Validation of the Wheelchair Outcome Measure in Residents in Long-term Care

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Abstract

Purpose—To determine the retest reliability and construct validity of the self-report and proxy versions of the Wheelchair Outcome Measure (WhOM) among residents in long-term care.

Method—The WhOM was administered to 55 wheelchair users living in residential care (38 self-respondents and 17 proxy-respondents). Retest data were collected to estimate reliability using Intraclass Correlation Coefficients (ICC) for each of the tool scores (Importance, Satisfaction and Importance × Satisfaction). For construct validity testing, spearman's correlation coefficients were used to assess whether WhOM scores were correlated with scores from the Late Life Function and Disability Instrument (LLDI) and Geriatric Depression Scale (GDS).

Results—The ICCs for the WhOM scores were between 0.68 and 0.84. Moderate correlations were found between the self-respondents and proxy-respondents groups with Importance × Satisfaction and LLDI ($r_s = 0.46$ – 0.50). No other significant correlations were found.

Conclusions—This study provides evidence for the reliability and validity of the WhOM for adults in residential care, but further testing is warranted to ensure it can facilitate prescription of the right device at the right time for residents in these settings.

Keywords

Mobility; participation; validation studies; nursing homes; wheelchairs

Introduction

Most residents in long-term care use wheelchairs as a means of mobility [1]. Unfortunately, residents experience a variety of wheelchair-related problems including discomfort, poor posture and wheelchairs that are unsuitable for self-propulsion [2–4]. In order to provide an appropriate wheelchair it has been recommended to involve users in a collaborative goal identification process [5,6]. The Wheelchair Outcome Measure (WhOM) [7] was developed to facilitate this approach.

The WhOM is a client-specific measure that evaluates participation level outcomes associated with wheelchair provision [7]. The WhOM demonstrates promising psychometric properties among individuals with spinal cord injury (SCI) [8] and community dwelling power mobility users [9]. For individuals with SCI [8], test-retest and inter-rater reliability intraclass correlation coefficients (ICCs) estimates were substantial (ICCs > 0.90), and it was moderately correlated with related items from a measure of social participation (the assessment of Life Habits) [10]. Among community dwelling power mobility users, the WhOM demonstrated good test-retest reliability with telephone administration (ICCs 0.77–1.00) [9]. Validity testing showed moderate correlations with a measure of device satisfaction (i.e., Quebec User Evaluation of Satisfaction with Technology) and a measure of assistive device-related quality of life (i.e., Psychosocial Impact of Assistive Devices Scale) [9].

However, little is known about its validity and reliability among those living in residential care. This represents a unique population given the high proportion of residents with dementia [2] and significantly lower levels of social participation (in comparison with peers that live in the community) [11–13]. Furthermore, facility residents frequently experience, seating discomfort [4,14], pressure ulcers[15] and reduced independent mobility [3]. Cognitive declines among residents may prevent them from completing outcome measures independently and necessitate the use of proxy respondents.

Therefore, our objectives were to determine the retest reliability and construct validity of the self-report and proxy versions of the WhOM among older adults living in residential care. We hypothesized that WhOM scores to be consistent over time and positively correlated with participation and negatively correlated with depressive symptoms.

Methods

The study used a two-week test-retest design. Ethical approval was provided by the local university review board and health authority.

Participants

To participate residents needed to: 1) use a wheelchair to get from their beds to the common rooms on their units, with or without the assistance of others, 2) use a wheelchair 2 hours per day on average, 3) be medically stable, 4) speak English and 5) be over 60 years of age. Residents were excluded if they had been in the facility or using a wheelchair <1 month. Proxy respondents were used for residents who were unable to complete the measure

independently due to cognitive impairments. To act as a proxy for a resident, the individual had to be in contact with the resident at least once a week and be able to speak English well enough to answer the study questions. If no family member met these criteria, a staff member who regularly worked with the resident was used.

Recruitment

Participants were recruited from 11 care facilities in the Lower Mainland of British Columbia as part of a larger cross-sectional study. After reviewing the study protocol informed consent was obtained from residents or their surrogate decision makers.

Data collection

Trained raters administered collected data at two time points (baseline and follow up). Participants demographic/clinical information (e.g./age, sex, and type of wheelchair) was collected from the medical charts and all of the measures (WhOM and validation measures) were administered at baseline. The WhOM was administered again approximately two weeks later ($M=13.8$ days). On the second occasion participants were asked to re-rate the activities they had previously identified at baseline.

Measures

WhOM

The WhOM [7] is a semi-structured, client-specific measure that is used to identify client's wheelchair-related, participation outcomes. Respondents rate the importance of and satisfaction with performance of self-identified activities while using their wheelchair based on an 11 point scale (0 = Not at all important/satisfied) to 10 (Extremely important/satisfied). Summary scores include mean satisfaction (the sum of all satisfaction scores $\div$ number of activities), and mean importance $\times$ satisfaction (the sum of the individual importance $\times$ satisfaction of all goals $\div$ number of activities).

Validation Measures

Two measures were used to provide evidence for the construct validity of the WhOM. We measured symptoms of depression, using the 15 item Geriatric Depression Scale (GDS) [16]. For question 9, we replaced the word "home" with "nursing home" to ensure clarity. This version of the GDS has moderate internal consistency (i.e., a Cronbach's coefficient of 0.749) and is moderately correlated with other measures of depression and life satisfaction [17].

The Late Life Function and Disability Instrument: Disability Component (LLDI) [18] is a 16-item tool that measures the frequency with which respondents take part in common activities. Discriminant validity testing of the measure found it could differentiate subjects assigned to four functional levels [18]. We modified four items to facilitate its use in residential care. We changed item 5 "Working at volunteer job outside your home" to "Helping out as a volunteer in the facility". For item 6, about taking part in active recreation, we changed the examples from "This may include bowling, golf, tennis, hiking, or jogging"

to, “This may include wheelchair bowling or swimming,” to reflect recreation activities more common in the facilities studied. For item 8, about “taking care of the inside of your home,” we changed the word “home” to “room”. For item 11, about “inviting people into your home for a meal or entertainment” we changed the word “home” to “facility”. In a recent study, reliability testing of the modified tool found it had an ICC of 0.94 [19].

We used the Standardized Mini-Mental State Exam (SMMSE) [20] to ensure that participants in the self-respondent group were above the cut-off suggested (e.g., 15) for the self-completion of the GDS [21]. If residents were below the cut-off score, a proxy respondent was sought.

Analysis

Descriptive statistics were used to summarize the data. Statistical assumptions were assessed to ensure that they were not violated beyond the tolerance of the statistic.

Reliability

Intra Class Correlation co-efficients ($ICC_{2,1}$) were calculated to determine retest reliability of the Mean Satisfaction (MeanSat) and Mean Important $\times$ Satisfaction (MeanImpt $\times$ Sat) scores.

We hypothesised that the reliability of the ICC would be 0.80. A coefficient of this magnitude is considered to be good to excellent [22]. We also calculated the standard error of measurement (SEM), (i.e., the standard error of repeated scores), and the minimal detectable difference (MDD), (i.e., the amount of change necessary to indicate true difference in scores)[22].

Bland-Altman limits of agreement plots were used to provide a visual assessment of how individual scores varied between first and second administration [23]. This display of within-test agreement helps to identify if any bias exists. Ideally the data points should be evenly distributed along the ‘zero line’ if there were no ceiling or floor effects, and an equal number of points should lie above and below if there is no pre-test/post-test bias. The limits of agreement represent how much test-retest scores differ with 95% probability.

Validity

We hypothesized that the magnitude of the associations would be $> \pm 0.35$ between the MeanSat, and MeanImpt $\times$ Sat and other measurements scores (LLDI Frequency, and GDS) for total, self-respondent, and proxy groups. Given the distributions of the variables, Spearman’s correlation coefficients were used to assess the direction and strength of the relationships among the variables. Analyses were conducted using SPSS 17.

Results

Participants are described in Table 1. The mean age of the participants was 84 ± 8.4 years, 67% of them were females, and most (82%) used a manual wheelchair. Residents

experienced an average of 2.95 ± 1.8 of health conditions. There were 38 self-respondents and 17 proxy respondents.

Reliability

The reliability coefficients for the WhOM scores are presented in Table 2. The ICC for MeanSat and for MeanImp $\times$ Sat scores was 0.67 and 0.82 respectively for the total group. The SEM and MDD were 1.04 and 2.90 for MeanSat, and 8.65 and 23.96 for MeanImp $\times$ Sat scores respectively.

The Bland-Altman plots for MeanSat and MeanImp $\times$ Sat demonstrated relatively equal distributions of values. Four individuals had values outside the levels of agreement for MeanSat retest scores. Three (from proxy group) of these individuals had improved scores upon retest and one (from proxy group) had a worse WhOM score based on the limits of agreement (-3.16 to 4.64). Three individuals had values outside the levels of agreement for MeanImp $\times$ Sat, one from proxy group below and two, one from proxy and one from self-respondent group, above the limits of agreement (-25.82 to 38.72). These individuals had more comorbidities and lower SMMSE scores than other subjects. The values for the WhOM MeanSat and MeanImp $\times$ Sat were evenly distributed and neither a ceiling nor a floor effect was observed.

Validity

As noted in Table 2, the Spearman's correlation coefficients for the WhOM and other measurements scores (LLDI Frequency, and GDS) ranged high $r=0.50$ for MeanImp $\times$ Sat and LLDI Frequency in self-respondent group to a low of $r=-0.31$ for MeanSat and GDS in the same group (Table 2). Three correlations supported our hypotheses. These correlations included the WhOM MeanImp $\times$ Sat and LLDI Frequency for total, self-respondent, and proxy groups. Two of the correlations had a $p < 0.05$. The p -value for the MeanImp $\times$ Sat score and LLDI Frequency in the proxy group was not statistically significant ($p=0.07$). No other correlations were significant.

Discussion

This study examined the reliability and validity of the self-report and proxy versions of the WhOM for older wheelchair users living in residential care. The findings provide preliminary support for use of the WhOM with this population, which is important given the large number of wheelchair users [24] and the sizeable proportion of residents with dementia or other cognitive impairments in these settings [25].

Reliability

The retest ICCs for MeanImp $\times$ Sat were excellent for all of the groups (Andresen, 2000). Two of the reliability coefficients derived in the study, MeanImp $\times$ Sat for both the total and Self-respondent group exceeded our hypothesised level of reliability; whereas, the MeanImp $\times$ Sat for proxy group was slightly below the hypothesised level. The possible reason for the lower correlation coefficient score in MeanImp $\times$ Sat for the proxy group is that the proxies have difficulty inferring satisfaction and importance consistently.

The ICCs for WhOM Sat across groups did not support our hypotheses. These values would be adequate for making group comparisons, but would not be considered adequate when making individuals comparisons [26]. Lower ICCs for WhOM satisfaction scores have also been reported in other studies [8,9], and may be attributable to decreased variance associated with these scores.

The MDD_{95%} values of 2.87 for WhOM MeanSat and 22.31 for the MeanImp $\times$ Sat are larger compared with those obtained for individuals with SCI [8] where the authors found MDD_{95%} values for MeanSat and MeanImp $\times$ Sat values of 1.61 and 16.27 respectively. Larger values among residential care residents are not unexpected in light of the frailty, comorbidity and cognitive declines experienced by individuals in these settings, which may affect the stability of their scores, even over a two-week period.

Another point to consider in interpreting the results of this study is the issue of data distribution. There was no floor or ceiling effect. The Bland-Altman plots identified four outliers whose scores fell outside the 2 standard deviation lines for the WhOM retest scores. Three participants who were higher functioning over-estimated their scores on second administration, whereas for one proxy the situation was reversed. This may be attributable to their larger number of comorbidities and their lower SMMSE scores, which may have contributed to increased variability in their scores.

Validity

The findings provide mixed support for the validity of WhOM in this population. Although the results did not support our hypothesis for MeanSat, there were moderate positive correlations between MeanImp $\times$ Sat and the LLDI Frequency. The correlation between MeanImp $\times$ Sat and LLDI Frequency for the proxy group met our hypothesis in terms of the magnitude of the relationship with approximately 25% shared variance. However this relationship was not statistically significant ($p=0.07$) most likely due to issues of sample size.

Finally, the correlation between the WhOM and GDS scores were not as hypothesized; however, the direction and magnitude of the value did approach what we anticipated for the self-responding residents. A possible explanation for the lack of relationship between GDS scores and WhOM scores among proxy respondents is that they do not infer satisfaction with self-selected activities in the same way they infer depressive symptoms for the residents they represented.

The findings provide some support for the use of MeanImp $\times$ Sat scores among self-responding residents, but results among proxy groups were more equivocal. Further research is needed to evaluate the WhOM satisfaction scores, especially for proxy respondents. Additional research with self-responding residents could also help identify cut off points for self-administration by examining the relationship between cognition level and reliability.

Limitations

There are four main limitations of the study. First, subjects represent a sample of convenience. Second, the small number of participants from the proxy group may have affected the results. Third, we modified some items from the LLDI and GDS, which may have affected their validity. Finally, a more client-centred measure of participation may have increased correlations with the WhOM.

Conclusion

The results of this study provide support for use of the WhOM on an individual basis among self-responding residents and for groups of residents who require proxy respondents. Additional studies with a larger sample size are needed to further explore the psychometrics of the measure to ensure it can facilitate prescription of the most appropriate wheelchairs for residential care facility residents.

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Implications for rehabilitation

- Clients who reside in long term care (LTC) institutions represent a population who have unique needs because of the varied types of activities in which they participate.
- This study provides support for use of the WhOM on an individual basis among self-responding residents.
- The study provides some support and use of the WhOM with groups of residents who require proxy respondents.
- Additional studies with a larger sample size are needed to further explore the psychometrics of the measure.

Table 1

Participant Characteristics (n=55)

Characteristics (range for measures)	Total	Self-respondent	Proxy
Groups n (%)	55 (100)	38 (69.0)	17 (31.0)
Sex n (%)			
Female	37 (67.3)	23 (60.5)	14 (82.4)
Male	18 (32.7)	15 (39.5)	3 (17.6)
Age			
Mean (SD)	84.45 (8.4)	83.13 (8.0)	87.41(8.9)
Range	63–102	63–102	69–101
Wheelchair n (%)			
Manual	49 (89.1)	32 (84.2)	17 (100)
Power	6 (10.9)	6 (15.8)	0 (0.0)
Comorbidity	2.95 (1.8)	3.03 (2.0)	2.76 (1.4)
GDS (SD) (0–15)	4.47 (3.2)	3.47 (2.9)	6.71 (2.6)
SMMSE (SD) (0–30)	17.60 (10.6)	24.16 (3.6)	2.94 (4.3)

Table 2

WhOM Reliability and validity values for the total, self-respondent and proxy groups.

Group	Measure	ICC	95% Confidence Interval	SEM	MDD95%	Spearman's Rho with LLDI Frequency	Spearman's Rho with GDS
Total group (n=55)	MeanSat	0.67	0.42–0.81	1.04	2.90	–0.06	–0.13
	MeanImp × Sat	0.82	0.68–0.89	8.65	23.96	0.42*	–0.11
Self-respondent group (n=38)	MeanSat	0.68	0.38–0.84	1.03	2.87	–0.01	–0.31
	MeanImp × Sat	0.84	0.70–0.92	8.05	22.31	0.50*	–0.27
Proxy group (n=17)	MeanSat	0.65	0.05–0.87	1.07	2.97	0.02	0.01
	MeanImp × Sat	0.77	0.39–0.92	9.80	27.15	0.46**	0.02

* p 0.05;

** p 0.07

ICC: Intraclass Correlation Coefficients; SEM: standard error of measurement, MDD: minimal detectable difference; LLDI: Late Life Function and Disability Instrument Disability Component; GDS: Geriatric Depression Scale.