions, estimating care requirements, and monitoring outcomes.⁴ To be clinically useful, a short and precise ADL measure is preferred to improve the administrative efficiency and reduce assessment burden.¹

The ADL Computerized Adaptive Testing system (ADL CAT) was developed to achieve both efficiency and precision of ADL assessments.¹ The ADL CAT has 3 advantages. First, the ADL CAT is quick to complete. The ADL CAT chooses only items tailored to a patient and skips items that are either too easy or too difficult for patients; it requires an average of only 88 seconds to complete.¹ Such efficiency is unlikely to be achieved with traditional measures, such as the FIM and Frenchay Activities Index (FAI). Thus, the ADL CAT can enhance the efficiency of administration and reduce the assessment burden on patients and

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raters.⁵ Second, the ADL CAT assesses a broad spectrum of ADL function. Commonly, ADL refers to basic ADL (BADL).^{6,7} However, assessing BADL does not capture the information on higher levels of ADL functions that are necessary for independence in the home and community (ie, instrumental ADL [IADL]).³ The ADL CAT combines the BADL and IADL items into 1 item bank to comprehensively assess patients' ADL functions.¹ Third, the ADL CAT takes into account sex differences in performing some IADL items (ie, domestic chores) and thus assigns different weights to these IADL items to prevent underestimation of male patients' ADL function in performing domestic chore items.¹ Because of the aforementioned advantages, the ADL CAT demonstrates great potential for use in clinical and research settings.

Validity of the ADL CAT has been well examined.¹ The ADL CAT has high concurrent validity (Pearson $r=.82$) with the combined Barthel Index (assessing BADL) and FAI (assessing IADL) in patients with stroke.¹ In addition, the 34 BADL and IADL items of the ADL CAT item bank are 1-dimensional.¹ Thus, the construct validity of the item bank of the ADL CAT is supported.

However, some other important psychometric properties, such as intrarater reliability, interrater reliability, and responsiveness of the ADL CAT, are still unknown, thus limiting the utility of the measure. Intrarater reliability reflects the extent of consistency between repeated assessments administered by the same rater.⁸ Interrater reliability indicates whether different raters give consistent scores when administering a measure to the same group of patients.⁸ The responsiveness refers to a measure's ability to detect change that occurs as a result of therapy or disease progression.⁹ It is critical for the ADL CAT to have sufficient intrarater reliability, interrater reliability, and responsiveness to ensure its utility in clinical and research settings. Thus, the aims of this study were (1) to examine the intrarater reliability and interrater reliability of the ADL CAT; and (2) to investigate the responsiveness of the ADL CAT in patients with stroke.

Methods

Participants

Intrarater and interrater reliability

We recruited 2 convenience samples of outpatients with chronic stroke from the Department of Physical Medicine and Rehabilitation at 7 hospitals between March 2011 and May 2012. One convenience sample was for examining intrarater reliability; the

other was for examining interrater reliability. All participants met the following criteria: (1) diagnosis of cerebral hemorrhage or cerebral infarction; and (2) having had a stroke recently (≥ 6 mo). In addition, all participants received traditional rehabilitation (eg, occupational therapy, physical therapy, or speech and language therapy where needed, 1 to 3 times per week for each therapy). The traditional rehabilitation provided trainings in ADL, mobility, endurance and strength, balance, communication, or language-based skills. We excluded patients with major comorbidities (eg, dementia or rheumatoid arthritis) or recurrent stroke during the study period that might influence ADL functioning.

Responsiveness

We recruited a consecutive sample of patients undergoing inpatient rehabilitation at 1 hospital from May 2011 to January 2013. The inclusion criterion for selecting participants was a diagnosis of cerebral hemorrhage or cerebral infarction. All participants received inpatient rehabilitation services (eg, occupational therapy, physical therapy, or speech and language therapy, 3 to 5 times a week for each therapy). The inpatient rehabilitation services focused on trainings in ADL, mobility, motor recovery, endurance and strength, balance, chewing, or swallowing, where appropriate. Patients with major comorbidities were excluded. Moreover, we excluded patients who stayed in the ward for <7 days because their ADL functions tended to be stable, as indicated by the short hospital stay. The whole study was approved by the local institutional review boards.

Procedure

Before the study, the raters (raters A and B, both occupational therapists) received at least 2 hours of training from the first author (Y.-C. L.; a very experienced ADL CAT user) on the administration of the ADL CAT. During the training session, the raters had to familiarize themselves with the items, response categories, interview procedures, and scoring. At the end of the training session, both raters individually interviewed 4 to 6 patients while the first author observed and scored at the same time. Then the raters' interview procedures and scoring results were checked by the first author to ensure that the procedures and results were satisfactory.

During the study, the raters interviewed the patients and their primary caregivers, if available, to assess the patients' level of independence in daily life. The raters asked the patients whether they had done a specific ADL task in the prespecified time frame (whether or not the patients actually put on pants or shorts themselves in the previous 1–2d before assessment). If the patients had done the task, the rater asked whether they had done it by themselves or with assistance. If it was the latter, the rater further asked the level of assistance during the task. If we obtained the responses from both the patients and their primary caregivers, but there was a discrepancy, the raters further clarified the discrepancy with the patients and their primary caregivers. After further clarification, if the discrepancies still existed, the rater would further check with the patients and their caregivers simultaneously to determine how the patients actually performed the ADL task within the time frame. If the patients had difficulty responding to the interview (eg, patients with aphasia or cognitive-perceptual deficits), their primary caregivers were interviewed instead.

Intrarater reliability

The ADL CAT was administered to the participants twice by rater A, 7 days apart.

List of abbreviations:

ADL	activities of daily living
ADL CAT	ADL Computerized Adaptive Testing system
BADL	basic ADL
CTT	classical test theory
DIF	differential item functioning
FAI	Frenchay Activities Index
IADL	instrumental ADL
ICC	intraclass correlation coefficient
IRT	item response theory
LOA	limits of agreement
MDC	minimal detectable change
SEE	standard error of estimate
SRM	standardized response mean

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