ORIGINAL ARTICLE

Measurement Properties of the Late Life Disability Index Among Individuals Who Use Power Wheelchairs as Their Primary Means of Mobility

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Abstract

Objective: To examine the reliability, validity, and factor structure of the Late Life Disability Instrument (LLDI) in individuals who use power wheelchairs as their primary means of mobility.

Design: A 4-week, test-retest study design.

Setting: Five Canadian cities.

Participants: The validity sample included 115 new and experienced power mobility users, and the reliability sample included 85 experienced users (N=115). These volunteer samples included individuals who were aged ≥50 years and independently used power mobility as their primary means of mobility.

Interventions: Not applicable.

Main Outcome Measure: The LLDI measures participation in 2 dimensions of 16 life activities: frequency and perceived limitations. Validity measures included the Wheelchair Skills Test—power version, the Assistive Technology Outcomes Profile for Mobility, the Hospital Anxiety and Depression Scale, the Power Mobility Wheelchair Confidence Measure, and the Life Space Assessment.

Results: For the reliability sample, raw intraclass correlational coefficients for limitation and frequency dimension scores ranged from .855 (95% confidence interval .781−.905) to .883 (95% confidence interval, .822−.924), respectively. For the validity sample, scores on the LLDI were correlated as hypothesized with scores on validity measures. The factor structure that was identified with the original sample was not replicated among power wheelchair users. For LLDI frequency, exploratory factor analysis indicated that 5 of the original 16 items did not perform similarly among power wheelchair users. For LLDI limitations, a 1-factor, rather than a 2-factor, solution was identified.

Conclusions: The study provides evidence in support of the reliability and validity of the measure but suggests that the original subscale scores may not be applicable to power wheelchair users.

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Power mobility is becoming an increasingly common means of mobility. In 2005, in the United States, an estimated 3.3 million people (ie, 1.4% of the population) used wheeled mobility, which included manual and power wheelchairs and scooters.[1] From 1990 to 2005, wheeled mobility use increased 5% annually.[2] In 1994-1995, it was estimated that 9% of those who used wheeled mobility mobilized using a power wheelchair.[3] Between 2000 and 2001, the relative percentage of power wheelchairs provided by the Department of Veterans Affairs in the United States increased from 8% to 14%.[4] Given that mobility disability increases exponentially with age[5,6] and world populations are rapidly aging,[7] power mobility represents a potential means to ameliorate this problem.

Measuring participation among power mobility users is important as a means of understanding participation-related issues that users may encounter and to justify the provision of these devices. Power mobility prescription has been associated with increased social participation among users.[8] However, power mobility users may also experience problems negotiating the physical environment[9-11] and discrimination, especially among older users.[11-13]

Although there are a number of generic measures of participation, none has been tested specifically with power wheelchair users. It is important to have generic participation measures to enable scores among different populations to be compared.[14] For example, the Late Life Disability Instrument (LLDI) measures respondents' perceived frequency of performance and limitations in the performance of life tasks[15]; however, initial psychometric testing of this measure was performed in a sample of 150 community-dwelling individuals, only 4 of whom used wheelchairs.[16]

Given that psychometric properties vary across populations, it is unclear whether the LLDI would perform similarly among individuals who use power wheelchairs. Therefore, as part of a longitudinal study, we explored the psychometric properties of the LLDI with older adults who use power wheelchairs as their primary means of mobility. Specifically, we wanted to examine the reliability, validity, and factor structure of the LLDI in this population.

Methods

This article draws on data from a longitudinal multisite study design that was approved by the ethics boards in all jurisdictions in which the research took place. The study used a test-retest design.

Participants

To be included in the longitudinal study, wheelchair users needed to be aged ≥50 years; able to follow 3-step commands in French or English; able to provide their own consent; and able to operate their power chair independently. The study included new (<6mo experience) and experienced wheelchair users from 5 Canadian cities. For the current study, only those participants who used power mobility as their primary means of mobility were included.

The validity sample included all participants. The reliability sample included only experienced users because it was anticipated that participation would fluctuate among new users.

Recruitment began May 2010 and concluded December 2012. We recruited subjects from rehabilitation facilities, wheelchair seating programs, and wheelchair equipment vendors (customer lists of stores who sell wheelchair equipment) via invitation from third-party recruiters, and via posters. We also recruited participants via social media, advertisements in newsletters and newspapers, and word of mouth. When contacted by interested individuals, research coordinators at each site provided study details, answered questions, confirmed eligibility, and scheduled appointments for data collection.

Measures

The LLDI measures frequency and perceived limitation of participation in 16 life tasks (eg, keeping in touch with others, preparing meals, active recreation, and taking care of errands).[15,16] In the preliminary validation study, factor analysis indicated that the frequency of performance dimension had 2 domains—personal roles and social roles, and the perceived limitations dimension had 2 domains—instrumental and management.

List of abbreviations:

ICC intraclass correlation coefficient
LLDI Late Life Disability Instrument

Test-retest intraclass correlation coefficients (ICCs) were as follows: .68 for the frequency dimension and .82 for the limitation dimension; and .44 for management role, .63 for personal role, .75 for social role, and .83 for instrumental role domain scores.[15] Based on data from the preliminary validation study, standardized scores can be calculated for the dimension and domain scores. A French version of the measure has been developed and validated.[17]

Demographic information was collected on each participant including age, sex, education (1=no formal education, 11=postgraduate degree), income ($15,000 increments), marital status, living situation, and power wheelchair experience (experienced or new [<6mo use]).

Data from 5 other measures were collected for investigating validity. Preliminary evaluation of the measures indicated that they were very reliable.[18] At the time of baseline data collection, all measures except the Wheelchair Confidence Measure were available in French and English.

The objective Wheelchair Skills Test 4.1—power version is a comprehensive performance-based evaluation of wheelchair skills.[19] It comprised 32 skills that assess the individual's ability to overcome environmental obstacles (eg, potholes and curbs) and perform transfers and other basic power wheelchair operations (eg, turning the chair). Trained raters provide a pass/fail for each item score. The overall score represents the average of performance scores for all applicable items.

The Assistive Technology Outcomes Profile for Mobility is a scale developed using item response theory with a sample of 1037 adults with cerebral palsy, multiple sclerosis, spinal cord injury, and stroke. The tool assesses 2 domains: activities and participation. It evaluates the self-perceived difficulties that mobility device users encounter performing various activities and roles with and without devices with a 5-point scale (1=unable to do, 5=without any difficulty).[20] Computer-assisted testing was used in the administration of this measure, and a T score ranging from 0 to 100 for each subdomain was calculated. Only the "with device" scores were analyzed.

The Hospital Anxiety and Depression Scale is a 14-item self-report scale that measures anxiety and depression.[21] Responses from each item are assessed on a 4-point scale (0–3), with higher scores indicating increasing symptom frequencies. Scores for each domain range from 0 to 21. The measure has good psychometric properties among individuals with spinal cord injuries (ie, adequate to excellent internal consistency and construct validity).[22] A systematic review by Bjelland et al[23] indicated that a score of 8 was the best cutoff for anxiety or depression.

The 59-item Wheelchair Confidence Measure for Power Wheelchairs Users[24,25] measures power mobility users' self-efficacy in 5 areas: negotiating the physical environment, wheelchair-related activities, problem solving, advocacy, and managing social situations. Item responses are recorded on a scale ranging from 0% (low confidence) to 100% (high confidence). A mean score is calculated to represent overall confidence.

The Life Space Assessment measures participants' frequency and independence of mobility in increasingly larger life spaces (eg, within their home, yard, neighborhood, city or town, and beyond) over the past month. Frequency is measured on a 4-point scale (1=<once per week, 2=1–3 times per week, 3=4–6 times per week, 4=daily).[26] Independence is measured on a 3-point scale (1=personal assistance required, 1.5=assistive device used, 2=independent). A total composite life space score, which ranges from 0 to 120, can be calculated by multiplying the frequency by the independence by the weighting for each life