

The Patient-Specific Functional Scale: Validity in Workers' Compensation Claimants

Douglas P. Gross, PhD, Michele C. Battié, PhD, Alexander K. Asante, MScOT

ABSTRACT. Gross DP, Battié MC, Asante AK. The Patient-Specific Functional Scale: validity in workers' compensation claimants. *Arch Phys Med Rehabil* 2008;89:1294-9.

Objective: To examine the construct and predictive validity of the Patient-Specific Functional Scale (PSFS) in workers' compensation claimants.

Design: Prospective cohort study with 1-year follow-up.

Setting: A workers' compensation rehabilitation facility.

Participants: Subjects included 294 claimants with a variety of musculoskeletal disorders. The sample was predominantly male (70%), with a mean age of 44 years. Subjects completed a battery of measures at baseline including the PSFS, the Pain Disability Index (PDI), and the Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36).

Interventions: Not applicable.

Main Outcome Measures: Outcomes for determining predictive validity included administrative indicators of timely return to work and recovery during the 1-year follow-up. Analysis included Pearson correlation and multivariable Cox and logistic regression.

Results: At baseline, the PSFS correlated moderately (*r* range, 0.3–0.5) with other indicators of functional limitation (PDI, SF-36 role—physical subscale) but negligibly with the SF-36 mental health and role—emotional subscales. The PSFS was associated with timely recovery (adjusted hazard ratio, 1.16; 95% confidence interval, 1.07–1.27) with increasing functional limitation related to delayed recovery.

Conclusions: Results provide construct and predictive validity evidence for the PSFS as an indicator of functional limitation in workers' compensation claimants.

Key Words: Disabled persons; Musculoskeletal diseases; Psychometrics; Rehabilitation; Workers' compensation.

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MUSCULOSKELETAL DISORDERS ARE leading causes of disability and work loss. In Canada, musculoskeletal conditions represent the second most burdensome category of illness, surpassed only by cardiovascular diseases.¹ Musculoskeletal disorders are unique in that their primary burden arises

from indirect costs associated with short- and long-term disability as opposed to direct provision of care. For this reason, improved methods for assessing functional limitations are warranted for the purpose of targeting therapeutic interventions.

Various strategies have been used for measuring functional limitations, including performance and self-report evaluations.² In terms of self-report measures, the most common have been fixed-item questionnaires with which patients rate their levels of ability on items already identified as meaningful by the test developers. Another alternative is patient-specific indices on which patients themselves identify the activities found most problematic.³ Several patient-specific indices have been developed for use in patients with musculoskeletal disorders, with most showing some value for treatment planning and monitoring at an individual level.⁴ Some evidence indicates that these scales are more responsive to clinical change than questionnaires with predefined items.⁵ However, because measurement items differ across patients, a recent review³ highlighted the need for more information related to the interpretation of numeric scores derived from patient-specific measures and the constructs being measured.

In the population of injured workers receiving compensation, 1 barrier to the widespread use of patient-specific indices is the possibility for opposing priorities on the part of the patient and insurer. Although compensation insurers may deem return to work and a patient's functional work limitations as top priority, patients may be more concerned with ability restrictions for recreational, family, or personal pursuits. Such scales have not been studied within the population of workers' compensation claimants, and the relationship between patient-specific ratings and work outcomes is currently unknown.

We evaluated the construct and predictive validity of a patient-specific functional index, the PSFS,⁶ in a sample of workers' compensation claimants. We hypothesized that PSFS scores would correlate moderately with other measures of perceived disability but poorly with measures of perceived mental health or emotional functioning. We also hypothesized that worse functional limitation ratings on the PSFS would be associated with delayed return to work.

List of Abbreviations

CI	confidence interval
FCE	Functional Capacity Evaluation
NDI	Neck Disability Index
ODI	Oswestry Disability Index
PDI	Pain Disability Index
PSFS	Patient-Specific Functional Scale
RCT	randomized controlled trial
RMDQ	Roland-Morris Disability Questionnaire
SF-36	Medical Outcomes Study 36-Item Short-Form Health Survey
VAS	visual analog scale
WBC Alberta	Workers' Compensation Board of Alberta

From the Department of Physical Therapy, University of Alberta, Edmonton, AB, Canada (Gross, Battié); Workers' Compensation Board in Alberta/Millard Health, Edmonton, AB, Canada (Gross); and Peter Lougheed Centre, Calgary Health Region, Calgary, AB, Canada (Asante).

Supported by the University of Alberta Department of Physical Therapy, Alberta Physical Therapy Association, and the Canada Research Chairs Program.

No commercial party having a direct financial interest in the results of the research supporting this article has or will confer a benefit upon the authors or upon any organization with which the authors are associated.

Reprint requests to Douglas P. Gross, PhD, 2-50 Corbett Hall, University of Alberta, Edmonton, AB T6G 2G4, Canada, e-mail: dgross@ualberta.ca.

Published online June 5, 2008 at www.archives-pmr.org.

0003-9993/08/8907-00762\$34.00/0

doi:10.1016/j.apmr.2007.11.040

METHODS

Design

Data were collected prospectively as part of a cluster RCT aimed at evaluating the effectiveness of an FCE protocol.⁷ The trial was conducted from October 2004 through May 2006 at the major rehabilitation facility of the WCB Alberta, Canada. The current study included subjects undergoing either a 1- or 2-day functional assessment protocol. All subjects enrolled into the intervention arm of the trial completed the PSFS as part of the functional evaluation and formed our study sample. The University of Alberta's Health Research Ethics Board approved this research.

Participants

Within the WCB Alberta system, claimants who have met or surpassed expected tissue-healing times and plateaued with primary care medical and rehabilitative interventions, yet report ongoing difficulties related to their compensable conditions, are referred for assessment to determine barriers to recovery.⁸ Testing takes place at assessment centers throughout the province, including at the WCB Alberta rehabilitation facility. As part of the return-to-work testing, subjects complete a battery of standardized tests. As mentioned, the PSFS was introduced into the assessment battery for subjects entering the intervention arm of a cluster RCT. Assessing clinicians had been randomly assigned to either the standard or intervention arm; thus, subjects receiving the PSFS should be representative of all claimants seen at the facility.

Measures

Patient-Specific Functional Scale. The PSFS is a self-report measure aimed at identifying functional status limitations that are most relevant to individual patients.⁶ It was designed for use in patients with varied musculoskeletal problems. The PSFS has adequate construct validity in subjects with neck and low back pain, because both average and individual activity scores have been found to correlate moderately to highly (r range, .59–.74) with the RMDQ⁶ and correlate highly with the NDI (r range, .74–.82).^{9,10} The measure also appears to have good ability to detect clinical change and has been found more responsive than the RMDQ and a numeric pain scale in patients with back pain and more responsive than the NDI in patients with cervical radiculopathy.^{5,10} Chatman et al¹¹ previously examined associations between the 8 SF-36 dimensions and the PSFS in a sample of patients with knee dysfunction. They reported moderate correlations between the PSFS and the SF-36 role—physical ($r=.39$), social function ($r=.32$), and physical function ($r=.34$) domains. They also reported low correlations between the PSFS and the SF-36 role—emotional ($r=.13$), bodily pain ($r=.12$), general health ($r=-.11$), vitality ($r=.24$), and mental health ($r=.23$) domains. The PSFS has not previously been tested in workers' compensation claimants.

On the PSFS, patients are asked to identify 3 activities with which they are having difficulty or are unable to perform because of their problem. After specifying the activities, patients are asked to rate their current levels of difficulty associated with each activity. The scoring scheme for each item was an 11-point numeric rating scale ranging from 0 (unable to perform the activity) to 10 (able to perform at same level as before the injury or problem). In this study, therapists were instructed to read the following to their patients: "I'm going to ask you to identify 3 important activities that you are unable to do or have difficulty with as a result of your problem." Once

the activities were listed, the therapist continued: "Today, how difficult is it to perform [*activity 1*] on a scale ranging from 0 (unable to perform the activity) to 10 (able to perform at the same level as before the injury or problem); (patient scores activity 1) [*activity 2*]; (patient scores activity 2); and [*activity three*] (patient scores activity 3)." For purposes of this study, because the research location was a workers' compensation facility, if none of the top 3 activities selected by a patient were work related, a rating on an additional work-related activity was sought. Because this was done after completion of the first 3 PSFS items it is unlikely to have altered PSFS test metrics. Individual activity item scores and an overall average PSFS score were used in analyses.

Pain Disability Index. The PDI is a measure of perceived disability due to pain. It has been tested in a variety of patient populations including those with compensated musculoskeletal disorders.¹²⁻¹⁴ The PDI asks patients to rate their levels of disability on a 0 to 10 scale on 7 areas of activity. Each subject's scores on these 7 items are summed for a total score between 0 and 70, with higher scores indicating higher levels of perceived disability. Percentage PDI, calculated as a subject's total score divided by the total possible score for only the items completed, has been recommended to overcome problems with missing data.¹⁵ Gronblad et al¹⁶ found that both overall PDI score and percentage score correlated strongly and nearly equivalently with the ODI, and our research group¹⁷ has reported similar findings when comparing the PDI and percent PDI to performance-based functional indicators.

Previous investigators have reported good test-retest reliability, high internal consistency, and good concurrent validity for the PDI when tested against the ODI in a group of subjects with low back pain.^{15,16} The PDI has been shown to accurately discriminate between patients who had just undergone back surgery and patients with low back pain maintaining full-time work.¹⁸ The PDI has also been reported to correlate moderately with FCE performance in workers' compensation claimants.¹⁷ We obtained percentage PDI scores from study subjects.

VAS for pain. The VAS for pain is a reliable and valid measure of perceived pain severity.² The scale used in the present study is anchored at both ends, with 0 (no pain) at one end and 10 (unbearable pain) at the other. Higher pain intensity ratings have previously been reported as moderately associated with lower functional ability in workers' compensation claimants.^{17,19,20}

The SF-36. The SF-36 is a generic health status survey questionnaire designed to assess the impact of illness on a patient's health-related quality of life.²¹ It measures 8 dimensions of health status including physical functioning, social functioning, role limitations because of physical problems, role limitations because of emotional problems, mental health, energy and vitality, bodily pain, and general health perception. Scores on these items range from 0 to 100, with higher scores indicating better health state. Internal reliability in the general and chronic disease populations ranges from .78 to .93.²² Its construct validity versus indicators such as presence or absence of disease, disease severity category, and changes in disease-related symptoms over time has been documented.^{21,23} It has been used in patients with a variety of musculoskeletal conditions, including those receiving compensation,^{21,23,24} and has been found moderately associated with other region-specific measures of disability.²⁵

Potential Confounders for Prediction Analysis

Information was obtained on a number of potential confounders available within the WCB Alberta databases that have previously been found associated with future recovery.⁸ Poten-

Table 1: Subject Characteristics (n=294)

Variable	All Claimants (N=589)	With PSFS (n=294)
Age (y)	44±11.7	44±11.9
Days from injury to FCE	420±1021*	388±912 [†]
Gross annual salary (Can \$K)	41.0±20.9	41.2±22.1
Previous claims	4.4±5.3	4.2±4.8
Male	70	70
Employed	73	75
English primary language	97	97
Receiving time loss benefits at assessment	78	79
Diagnosis (primary ICD-9 coding)		
Sprain/strain	33	31
Unspecified pain conditions (ie, lumbago)	18	19
Fracture	13	14
Dislocation	5	6
Shoulder disorder	5	6
Spinal disk disorder	6	5
Nerve disorder	3	3
Contusion	2	3
Open wound	1	2
Amputation	1	1
Other (ie, inguinal hernia, crush injury)	13	10

NOTE. Values are mean ± SD or percentage.

Abbreviation: ICD-9, *International Classification of Disease, 9th Revision*.

*Median, 133.

[†]Median, 129.

tial confounders included duration of injury, age, sex, employment status, preaccident annual salary, number of previous compensation claims, number of previous health visits, and scores on the pain VAS.

Outcome Measures

Administrative recovery outcomes. To evaluate PSFS predictive validity, we were interested in determining the association between PSFS scores and successful return to work. To do this we obtained information on surrogate measures of timely and sustained readiness for return to work in the year after assessment. Specifically, primary outcome measures included time to claim closure after FCE and days to suspension of time-loss benefits after FCE in subjects receiving time-loss benefits at baseline. These outcomes were censored at 1 year. We also obtained information on the rate of recurrence in subjects experiencing benefit suspension or claim closure. Recurrence was defined as whether the claim was reopened or a new claim filed after initial claim closure within 1 year after the FCE, or whether time-loss benefits restarted after having been suspended for a period of 7 days within 1 year after the FCE. These outcomes are often used as recovery indicators within insurance and compensation contexts.^{26,27}

Data Analysis

Initially, all data records were reviewed to ascertain if any data issues such as missing data, outliers, or out-of-range values existed within the data set. Descriptive statistics were then calculated including means and SDs for continuous variables, percentages for categorical variables, and Kaplan-Meier curves for time to event data.

To examine construct validity, Pearson correlation coefficients were calculated for the PSFS and the PDI, VAS, and SF-36 domains. The magnitude of a relationship was judged to be low if correlation coefficients varied between .00 and .29, moderate if between .30 and .59, and strong if above .60.^{28,29} To test predictive validity of the PSFS, Cox and logistic regression were used with a risk factor modeling strategy.^{30,31} Initially crude relationships between PSFS and timely recovery outcomes were determined by entering the variable into separate Cox regressions with days to claim closure and days to suspension of time-loss benefits as dependent variables. Results were then adjusted by adding potential confounders simultaneously to the Cox model. The proportion of variation explained was calculated using the technique described by Schemper.³² For the dichotomous sustained return-to-work outcomes, a similar process was undertaken using logistic regression.³⁰ A .05 α level was used to judge significance. All analyses were conducted using SPSS.^a

RESULTS

Of 589 claimants meeting study inclusion criteria, 294 (50%) had complete data on the PSFS and predictor variables of interest and were included in subsequent analyses. No statistically significant differences were seen between those with PSFS data and those without on the 16 descriptive variables examined (table 1). Only 158 (54%) had complete data on the SF-36. Subjects were predominantly employed men reporting moderate levels of pain (see table 2 for scores on the self-report questionnaires). Mean PSFS scores indicated high levels of perceived functional limitation (3/10, where 0 is unable to perform the activity). A work-related activity was not identified as problematic in the PSFS by 110 subjects (37%), and therapists therefore requested a fourth item. The specific activities identified by claimants in the first PSFS item are listed in table 3.

Construct Validity

With the exception of the fourth PSFS item, moderate correlations were observed between the PSFS and 2 of the other functional measures (r range: for PDI, $-.32$ to $.53$; for SF-36 role-physical, $.32$ – $.44$) (table 4). The direction of these coefficients was as expected, with higher PSFS functional limitation associated with higher perceived disability on the PDI and SF-36. Unexpectedly, low correlations were seen between the

Table 2: Subject Scores on Self-Report Questionnaires

Measure	Mean ± SD
PSFS (/10)	
Activity 1 (n=294)	3.1±2.3
Activity 2 (n=287)	3.0±2.1
Activity 3 (n=273)	3.1±2.3
Activity 4 (n=110)	2.0±2.1
Average score (n=294)	3.1±1.8
% PDI (n=294)	49.0±20.3
VAS for pain (/10) (n=294)	4.4±2.6
SF-36 domains (/100) (n=158)	
Physical function	53.2±21.6
Bodily pain	31.6±19.1
Role-physical	24.8±23.3
Role-emotional	52.1±34.3
General health	65.0±19.9
Social functioning	49.8±26.3
Mental health	61.1±21.8
Vitality	48.1±20.5

Table 3: Activity Reported as Difficult in First PSFS Item

Item	Percentage
Lifting	21
Household chores (ie, vacuuming, dishes)	15
Sports	14
Walking	8
Climbing stairs/ladder	5
Bending	4
Driving	4
Standing	4
Carrying	3
Reaching	3
Overhead work	3
Pushing/pulling	2
Working	2
Sex	1
Gripping objects	1
Other (eg, handling animals, filing, changing diapers)	10

PSFS individual item scores and the physical function domain of the SF-36 (*r* range, .07–.25), whereas the average PSFS score correlated moderately (*r*=0.3). Low correlations were also observed between the PSFS and the SF-36 mental health and role–emotional domains (*r* range, .10–.21) and pain VAS (*r* range, –.19 to –.24).

Predictive Validity

The median time to suspension of time-loss benefits was 31 days (95% CI, 29–33d), and only 11 subjects (5%) received benefits for the entire follow-up year. Median claim duration was 54 days (95% CI, 47–61d). Ninety-one subjects (32%) experienced a recurrent claim event within the follow-up year.

For every 1-point improvement on the 11-point average PSFS score, where higher scores indicate less functional limitation, subjects were approximately 15% more likely (adjusted hazard ratio, 1.16; 95% CI, 1.07–1.27) to experience suspension of time-loss benefits during the follow-up year (table 5). Worse average PSFS scores also tended to be associated with slower claim closure (crude hazard rate ratio, 1.14; 95% CI, 1.06–1.22). The PSFS variable crudely explained approximately 7% of the variation in these outcomes, which was comparable to the variance explained in time to benefit suspension by the PDI (also 7%). The PDI was more predictive of time to claim closure (14% variation explained). Controlling

for the PDI did not meaningfully alter PSFS hazard ratios. The relationship between average PSFS scores and timely recovery outcomes was only slightly reduced after controlling for potential confounders. Individual activity scores were also significantly associated with future suspension of benefits and claim closure (see table 5 for results for activity 1). In the 110 subjects asked to rate a fourth work-related activity on the PSFS, this item was less highly associated with future suspension of benefits than subject scores on the non–work-related first item (hazard ratio, 1.12 vs 1.19).

The association between average PSFS and future recurrence was small and not statistically significant (see table 5). Higher scores on the first activity item tended to be associated with higher odds of experiencing recurrence (odds ratio, 1.09; 95% CI, 0.98–1.22). Twenty-eight percent of subjects scoring below the mean on the first PSFS item experienced a recurrent event, whereas 38% of subjects scoring above the mean experienced recurrence.

DISCUSSION

We have presented evidence supporting the validity of the PSFS as an indicator of functional limitation in workers' compensation claimants with a wide variety of musculoskeletal conditions. Scores on the scale correlated moderately with other validated self-report measures of disability including the PDI and SF-36 role–physical subscale. The pattern of correlations between the PSFS and the various SF-36 subscales was quite similar to that reported by Chatman et al.¹¹ Remarkably, while claimants were not required to identify work-specific activities, scores on the PSFS were modestly associated with future administrative recovery outcomes. In fact, in subjects asked to provide a work-related activity on the PSFS, the work-related item was not as predictive of time to suspension of benefits as the first supplied non–work-related item. The first PSFS item appears as useful as the overall average PSFS score for purposes of prediction. It is unknown whether only 1 item would be as useful for purposes of detecting meaningful change in functional status over time.

The PSFS appears to provide useful clinical information while requiring a very low administrative burden. While modest, the magnitude of association between the PSFS and future recovery outcomes was similar to that provided by the 7-item PDI. Although the PDI was slightly more predictive of time to claim closure, both the PDI and the PSFS explained approximately 7% of the variation in time to benefit suspension in the follow-up year. This is comparable to the proportion of vari-

Table 4: Correlations Between PSFS and Other Self-Report Measures

Scale	Activity 1 (n=294)	Activity 2 (n=287)	Activity 3 (n=273)	Activity 4 (n=110)	Average PSFS (n=294)
PDI	–.48*	–.44*	–.32*	–.27*	–.53*
VAS for pain	–.23*	–.21*	–.12*	–.19	–.24*
SF-36 dimensions	(n=158)	(n=154)	(n=147)	(n=67)	(n=158)
Role–physical	.36*	.32*	.33*	.13	.44*
Physical function	.23*	.25*	.18*	.07	.30*
Role–emotional	.16*	.19*	.11	.10	.21*
Bodily pain	.30*	.32*	.20*	–.04	.33*
Social function	.25*	.28*	.24*	.04	.32*
Vitality	.30*	.14	.08	.16	.24*
General health	.18*	.11	–.03	–.05	.11*
Mental health	.14	.14	.08	.16	.17*

NOTE. Values are Pearson correlation coefficients. **P* significant at .05.

Table 5: Associations Between Functional Scales and Recovery Outcomes

Scale	Suspension of Benefits (n=233)		Claim Closure (n=294)		Recurrence (n=285, 32% recurred)	
	Hazard Ratio (95% CI)	PVE	Hazard Ratio (95% CI)	PVE	Odds Ratio (95% CI)	R ² (%)
Average PSFS						
Crude	1.21 (1.11–1.31)	7	1.19 (1.11–1.27)	8	1.02 (0.88–1.18)	0
Adjusted	1.16 (1.07–1.27)	5	1.14 (1.06–1.22)	4	0.98 (0.86–1.13)	0
PSFS activity 1						
Crude	1.15 (1.07–1.23)	7	1.15 (1.09–1.22)	7	1.10 (0.98–1.22)	1
Adjusted*	1.08 (1.00–1.16)	3	1.06 (1.00–1.13)	1	1.13 (0.99–1.29)	2
PDI						
Crude	4.43 (2.21–8.89)	7	8.78 (4.65–16.60)	14	1.41 (0.42–4.78)	0
Adjusted	2.97 (1.34–6.56)	3	5.04 (2.40–10.56)	6	3.00 (0.67–13.48)	1

Abbreviation: PVE, percentage of variance explained.

*Adjusted for age, sex, employment status, duration of injury, annual salary, previous WCB Alberta claims, number of previous health care visits, and subject scores on the VAS for pain.

ation explained by functional capacity evaluation within the same WCB Alberta jurisdiction.³³ However, the PSFS has the added appeal of being highly meaningful for patients, allowing them to highlight unique functional challenges they face due to their conditions. This includes items that are potentially not captured in fixed-item measures, possibly explaining the high responsiveness reported for the PSFS.^{5,10}

In this sample of work injury claimants experiencing work disability, many of the problematic activities noted as most important by subjects tended to relate to home and leisure time activities. Although the most commonly reported activity with which claimants were having difficulty was lifting, which could relate to work and/or leisure activities, the next 2 most common activities noted were household chores and sports. However, there were no indications that functional limitations on household or leisure activities were any less predictive of the claims-related recovery outcomes than work-related activities. This adds further support to use of the PSFS as a meaningful measure of disability in work injury claimants. Our study relates only to issues of construct and predictive validity, and it remains unknown whether the PSFS is responsive to change over time in workers' compensation claimants.

Study Limitations

One limitation of the current study was the low proportion of subjects (50%) with complete data on the self-report questionnaires. No statistically significant differences were expected or seen between those with missing data and those without on the 16 descriptive variables examined. Another limitation was the reliance on surrogate indicators of return to work and recovery available within the WCB Alberta administrative database. Although the variables *time receiving benefits* or *time to claim closure* are often used as outcomes within insurance and workers' compensation jurisdictions,^{26,27} they may underestimate actual duration of disability.³⁴ They are, however, important outcomes from an insurance and cost perspective.

CONCLUSIONS

Results provide construct and predictive validity evidence for the PSFS as an indicator of functional limitation in workers' compensation claimants. The tool provides clinically useful, patient-centered information at low administrative burden.

Acknowledgment: The Workers' Compensation Board of Alberta/Millard Health assisted with data acquisition and study implementation.

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