



Functioning Everyday with a Wheelchair (FEW) Tools: A review

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Citation:Sarsak HI (2018)Functioning Everyday with a Wheelchair (FEW) Tools: A review. Adv Ortho and Sprts Med: AOASM-102.

Received Date: 01 August, 2018 **Accepted Date:** 07 August, 2018; **Published Date:** 15 August, 2018

Abstract

There is currently a lack of comprehensive outcome measures that focus on everyday functioning with a wheelchair [1-4]. Most of the current measures don't address the quality of functional performance or provide individual scores for independence and safety for both manual and power wheelchair users. Furthermore, these measures do not fully represent all the important tasks wheelchair users identified as important to perform in a seating-mobility device such as comfort needs, reaching, transfers, and transportation [5-7]. In response to the need for more comprehensive outcome measures, the FEW tools have been developed and proved to be comprehensive, reliable, valid, and useful.

1. Keywords: Assessment; FEW; Function; Wheelchair

2. Introduction

In response to the need for more comprehensive outcome measures to document function for third-party payers, and evaluate the efficacy of wheeled mobility interventions, a team of researchers at the University of Pittsburgh developed the FEW (a self-report measure), the FEW-Capacity (FEW-C, a performance-based measure for the clinic), and the FEW-Performance (FEW-P, a performance-based measure for the home) outcome measurement instruments. The FEW-C and FEW-P were structured after the Performance Assessment of Self-Care Skills (PASS) because of its measurement parameters (independence, safety, and adequacy) and its focus on four domains of functioning: Functional Mobility (FM), Activities of Daily Living (ADL) including self-care, Instrumental ADL (IADL) with a physical emphasis (PIADL), and IADL with a cognitive emphasis (CIADL).

2.1. FEW Tools (FEW, FEW-C, FEW-P)

Item 1 of the three tools is self-report and items 2 through 10 of the FEW-C and FEW-P are performance-based observation items that yield three distinct category scores: independence, safety, and quality.

2.2. FEW

The FEW Beta Version 2.0 is a 10 item structured self-report outcome measurement tool (**Table 1**) that was developed based on input and validation from wheelchair users. The FEW can be self-administered, administered as an interview or administered by telephone. Items 2-10 of the FEW measure perceived functional independence of individuals who use a wheelchair or scooter as their primary mobility and seating device and have progressive or non-progressive conditions. For example, the OPERATE item is "The size, fit, postural support and functional features of my wheelchair/scooter allow me to operate it as

independently... as possible: (e.g., do what I want it to do when and where I want to do it). The items are scored using a 6 point scale of 6 = completely agree to 1 = completely disagree, and a score of 0 = does not apply. The FEW enables clients to identify the degree of problems they have performing 9 functional tasks in their daily lives while using their wheelchairs (manual/power wheelchair/scooter). It has excellent test-retest reliability (ICC = 0.92). In addition, the FEW has excellent content validity because it was generated by input from both consumers and clinicians, validated by several samples of wheelchair/scooter users, and shown to be capable of detecting users' perceived function with a wheelchair over time [5,6,8,9].

	Items/tasks
1.	Stability, Durability, Dependability
2.	Comfort Needs
3.	Health Needs
4.	Operate
5.	Reach
6.	Transfer
7.	Personal Care
8.	Indoor Mobility
9.	Outdoor Mobility
10.	Transportation

Table 1: Items of the FEW, FEW-C, and FEW-P.

2.3. FEW-C

The FEW-C is a performance-based observation tool, for use by clinicians and researchers to measure functional outcomes of wheelchair and seating interventions in the clinical setting. Items 2 - 10 were structured using the criterion-referenced approach of the Performance Assessment of Self-Care Skills (PASS) [10,11] and designed to match the items of the FEW. The FEW-C was designed to measure function based on the International Classification of Functioning, Disability and Health (ICF) construct of capacity, namely, a person's ability to execute a task under standardized conditions (World Health Organization [WHO][12]. The FEW-C has demonstrated excellent interrater reliability (ICC = 0.99), excellent internal consistency ($\alpha = 0.97$), and fair to good convergent validity when compared with tools measuring similar traits (e.g., the FEW, and the Functional Abilities in a Wheelchair (FAW) tools) by different methods [7].

2.4. FEW-P

The FEW-P is a performance-based observation tool, for use by clinicians and researchers to measure functional outcomes of seating and wheeled mobility interventions in the home/community. Items 2 – 10 are performance-based, as in the FEW-C. The FEW-P was designed to measure function based on the ICF construct of performance in the “lived in” environment (WHO, 2001). The FEW-P has demonstrated excellent inter-rater reliability and internal consistency ($\alpha = 0.95$) [6].

2.5. FEW-C and FEW-P data: independence

Summary scores are based on a predefined 4-point ordinal scale for independence and scores are hierarchical, ranging from 3 (no assists given for task initiation, continuation, completion) to 0 (three physical assists or total assistance given for task initiation, continuation, or completion) [6,7] (see Table 2). For each item, the assessor observes the wheelchair user perform the task and rates the level of independence based on the type and number of assists given. The manual provides detailed information on the administration, scoring, and interpretation for each [6].

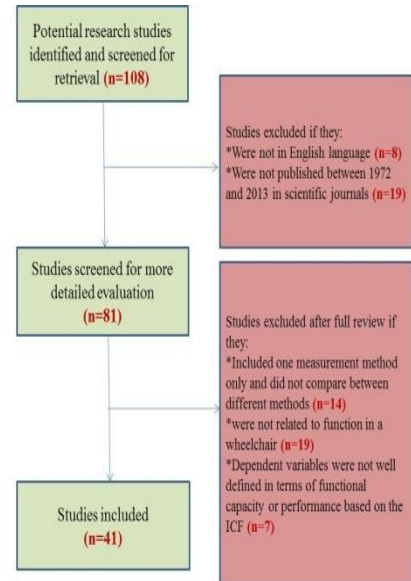
Score	Independence Data
3	No assists
2	No physical assists;
	Occasional verbal and/or Visual assists
1	Occasional physical assists;
	Continuous verbal and/or Visual assists
0	Continuous physical assists;
	Total assistance

Table 2: Summary independence scores of the FEW-C and FEW-P.

3. Method

The following electronic databases were searched to identify literature relevant to this study: PubMed, Ovid (MEDLINE, PsychINFO, and Global Health), and Cumulative Index of Nursing and Allied Health

Literature (CINAHL). Search terms (keywords) used were wheelchair combined with functional assessment, function, assistive technology, outcome, skill, performance, self-report, clinic, and home. One hundred eight potential relevant research studies were identified and screened for the literature review (**Figure 1**). Research studies were selected and included in the literature review if they were written in the English language and published between 1972 and 2013 in peer-reviewed journals. Based on these criteria, 81 studies out of the 108 were identified and reviewed and 27 studies were excluded. Furthermore, studies were screened again for more detailed evaluation and were included if they involved functional assessments, comparisons between subjective (self/proxy report) or objective (performance-based observation) methods and clinic and home assessments. In addition, previous studies that addressed the psychometric properties of the Functioning Everyday with a Wheelchair (FEW) instruments and focused on measurement of function among wheelchair users were also included. Studies were excluded if they included one measurement method only and did not compare between different methods (e.g., studies which used self-reports only or assessments at home only were excluded), or because the dependent variables were not well defined in terms of functional capacity or performance based on the International Classification of Functioning, Disability and Health (ICF)[12]. Additionally, when the literature review on assessment of functioning with a wheelchair was conducted, studies related only to skills, not functioning in a wheelchair, were excluded. This yielded a total of 41 studies that were included in the literature review and 40 studies were excluded.



Note: ICF: the International Classification of Functioning, Disability, and Health

Figure 1: Flow Diagram of the Literature Review.

4. Results

The literature review revealed that despite the importance of assessing functional performance in persons who have been prescribed wheeled mobility and seating devices, few studies specifically have considered the everyday functional abilities of wheelchair users. Instead, research focused on a narrow range of activities (i.e., issues of design, abandonment, cost, and policy) and ignored the role of wheelchair interventions for enabling activities and participation. Outcomes of seating-mobility interventions can be measured using subjective (self/proxy report) or objective (performance-based observation at clinic and home) methods. Few studies have examined the associations between these methods among wheelchair users. Therefore, data obtained from different data gathering methods should be interpreted with caution because they do not always yield equivalent results, and the extent of agreement between these methods remains an open question. Although there are several assessments of wheelchair skills, none address independence, safety and adequacy of performance of everyday tasks with a wheelchair. In response to the need for more comprehensive outcome measures for clients seeking and receiving wheeled mobility devices, to document function for third-party payers, and evaluate the efficacy of wheeled mobility interventions, a team of researchers at the University of Pittsburgh developed the FEW, the FEW-C, and the FEW-P instruments.

The trio of FEW tools has been used in research and proved to be reliable, valid, and useful [5-7,9,11,12]. A study of 25 subjects showed that both the self-report FEW and FEW-C were able to detect significant changes in function over time following the provision of a new wheeled mobility and seating device. However, the FEW often significantly underestimated function compared to the FEW-C, and therefore documented greater changes in function over time. [7]. Underestimation may have occurred because it is not unusual for individuals who are seeking interventions to underestimate their capabilities to obtain services or products [1]. The FEW tools have been used in telerehabilitation studies and also proved to be reliable, and effective in that venue. A study of 98 adults with mobility impairments using wheeled mobility and seating devices (manual wheelchair, power wheelchair, scooter) were tested to determine whether or not the telerehabilitation (TR) treatment condition at remote clinics was equally effective when compared to the standard in-person (IP) treatment at local clinics. The study findings were based on the level of function the participants showed with their new wheeled mobility and seating devices as measured by using the FEW outcome tool. They found that the telerehabilitation treatment condition was equally effective on all items except for the FEW Transportation item. Another study of 46 subjects with mobility impairments using wheeled mobility and seating devices evaluated the interrater reliability between a generalist clinician using the FEW-C in person (IP) and an expert clinician observing through Telerehabilitation (TR) from a remote clinic. The expert clinician, located more than 100 miles away, was able to accurately evaluate the functional mobility needs of clients being assessed for new mobility devices [11].

5. Discussion

The FEW, FEW-C, FEW-P tools have been used in research and proved to be reliable, valid, and useful. Therefore, Sarsak (2013)[13] conducted three studies using the FEW tools to investigate the following objectives:

- Examine the associations among the FEW, the FEW-C, and the FEW-P instruments at pretest and posttest following the provision of a new wheeled mobility and seating device provided by a qualified interdisciplinary team of clinicians.
- Examine specific demographics, wheelchair characteristics, and functional status indicators

associated with change scores of three target variables (FEW, FEW-C, and FEW-P).

- Examine the concordance of the FEW and the FEW-C with the FEW-P as the criterion measure, and investigate the differences between the FEW-C and the FEW-P at pretest and posttest following the provision of a new wheeled mobility and seating device.

Participants for the three studies by Sarsak (2013)[13] were a subset of participants from the studies by Mills (2003)[6] and Schmeler (2005)[7]. Participants in these studies were recruited from the University of Pittsburgh Medical Center, Center for Assistive Technology (CAT) in Pittsburgh, Pennsylvania, the Hiram G. Andrews Center (HGAC), and the Center for Assistive and Rehabilitative Technology (CART) in Johnstown, Pennsylvania. All participants were seen at the three sites for provision of a wheeled mobility and seating device. The inclusion criteria for participants recruited for these studies were (a) existing manual/power wheelchair or scooter user, who had experienced a change in functional status; (b) 18 years of age or older; and (c) adequate cognitive and language status, that is participants would be able to understand and verbally respond to questions and carry out the tasks in the FEW, FEW-C and FEW-P. Cognition and language status were determined by information provided by team members from the Center for Assistive Technology (CAT) and the Center for Assistive and Rehabilitative Technology (CART). Although informed consent was obtained from 25 participants, only 19 participants had complete data for all three instruments, and therefore the secondary analyses were conducted with data from those 19 participants.

The studies sample by Sarsak (2013)[13] consisted of 19 wheeled mobility and seating device users with progressive or non-progressive conditions who needed a new wheeled mobility and seating device (e.g., loss of strength, new living environment, and chronic shoulder pain). Descriptive statistics related to participants' demographics and specific wheelchair characteristics were calculated. Of the 19 participants, 9 were male and 10 were female. The average participant was 53.1 years old, Caucasian, and had used a wheelchair for 9.5 years. Participants with multiple sclerosis comprised over one third of the sample (Table 3). At pretest, 3 of the wheelchairs were power and 16 were manual. The manual wheelchairs, on average, were 3.7 years old with sling seats (n = 15), and no seat functions other than manual elevating leg rests. At posttest, all

wheelchairs used by the participants were power chairs. The power wheelchairs were equipped with power elevating foot supports (n = 10), full-length adjustable height arm supports (n = 10), and multiple seat functions (n = 9) (Tables 4 and 5) for detailed characteristics of the participants' wheelchairs).

Demographics	Mean (SD)	n
Age (mean, SD range]	53.1 (± 11.0) [36 – 72]	
Gender		
Male (n)		9
Female (n)		10
Race		
Caucasian (n)		17
African American (n)		2
Years using a wheelchair (mean, SD)	9.5 (± 11.3) [1 – 45]	
Age of current wheelchair (mean, SD)	3.74 (± 2.5) [1 – 9]	
Number of wheelchairs owned currently		
1 (n)		11
2 (n)		7
3 (n)		1
Primary medical condition		
Above Knee Amputation (n)		1
Cardiac Disease (n)		1
Cerebral Palsy (n)		1
Cerebral Vascular Accident (n)		2
Lupus (n)		1
Mitochondrial Disease (n)		1
Multiple Sclerosis (n)		7
Orthopedic Disorder (n)		1
Parkinson Disease (n)		1
Spina Bifida (n)		2
Traumatic Brain Injury (n)		1

Table 3: Study participants' demographics at baseline (n=19).

Characteristics	Pretest	Posttest
	n	n
Type of wheelchair		
Manual	16	0
Power	3	19
Scooter	0	0
Weight of manual wheelchairs		
Standard	8	0
Lightweight	3	0
High strength lightweight	4	0
Ultra-lightweight	1	0
Power wheelchair		
Front-wheel drive	1	9
Mid-wheel drive	1	6
Rear-wheel drive	1	2
Missing data	0	2

Table 4: Type of wheelchair at pretest and posttest (n=19).

Characteristics	Pretest	Posttest
	n	n
Back supports		
Sling upholstery	15	0
Adjustable tension back	1	1
Rigid back	1	8
Custom-contoured back	0	2
Captain-style seat	1	3
Other (e.g. standard, back cover, cushion)	1	6
Foot supports		
Power elevating	0	10
Manual elevating	7	1
Fixed	1	3
Swing-away	7	2
Flip-up	1	4
Removable	3	1
Arm supports		
Full-length, fixed height	6	0
Full-length, adjustable height	1	10
Desk-length, fixed height	6	2

Desk-length, adjustable height	3	3
Swing-away	0	3
Flip-up	4	9
Removable	5	0
Other (e.g. front anti-tippers)	3	0
Seat functions		
Power tilt in space only	1	3
Power reclining backrest only	0	0
Power seat elevator only	1	1
Tilt-in-space and reclining back only	0	1
All of the above	0	9
All of the above plus passive standing	0	1

Table 5: Specific characteristics of study participants' wheelchairs, at pretest and posttest (n=19).

For the first study, we examined associations among the FEW, FEW-C, and FEW-P, and found that the strength of the correlations among the different methods varied by item, time and environment. In general, there were stronger correlations between the three tools at the pretest when compared with the posttest. This might be attributed to familiarity with the wheeled mobility device at pretest. It may also be due to the fact that new power wheelchairs were given to the clients only 2 weeks before the posttest, and they were less familiar with operating them [13].

For the second study, we examined specific demographics, wheelchair characteristics, and functional status indicators associated with pretest to posttest change scores of the FEW, FEW-C, and FEW-P. Our Exhaustive Chi-Squared Automatic Interaction Detector (CHAID) models showed that independence, number of physical assists, safety, and tasks related to Outdoor Mobility at pretest were most strongly associated with changes in perceptions and performance of everyday tasks over time. Examining these indicators closely in a clinical setting with wheelchair users during the seating evaluation and intervention process is necessary. It may enhance understanding the effect of such indicators on wheelchair users' perceptions and functional performance, as well as guide interventions [13].

For the third study, our results suggested that the FEW-C and FEW-P did not differ significantly at pretest for independence, safety or quality. However, at posttest, safety and quality ratings of the FEW-C were significantly better than the FEW-P, and driven by two items: Outdoor Mobility safety and Personal Care quality. We concluded that the impact of the environment on activity performance of wheelchair users can be neutral or enabling depending on time of assessment and tasks being assessed. Our results also indicated that the FEW-C was most concordant with the FEW-P for the majority of the items compared to the FEW. Clinically, rehabilitation clinicians may get a more accurate estimation of performance in the home from a clinic assessment, and they are cautioned that the inclusion of self-report assessment and data obtained from clients' perceptions may not be concordant with actual performance [13].

6. Conclusion

In summary, the findings of our studies add to the work of previous studies that supported the use of the FEW tools for clinic and research use. The FEW tools have complementary relationships, and each tool could bring unique information to wheeled mobility and seating interventions. The application of FEW tools is promising and may help to highlight the importance of factors that may influence the change in functional performance among wheelchair users, and suggest priorities and specific focus areas for seating interventions. The use of larger samples that include new wheelchair users and those with more diverse diagnoses and cognitive and language limitations, may strengthen the generalizability of future studies [14-17].

7. Acknowledgement

I would like to give my sincere thanks and deepest appreciation and gratitude to the Department of Occupational Therapy at the School of Health and Rehabilitation Sciences at the University of Pittsburgh for their collaboration and support.

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