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Reliability and validity of the French-Canadian Late Life Function and Disability Instrument in community-living wheelchair-users

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Abstract

Purpose—To examine the test-retest reliability, standard error of measurement and minimal detectable change, construct validity, and ceiling and floor effects in the French-Canadian Late Life Function and Disability Instrument (LLFDI-F).

Method—The LLFDI-F is a measure of activity (i.e. physical functioning of upper and lower extremities), and participation (i.e. frequency of and limitations with). The measure was administered over the telephone to a sample of community-living wheelchair-users, who were 50 years of age and older, in this 10-day retest methodological study. The sample (n=40) was mostly male (70%), had a mean age of 62.2 years, and mean experience with using a wheelchair of 20.2 years. Sixty-five percent used a manual wheelchair.

Results—The test-retest intraclass correlation coefficients ($ICC_{2,1}$) for the participation component ranged from 0.68 to 0.90 and from 0.74 to 0.97 for the activity component. Minimal detectable changes ranged from 7.18 to 22.56 in the participation component and from 4.71 to 16.19 in the activity component. Mann-Whitney U tests revealed significant differences between manual and power wheelchair-users in the personal and instrumental role domains, and all areas in the activity component.

Conclusion—There is support for the test-retest reliability, and construct validity of the LLFDI-F in community-living wheelchair-users, 50 years of age and older. However, because the majority of items in the lower-extremity domains of the activity component do not account for assistive

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device use, they are not recommended for use with individuals who have little or no use of their lower-extremities.

Keywords

psychometrics; wheelchairs; rehabilitation; social participation; geriatrics

Introduction

Wheelchairs are prescribed to enable various activities at the individual level, and facilitate participation at the societal level. A key issue, however, is that many older individuals are not able to use their wheelchair as desired [1], and therefore are at high risk of having activity limitations [2] and participation restrictions [3]. For example, Hoenig et al. established that limitations with using the wheelchair (e.g. independently transfer, push the wheelchair, mobility inside the home) were associated with fewer excursions outside the home [2], and in a qualitative study of individuals with stroke, Barker et al. reported that issues with propelling the wheelchair led to decreased independence, and increased issues with community participation [3]. Because aging is associated with wheelchair usage [1,4,5], the prevalence of wheelchair-users, 50 years of age and older is likely to increase due to population aging. Therefore, there is a growing need for reliable and valid activity, and participation measures for use with older, community-living wheelchair-users, to identify and treat activity limitations, and participation restrictions.

In a recent review on activity and participation measures that are specific for wheelchair-users, Mortensen et al. [6] identified one measure with a primary focus on participation and several others evaluating activity or a combination of activity and participation. Most measures had a limited focus on mobility ability, with good reliability evidence. Although most measures included in Mortenson's review were reliable and valid, all were developed for use with wheelchair-users to account for the effect of the wheelchair on activity and participation. Even though these population-specific measures have a greater degree of specificity, they have reduced generalizability [7]. The items in such specific measures are only applicable to wheelchair using populations and therefore inhibit comparisons between walking and wheeling populations.

Generic measures of activity and participation on the other hand are widely available and useful for intended purposes. However, the application of such measures that are neither reliable nor valid for use with older wheelchair-users is a likely source of bias [8]. Therefore the use of any generic measure is predicated upon establishing their measurement properties of reliability, to ensure the measure is assessing a construct in a reproducible fashion, and validity, to ensure the measure is capturing what it is supposed to [7]. From clinical and research perspectives, the information derived from these measures enable the identification of individuals who may require further evaluation, benefit from certain treatments, evaluate whether treatments are effective, and monitor progress, which is similar to information derived from the wheelchair specific measures. However, the use of reliable and valid generic measures among different populations allows for comparisons, which are important for policy analyses, and decision-making processes related to the allocation of scarce

resources [7]. When considering an increase in the prevalence of adult wheelchair-users, and the paucity of reliable and valid generic activity and participation measures used with this population, more research is needed to identify reliable and valid activity and participation measures for use with adult wheelchair-using populations.

To this end, the self-report Late Life Function and Disability Instrument (LLFDI) [9,10] is a widely used measure of activity and participation. For example, The LLFDI has been validated for use with several community-living, older adult populations, including those with multiple chronic conditions, osteoporosis, multiple sclerosis, stroke, heart disease, and cancer [11]. It has been used as an outcome measure in several intervention studies [12], and translated into Spanish [13], Hebrew [14], German [15],and Korean [16].

In developing the LLFDI, the authors applied both theoretical (i.e. Nagi's disablement model [17] as the underlying conceptual framework) and statistical (i.e. principles of Item Response Theory) rigour thereby creating a conceptually sound measure with the potential to assess activity and participation in a comprehensive manner [9,10]. The LLFDI comprises two separate components: participation and activity. In the *participation component* (i.e. disability component), two dimensions (i.e. frequency of and limitations with participation) are captured using the same 16 items. In the frequency dimension, individuals rate their frequency of performing life tasks in two role domains. In the social role domain the frequency of performing various social and community tasks (e.g. visiting friends) is assessed, and in the personal role domain the frequency of performing various personal tasks (e.g. taking care of health) is captured. In the limitations dimension, participants rate the extent they feel limited in performing tasks in two domains. The instrumental role domain reflects activities in the home and community (e.g. visiting friends), and the management role domain reflects activities that involve organization or management of social tasks (e.g. taking care of health). Summing item responses derives raw total scores, which are then converted into standardized scores that range from 0 to 100. Total standardized scores indicate more participation frequency and fewer limitations. Table 1 presents the participation component of the LLFDI, the two dimensions and the domains, in addition to details of the measure's 5-point response format.

In the 40-item *activity component* (i.e. function component), an individual's functioning is assessed in three domains, including upper extremity, basic lower extremity, and advanced lower extremity [10]. There are eight items that inquire specifically about difficulty doing an activity with the use of assistive devices. Whereas these 8 items are only administered if respondents use assistive devices for mobility, the other 32 items are not specific to assistive device use, and therefore administered to everyone. Similar to the participation component, the summed raw scores are converted into standardized scores ranging from 0 to 100. Higher total standardized scores indicate more functional ability. Table 1 presents the activity component of the LLFDI, the three domains, and the details of the 5-point response format.

Because the items in the participation component do not ask how a person participates (e.g. with a wheelchair or not), they are independent of mobility and therefore can be administered among wheelchair-using populations with neither modification nor concern over irrelevant items. In fact, Mortenson et al. used the frequency dimension in a study of

older, wheelchair users residing in nursing homes [20]. Similarly, the total scores in activity component account for assistive device use [21] through the use of eight additional questions that inquire about difficulty doing an activity with the use of assistive devices. Furthermore, in a study comparing the LLFDI to the London Handicap Scale, Dubuc et al. found the participation component of the LLFDI to have a wider range of content coverage, less ceiling effects, and better precision [18]. Moreover, Gill advocates that the activity component of the LLFDI may be the best contemporary measure of activity [19].

Therefore, given the wide-spread use of the LLFDI, and its potential for use with wheelchair-using populations, the purpose of this study was to investigate the measurement properties of a telephone-administered French-Canadian LLFDI (LLFDI-F) in wheelchair-users 50 years of age and older. More specifically, in this methodological study, for each of the measure's dimensions and domains we examined the: 1) 10-day test-retest reliability; 2) standard error of measurement (SEM) and minimal detectable change (MDC) to identify real change beyond measurement error; and 3) construct validity by assessing whether the measure could distinguish between manual and power wheelchair-users; and 4) ceiling and floor effects.

Methods

Participants

A volunteer sample was recruited from the local rehabilitation institute in Quebec City, Canada. Individuals in the institute's contact database who provided consent to be contacted for research purposes were given study information by occupational therapists and/or research assistants. Individuals were included in the study if they: were at least 50 years old; lived in the community or an assisted living residence; had at least 12 months experience using either a power or manual wheelchair; and used their wheelchair for at least four hours daily. Individuals with emotional and/or psychiatric problems were excluded from study.

Forty-three individuals were enrolled. The data from three individuals were excluded from analyses. One subject dropped out after baseline testing, another individual had cognitive issues, and the third indicated that his/her responses at baseline were not accurate. The remaining individuals (n=40) were mostly male (70%), had a mean age of 62.2 years, and mean experience with using a wheelchair of 20.2 years. The majority used manual wheelchairs (65%). Sample characteristics are presented in table 2. The mean time between testing was 10.8 days.

Study protocol

Participants were scheduled for two telephone interviews, ten days apart. During the first interview, a trained rater administered the LLFDI-F, and the demographic information questionnaire that gathered data on age, sex, education, employment and marital status, type of wheelchair used (power or manual), and years experience with using a wheelchair. At the second interview participants were retested on the LLFDI-F by the same rater. During administration of the LLFDI-F, the rater provided the LLFDI-F instruction, and then read each item out-loud along with the response options. The participants then selected their

option and reported back to the rater. The participants did not receive the questionnaire. The local research institution provided ethical approval.

French-Canadian LLFDI

The LLFDI was translated into Canadian-French using Vallerand's international standards for the transcultural validation of questionnaires [22,23]. The beta version of the translated measure was then back-translated into English. The original LLFDI was compared to the back-translated LLFDI-F, and any discrepancies between the two measures were resolved through discussion among members of the research team, that included two bilingual researchers and a professional translator.

To make the eight items that are administered to individuals who use assistive devices more specific to wheelchair use, the introductory question was modified from, " When using your cane, walker, or other walking device, how much difficulty to you have…?" to, "When using your wheelchair, how much difficulty do you have…? In addition, five of the eight items inquired about ability to move around with an assistive device in general, and were modified to inquire about ability to move specifically with a wheelchair.

Data analyses

Descriptive statistics were used to characterize the sample.

Test-retest reliability—Two-way random effect intraclass coefficient ($ICC_{2,1}$) models with absolute agreement to account for any systematic variability between the two administrations were used to evaluate test-retest reliability. Intraclass correlation coefficients$_{2,1}$ in the range of 0.40 to 0.74 represent moderate to good reliability, and ICCs$_{2,1}$ greater than or equal to 0.75 represent excellent reliability [24].Based on previous methodological studies of the LLFDI [9–11,14], we hypothesized that the $ICC_{2,1}$ would be at least moderate to good for all participation frequency and limitations scores. We also hypothesized that the $ICC_{2,1}$ would be in the excellent range for all of the activity scores.

Standard Error of Measurement and Minimal Detectable Change—The SEM quantifies the precision of scores within the sample using the reliability estimates [25]. In this study we calculated the SEM for each dimension and domain using the formula $SEM = s \times \sqrt{(1 - ICC_{2,1})}$, where s = SD of the test at time 1, and $ICC_{2,1}$ = test-retest reliability coefficient of the LLFDI [25]. Higher SEM values indicate less precise measurements. Minimal Detectable Change refers to the amount of true change above the threshold of error expected in the measurement [25]. In this study, we calculated MDCs using a 95% (i.e. z = 1.96) confidence interval with the formula $MDC_{95} = SEM \times \sqrt{2} \times z$ [25]. A MDC_{95} is suggestive that 95% of individuals will demonstrate random variation less than the MDC_{95} value when tested on multiple occasions [25]. Higher MDC_{95} values indicate that larger changes in total scores are necessary to reflect a true change beyond measurement error.

Construct validity—We used Mann-Whitney U-tests to establish construct validity by determining whether the LLFDI-F scores could distinguish between manual and power wheelchair-users. Based on previous research of activity and participation among

wheelchair-users [26], we hypothesized that manual wheelchair-users would report significantly ($p \leq 0.05$) higher participation and activity scores than power wheelchair-users.

Ceiling and floor effects—The percentage of individuals with the lowest and highest possible score in each of the dimensions and domains were recorded, and values greater than 20% were considered as floor and ceiling effects [24].

We determined a sample size of at least 34 to yield a confidence interval width of 0.30 given a hypothesized ICC of >0.75 and an alpha of 0.05 to derive estimates between two time points [27]. We oversampled to accommodate for loss to follow-up. All data were analyzed with SPSS version 19.0.[a]

Results

Descriptive statistics and reliability values for the participation and activity components are detailed in table 3. In the frequency dimension, overall and domain mean scores at both time points were in the lower half of possible scores. The mean scores in the limitations dimension were slightly higher indicating fewer participation limitations. The overall activity score and the 2 lower extremity scores were below 40 out of 100. The upper extremity scores were approximately 60.

Test-retest reliability—In the participation component, the $ICCs_{2,1}$ were 0.86 and 0.87 for the frequency and limitations dimensions, respectively. In each of the participation domains, the $ICCs_{2,1}$ ranged from 0.68 in the management role domain to a high of 0.90 in the instrumental role domain. In the activity component, the $ICC_{2,1}$ was 0.93 for the overall score, and ranged from 0.74 in the basic lower extremity domain to 0.97 in the upper extremity domain

Standard Error of Measurement and Minimal Detectable Change—In the participation component, the SEM and MDC_{95} for the frequency dimension was 2.59 and 7.18, respectively, and 4.44 and 12.31 for the limitations dimension. In each of the participation domains, the SEMs ranged from a low of 3.49 in the social role domain to a high of 8.14 in the management role domain. The corresponding $MDCs_{95}$ ranged from 9.67 to 22.56.

In the activity component, the SEM and MDC_{95} was 1.70 and 4.71 respectively. In each of the activity domains, the SEMs ranged from 3.75 in the advanced lower extremity domain to 5.84 in the basic lower extremity domain, and the $MDCs_{95}$ from 10.39 to 16.19.

Construct validity—With the exception of the advanced lower domain mean total scores, the mean total scores in all other areas of the LLFDI-F were higher for manual wheelchair-users than power wheelchair-users. Mann-Whitney U tests revealed significant differences between the two groups in the personal ($p = 0.048$) and instrumental ($p = 0.050$) role

[a]SPSS version 19.0, IBM Corporation 1 New Orchard Road Armonk, New York 10504-1722.

domains, and all areas in the activity component, including the overall score ($p = 0.001$). Table 4 details the LLFDI-F scores by wheelchair group.

Ceiling and floor effects—There was a ceiling effect in the management role domain where 22.5% of the subjects reported the highest possible score. No other ceiling or floor effects were observed.

Discussion

In this study, we investigated the measurement properties of the LLFDI-F, in community-living, wheelchair-users, 50 years of age and older. In the participation component, there was excellent test-retest reliability for both dimensions and three of the role domains, and good reliability for the management role domain. These findings provide evidence in support of our hypotheses that the $ICCs_{2,1}$ would be at least moderate to good for all participation frequency and limitations scores, and that the $ICCs_{2,1}$ would be in the excellent range for the activity scores. Although our test-retest results are slightly higher than those found in the study by Jette et al. [9], it may be that the discrepancies are due to recall bias because of the shorter retest time period in this study. Regardless, our findings indicate that the reliability of the LLFDI-F administered over the telephone to older wheelchair-users is similar to the English version used with older ambulatory populations [9]. For example, as with the English version, the reliability of the management role domain in this study was the lowest, largely explained by the small number of items in the domain, and the reliability of the overall limitation dimension was slightly higher than the overall frequency dimension, suggesting that a person's knowledge of the extent of their limitations is more stable than their perception of frequency of engaging in various activities. Importantly, the results indicate that the frequency of and limitations with participation may manifest and behave similarly in adults, regardless of wheelchair use or not. With the exception of the basic lower extremity domain, which had good to excellent reliability, the test-retest reliability coefficients of the other activity component scores were excellent as hypothesized.

This is the first study to report $MDCs_{95}$ in the LLFDI. Minimal detectible changes reflects real change given the SEM [25], and are useful for interpreting results in intervention studies. For example, if post-intervention scores of the overall frequency dimension are at least 7.18 points greater than baseline scores, there is 95% certainty that the change exceeds measurement error. Minimal detectible changes however do not represent differences that are clinically relevant.

Although manual wheelchair-users reported higher scores in all areas of the participation component, the hypothesis that significant differences exist between manual and power wheelchair-users in each of the areas was only partially supported. Our findings indicated that the two wheelchair groups have similar frequencies of performing social and community tasks, but differ in terms of the frequency of performing personal tasks. These findings are corroborated by Hastings et al. [26]who found that individuals with spinal cord injuries who used power wheelchairs required more assistance with self-care, and household chores than manual wheelchair-users, and that there was no difference between the groups in social aspects of life.

There was also a significant difference in the instrumental role domain that reflects perceived limitations in doing activities in the home and community. Power wheelchair-users may feel more limited in this role because of transportation issues. For example, fewer power wheelchair-users have been shown to return to driving than those using a manual wheelchair [26]. This likely results in more perceived limitations in participating in community activities among power wheelchair-users.

As expected, significant differences were found for all areas in the activity component. Manual wheelchair-users reported greater activity overall, and in the upper, and basic lower-extremity domains. Power wheelchair-users, however, reported higher scores in the advanced lower-extremity domain. Although counterintuitive, the finding is reasonable because in the advanced lower-extremity domain, many questions pertain to an individual's ability to go distances (e.g. rolling several blocks with assistive device).

When considering the physical strain a manual wheelchair-users face when wheeling several blocks, their responses would likely indicate more difficulty than power wheelchair-users who have to push a joystick to move the wheelchair.

The mean scores in the participation component in this study were lower than previously reported scores of ambulatory older adults [9,14,28,29], despite the items being independent of mobility ability. This is consistent with other findings that wheelchair-users have lower rates of participation in leisure and physical activities than ambulatory individuals [30]. The mean participation frequency scores in this study, however, were higher than reports of individuals residing in nursing homes [20,31], likely because of the narrower range of activities available to nursing home residents.

With the exception of the upper extremity domain, the mean scores in the other areas of the activity component were in the lower half of all possible scores. Not surprising, the scores are lower than those reported by individuals with ambulatory ability [10,14,28,29,31]. This is because the majority of the items that comprise the basic and advanced lower extremity activity domains require either a standing or walking ability. Therefore, lower scores would be expected among subjects who are full time wheelchair-users. None of the activity domains, however, presented floor effects. This finding is likely due to the heterogeneity of the sample. For example, individuals who use wheelchairs because of lower-extremity amputations have ambulatory ability when using a prosthetic limb, and would likely report higher scores in the lower-extremity domains than individuals with tetraplegia who may have minimal (or "no") ambulatory ability. In addition, the items in the activity domains assess a wide variety of daily activities ranging from easy (e.g. putting on and taking off a coat) to difficult (e.g. getting up from the floor). Therefore, completing the easier items entails less difficulty, which would possibly negate any floor scores.

This study is not without limitations. First, the length of time between the two test administrations may have been too short. As a result there may have been carryover effects due to memory recall. In addition, the self-report nature of our data from a volunteer sample may be influenced by recall bias and/or social desirability. As a result, the data may not accurately represent the population as a whole. Another limitation has to do with the

heterogeneous sample of wheelchair-users used in this study and the results of the lower-extremity activity domains. While the results support the use of the scales among heterogeneous samples with a wide range of lower-extremity functioning, the use of the scales among more homogeneous samples with less functioning may result in floor effects. Next, because individuals had to be at least 50 years of age to participate in the study, the scores in both the participation and activity component may not accurately reflect the scores of individuals who are in their later years of life. The results therefore are limited in their generalizability to individuals with characteristics similar to that of the sample used in this study. Furthermore, modifications were made to the eight add-on questions for individuals who use assistive devices for their mobility. Because we specify the use of wheeled mobility for some of the items, in lieu of ambulating, the scores may be inflated. Regardless, our findings suggest caution should be used if using the activity component with wheelchair-users. Finally, the results are further limited in their generalizability to the method in which the LLFDI was administered.

In conclusion, the participation and activity components of the LLFDI-F are reliable measures of participation and activity, respectively, among community-living wheelchair-users, 50 years of age and older. The participation component has some ability to distinguish between manual and power wheelchair-users in both frequency of and limitations with participation dimensions, whereas the activity component is able to distinguish between wheelchair-users in all domains. Because questions in the participation component of the LLFDI are independent of mobility, the measure can be used with any sample of wheelchair-user without concern over irrelevant items. However, caution must be taken when using the activity component among homogeneous samples of wheelchair-users who have little or no use of their lower-extremities.

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Table 1

The Late Life Function and Disability Instrument

Component	Dimension	Domains	Number of items	Response options	Raw score range	Standardized score range
Participation (Disability)	Frequency		16	1 (never) to 5 (very often)	16 to 80	0 to 100
		Social role	9		9 to 45	
		Personal role	7		7 to 35	
	Limitations		16	1 (completely) to 5 (not at all)	16 to 80	0 to 100
		Instrumental role	12		12 to 60	
		Management role	4		4 to 20	
Activity (Function)	Functioning		40 *	1 (cannot do) to 5 (none)	40 to 200	0 to 100
		Upper extremity	7		7 to 35	
		Basic lower extremity	17		17 to 85	
		Advanced lower extremity	16		16 to 80	

* includes 8 items that are specific for individuals who use assistive devices for mobility: 3 items in the basic lower extremity domain; and 5 items in the advanced lower extremity domain.

Table 2

Sample characteristics

Characteristic	Total Sample (n = 40)	Manual Wheelchair-users (n = 26)	Power Wheelchair-users (n = 14)
Age (years±SD)	62.2 ± 7.6	61.0 ± 5.6	62.8 ± 8.5
Sex (men) n (%)	28 (70.0)	17 (65.0)	11 (79.0)
Married/common-law n (%)	21 (52.5)	15 (57.7)	6 (42.8)
Time using the wheelchair (years±SD)	20.2 ± 12.3	19.1 ± 12.5	22.2 ± 12.1
Diagnosis n (%)			
Spinal Cord Injury	23 (57.5)	15 (57.7)	8 (57.1)
Amputation	3 (7.5)	3 (11.5)	0 (0.0)
Multiple Sclerosis	5 (12.5)	3 (11.5)	2 (14.3)
Other	7 (17.5)	5 (19.2)	4 (28.6)
Education level n (%)			
Elementary school	5 (12.5)	5 (19.2)	0 (0.0)
High school	18 (45.0)	11 (42.3)	7 (50.0)
College	8 (20.0)	5 (19.2)	3 (21.4)
University	6 (15.0)	4 (15.4)	2 (14.3)
Post-graduate	3 (7.5)	1 (3.8)	2 (14.3)
Employment status n (%)			
Full time job	6 (15.0)	5 (19.2)	1 (7.2)
Part-time	2 (5.0)	1 (3.8)	1 (7.2)
Unemployed	13 (32.5)	8 (30.8)	5 (35.7)
Retired	19 (47.5)	12 (46.2)	7 (50.0)
Daily time spent using the wheelchair n (%)			
≥11 hours	29 (72.5)	17 (65.4)	12 (85.7)
Days between testing (days±SD)	10.8 ± 7.7	10.2 ± 6.2	12.0 ± 10.0

Table 3

Descriptive statistics and reliability values of the LLFDI-F

	Time 1 (mean ± sd)	Time 2 (mean ± sd)	$ICC_{2,1}$ (95% CI)	SEM	MDC_{95}
Participation Component (n=40)					
Frequency Dimension					
Social Role:	43.23 ± 9.69	42.25 ± 9.39	0.87 (0.77 – 0.93)	3.49	9.67
Personal Role: *	49.75 ± 13.21	48.84 ± 10.39	0.76 (0.59 – 0.87)	6.47	17.93
Overall: *	46.61 ± 6.93	46.34 ± 6.48	0.86 (0.76– 0.93)	2.59	7.18
Limitations Dimension					
Instrumental Role: *	52.24 ± 15.91	54.61 ± 18.09	0.90 (0.80 – 0.95)	5.03	13.94
Management Role:	79.74 ± 14.39	81.77 ± 15.32	0.68 (0.48 – 0.82)	8.14	22.56
Overall: *	56.97 ± 12.32	59.11 ± 15.06	0.87 (0.75 – 0.93)	4.44	12.31
Activity Component (n=40)					
Upper Extremity:	61.14 ± 29.89	59.24 ± 29.56	0.97 (0.95 – 0.99)	5.18	14.36
Basic Lower:	39.05 ± 11.46	39.01 ± 8.47	0.74 (0.55 – 0.85)	5.84	16.19
Advanced Lower:	29.98 ± 8.83	28.94 ± 10.29	0.82 (0.69 – 0.90)	3.75	10.39
Overall:	39.69 ± 6.44	39.08 ± 6.22	0.93 (0.88 – 0.96)	1.70	4.71

Note: Higher scores indicate more participation frequency, fewer participation limitations, and more functioning; CI = confidence interval; ICC = intraclass correlation coefficient; SEM = standard error of measurement; MDC = minimal detectable change

* n=39

Table 4

Construct validity of the LLFDI-F

	Manual Wheelchair-users (n = 26) (mean ± sd)	Power Wheelchair-users (n = 14) (mean ± sd)	U-value
Participation Component			
Frequency Dimension			
Social Role:	44.27 ± 9.99	41.30 ± 9.12	144.50
Personal Role:	52.98 ± 13.94	43.76 ± 9.55	112.50*
Overall:	48.12 ± 7.11	43.82 ± 5.85	119.50
Limitation Dimension			
Instrumental Role:	55.96 ± 15.13	45.33 ± 15.47	113.00*
Management Role:	81.53 ± 13.12	76.40 ± 16.48	147.50
Overall:	59.62 ± 11.92	52.07 ± 11.94	117.50
Activity Component			
Upper Extremity:	75.86 ± 18.60	33.81 ± 27.86	43.00*
Basic Lower:	43.55 ± 7.95	30.71 ± 12.53	55.50*
Advanced Lower:	27.49 ± 10.05	34.59 ± 2.04	89.50*
Overall:	42.01 ± 5.82	35.39 ± 5.33	68.00*

Note: Higher scores indicate more participation frequency, fewer participation limitations, and more functioning; differences between groups were evaluated with Mann-Whitney U tests at time 1.

*$p \leq 0.05$