Psychometric properties of the Dutch Short Musculoskeletal Function Assessment questionnaire (SMFA) in patients with a fracture of the upper or lower extremity

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Abstract

Purpose: This prospective study examined the psychometric properties of the adapted Dutch translation of the Short Musculoskeletal Function Assessment (SMFA) questionnaire in patients with isolated unilateral lower (LEF) or upper extremity fractures (UEF). ***Methods:*** Patients (N=458) completed the SMFA, WHOQOL-Bref, and the RAND-36 at time of diagnosis (i.e., pre-injury status), one week, and two weeks post-fracture. Principal axis factoring was performed and Cronbach's alpha coefficients (α) and intra-class correlations coefficients (ICC) were calculated. Furthermore, Pearson's product-moment correlations (r), paired *t*-tests, and standardized response means (SRM) were calculated. ***Results:*** A three-factor structure was found: Lower extremity dysfunction, Upper extremity dysfunction, and Daily life consequences. This structure was different for patients with LEF versus UEF. ICCs ranged from .68 to .90 and α varied from .81 to .95. The correlations between the SMFA and respectively the RAND-36 and WHOQOL-Bref were small to large depending on the SMFA factor combined with fracture location. Responsiveness was confirmed ($p<.0001$; SRM ranging from .28 to 1.71).

Conclusions: The SMFA has good psychometric properties in patients with fractures. Patients with UEF and LEF could not be regarded as a homogenous group. The development of separate SMFA modules should be considered.

Keywords: SMFA, fractures, psychometrics, factor structure, reliability, validity, responsiveness

Introduction

Currently, in clinical practice of lower extremity fractures (LEF) and upper extremity fractures (UEF), the main focus is on physical function rated by physicians [1,2] or patients [3,4]. Less is known about patient's health status (HS) and health-related quality of life (HRQOL). The Short Musculoskeletal Function Assessment questionnaire (SMFA) was developed to assess HS (HS; Dysfunction index) and HRQOL (HRQOL; Bother index) in patients with musculoskeletal disorders [5]. The SMFA is a feasible outcome instrument in research as well as clinical settings [6] since it provides direct feedback to patients and clinicians in office visits. Currently, different language adaptations of the original American English SMFA have been developed [7-11]. Recently, the SMFA was translated into Dutch [12]. Like the other translations, it contains several double-barrelled items leading to reduction of item clarity [13]. Therefore, our aim was to develop a SMFA without double-barrelled questions. We examined the psychometric properties of this questionnaire and hypothesized that our adaptation would be a psychometric sound measure in patients with LEF and UEF. More specifically, we expected that the construct validity would be good, which will be demonstrated by moderate to large correlations ($r \geq .30$) between SMFA items asking patients how much they are bothered by their problems and World Health Organization Quality of Life assessment instrument-Bref (WHOQOL-Bref) scores [14]. Moreover, we hypothesized that at least moderate correlations would be found between SMFA items that were oriented towards physical dysfunction and the physical-related RAND-36-item Health Survey (RAND-36) subscales [15]. Regarding responsiveness, we expected patients to deteriorate from pre-injury to one week after fracture with items related to lower extremity dysfunction being the most responsive in patients with LEF and items related to upper extremity dysfunction being the most responsive in patients with UEF (i.e., large effect sizes).

Methods

Translation of the SMFA

Forward-backward translation [16] and guidelines for cross-cultural adaption were used for the translation of the SMFA into the Dutch language [17]. The multidisciplinary committee consisted of one trauma surgeon, one orthopaedic trauma surgeon, and a medical psychologist specialized in QOL assessment. Six double-barrelled items (i.e., items 2, 8, 27, 28, 35, 46) of the American English SMFA [5] were divided into two separate questions. For example, item 27: 'How often do you avoid using your painful limb(s) or back?' was transformed into two items: (a) 'How often do you avoid using your painful limb(s)?' and (b) 'How often do you avoid using your back?' In addition, concerning item 4: 'How difficult is it for you to climb stairs?' a complementary item was designed: 'How difficult is it for you to descend stairs?' After these adaptations our Dutch SMFA contained 53 items instead of 46 items.

Patients

Patients visiting the Emergency Department of the St. Elisabeth Hospital (The Netherlands) were recruited from November 2010 until January 2012. Inclusion criteria were an unilateral LEF or UEF, ≥18 years old, and capacity to self-report. Exclusion criteria were multiple trauma, pathological fractures, complicated fractures, severe psychopathology or serious physical comorbidity. To perform a factor analysis, four to ten patients for each item is advised with a minimum of 100 patients [18]. Therefore, we intended to include at least 400 patients.

Design

During their hospital visit or within a few days after this visit, eligible patients were invited to complete questionnaires at time of diagnosis (Time-0), 1 week (Time-1), and 2 weeks post-

fracture (Time-2). Therefore, a prospective study design with the pre-injury status retrospectively gathered at Time-0 was performed. The study was approved by the local Medical Ethics Committee. Patients provided informed consent before entering the study.

Measures

The Dysfunction index of our Dutch SMFA contains 39 items assessing the amount of difficulty patients have performing certain activities and how often patients are experiencing problems during certain functions. The Bother index consists of 14 items asking patients how much they are bothered by their problems in various areas (e.g., recreation and leisure, sleep and rest, work, family). Both indices use a five-point Likert-format with scores ranging from 1 *(not at all/never/none)* to 5 *(unable to do/always/extremely)*. After summing the corresponding items and score transformation, the indices range from 0 to 100. Higher scores indicate poorer HS or HRQOL.

HS was also assessed with the RAND-36 [15] and QOL was assessed with the WHOQOL-Bref [14]. These questionnaires have good psychometric properties [5,19,20]. Sociodemographic data were gathered at baseline (See Table 1).

Statistical analyses

Independent *t*-tests and Chi-square tests were performed to compare responders and non-responders on age, sex, and fracture location. Values of skewness and kurtosis >0 are indicative for violation of the normality assumption [21]. Floor and ceiling effects were present if >15% of the patients achieved the lowest or highest score [22].

Prior research on the dimensionality of the SMFA remained inconclusive [10-12]. Therefore, principal axis factoring (PAF) was used to analyze the underlying factor structure of the adapted SMFA (i.e., Time-1). Suitability for PAF was evaluated with the Kaiser-

Meyer-Olkin measure, with .5 being the minimum acceptable value and with Bartlett's Test of Sphericity [23]. To extract the number of factors, Kaiser's criterion and Cattell's scree plot were used [24]. Oblique rotation was performed since correlation coefficients were >.32 [25]. An iterative process was performed in which items with factor loadings of <.4 were removed from the initial solution [26]. This process was completed when all remaining items had substantial factor loadings.

For each newly identified factor Cronbach's alpha coefficients (α) were calculated. An α of at least .70 is considered acceptable [27]. Intra-class correlation coefficients (ICC) for absolute agreement were calculated for test-retest reliability purposes, using the SMFA-scores at Time-1 and Time-2. A two-way random effects model was used. ICC of ≥.70 are considered adequate [27].

Construct validity was assessed by calculating Pearson's product-moment correlation coefficients (r) between SMFA factors and RAND-36 and WHOQOL-Bref domains. Indicative for convergent validity were moderate (r=.30 to r=.49) to high correlations (r≥.50) between the SMFA and related domains, whereas small correlations (r=.10 to r=.29) were indicative for divergent validity [28].

Responsiveness was examined with paired *t*-tests and standardized response means (SRM). SRM were calculated as the mean change score in a group of patients, divided by the standard deviation of this change score [18]. SRM between .20 and .50 were considered small, SRM of >.50 moderate, and >.80 large [28]. All statistical analyses were performed using SPSS for Windows version 19.

Results

The response rate was 56.1% (See Figure 1). Compared to non-responders, responders were more often female (p=.002), had more ankle/foot fractures (p=.004), but less fractures of the

toe (p=.030) or upper leg/hip (p=.018). They did not differ on age (p=.124). The baseline characteristics are outlined in Table 1.

Dimensionality

The suggested factor solutions for the total group (LEF and UEF) were not interpretable (results not shown). Therefore, PAF was performed on the data of patients with LEF and UEF separately.

Table 2 presents the indices for factor extraction. For LEF, the three-factor solution (R^2=51.9%) was most interpretable with simple structure established (Table 3): factor 1 Lower extremity dysfunction (23 items), factor 2 Upper extremity dysfunction (9 items), and factor 3 Daily life consequences (15 items).

A three-factor solution (R^2=50.4%) with simple structure was also most optimal for UEF (Table 3): factor 1 Lower extremity dysfunction (14 items), factor 2 Upper extremity dysfunction (28 items), and factor 3 Daily life consequences (7 items).

Table 4 presents the descriptive statistics of the SMFA scores, α, ICC, floor and ceiling scores, and responsiveness.

Score distribution and missing data

The assumption for normality was violated for Upper extremity dysfunction and Lower extremity dysfunction. Ceiling scores were achieved by 36.8% of the patients with LEF on Upper extremity dysfunction and by 30.5% of patients with UEF on Lower extremity dysfunction.

Overall, the percentage of missing data ranged from 3.1% to 19.9% (Time-1). In both populations, item 18 (up to 6.6%; asking the patient how difficult is to drive a car) and item

25 (up to7.6%; asking the patient how difficult it is to be sexually active) were most often missing at all time points.

Reliability

For both LEF and UEF, α's ranged from .81 (Daily life consequences) to .95 (Lower extremity dysfunction and Upper extremity dysfunction). ICC's ranged from .68 (Upper extremity dysfunction) to .90 (Lower extremity dysfunction).

Validity

In patients with LEF, convergent validity was shown for example by high correlations between the SMFA factor Lower extremity dysfunction and the RAND-36 Physical functioning subscale (r=.80) and the WHOQOL-Bref Physical health domain (r=.65) (See Table 5). With regard to divergent validity, the factor Upper extremity dysfunction showed low correlations in these patients with all the RAND-36 subscales (r=.06 to r=.28) and all the WHOQOL-Bref domains (r=.10 to r=.21).

A different correlation pattern was found for patients with UEF. In these patients, convergent validity was demonstrated by high correlations between the SMFA factor Upper extremity dysfunction and the RAND-36 Physical functioning subscale (r=.68) and the WHOQOL-Bref Physical health domain (r=.68). Divergent validity was shown by small correlations between the SMFA factor Upper extremity dysfunction and the RAND-36 subscale General health perception (r=.26) and the WHOQOL-Bref domain Social relationships (r=.23).

For both patients with LEF and UEF, responsiveness was shown by significant effects for time for Lower extremity dysfunction, Upper extremity dysfunction, and Daily life consequences (Figure 2a and Figure 2b). Concerning LEF, large SRM were found for Lower

extremity dysfunction and Daily life consequences. A small SRM was found for Upper extremity dysfunction. For patients with UEF, the SRM for Upper extremity dysfunction was large. SRM for both Lower extremity dysfunction and Daily life consequences were considered to be small (Table 4).

Discussion

The psychometric properties of the adapted SMFA were adequate. A three-factor structure was the optimal solution. The difference in factor solution compared to the four-factor structure of Reininga et al. [12] may be explained by the fact that they performed their analyses on a more heterogeneous population. In addition, their patients were mainly treated several months previous to the start of the study, leaving the sample relatively healthy. We included patients directly after trauma. Three-factor solutions were also found in other heterogonous study samples [10,11]. However, the clustering of items was not in accordance with our factor structure. This suggests that acute fractures have their own specific factor structure.

Moreover, the factor structure between patients with acute LEF versus UEF differed. No interpretable factor structure could be derived from the data when patients with LEF and UEF were combined. Also the items with no substantial factor loadings were different for these patients groups. Depending on the fracture location, items moved from the factor Lower extremity dysfunction to Upper extremity dysfunction (and vice versa). It concerned items on work, personal hygiene, going out by yourself as well as the feeling of being disabled. Thus, patients with LEF versus UEF should be considered as distinct groups with specific impairments. Different questions are relevant for these two patient groups.

The fact that patients from the target population were not involved in the adaptations of the SMFA may be considered to be a limitation of this study. Consistent with previous

findings, the SMFA is limited by ceiling effects [5,11,12]. The item on patients' ability of driving a car is conceptually problematic because in the Netherlands, it is illegal to drive a motor vehicle with an immobilized extremity. The correlations between the SMFA and RAND-36 were small to large, depending on the factor in combination with the fracture location. This in contrast to the moderate to strong correlations, regardless of the factor, found by Guevara et al. [10]. The difference may be explained by the study population with patients in our study having injuries located very specific on one area of the body whereas Guevara et al. included also patients with spine problems. Spine problems have a more general impact on functioning, so items targeting upper and lower extremity dysfunction might be both relevant for those patients [10]. Although the SMFA consists of several items assessing HRQOL, we were the first who used the WHOQOL-Bref to establish construct validity. The factor Daily life consequences was strongly related with all WHOQOL-Bref domains compared to Lower extremity dysfunction and Upper extremity dysfunction. This suggests that items in the factor Daily life consequences are more QOL-oriented.

Responsiveness was high, especially for Upper extremity dysfunction in patients with UEF and for Lower extremity dysfunction in patients with LEF. However, SRM are highly dependent on the standard deviation and paired *t*-tests also on the sample size [18]. Therefore, future studies should include a golden standard like a global rating scale (i.e., patients answer a single question to indicate how much they have changed on the construct of interest). Then it would be possible to study responsiveness with correlations or receiver operating characteristics curves [18]. Another limitation of our study was the response rate of 56.1%. Patients were less inclined to participate when having an acute injury and/or had only minor symptoms of their fractures (e.g., toe fracture).

In summary, the Dutch adaptation of the SMFA is a reliable and valid questionnaire to measure HS and HRQOL in patients with UEF and LEF. However, this study showed that

different SMFA questions are relevant for these two patient groups. The development of separate SMFA modules should be considered.

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Table 1. Patient characteristics at baseline

Characteristics	**n= 458**
Age (years)	49 ± 17.7
Sex	
Male	196 (42.8)
Female	262 (57.2)
Marital status	
Partner	314 (68.6)
No partner	100 (21.8)
Missing	44 (9.6)
Educational level	
Low ≤10 years of education	26 (5.7)
Middle 10-14 years of education	129 (28.2)
High ≥ 14 years of eduction	241 (52.6)
Missing	62 (13.5)
Fracture location	
Finger	45 (9.8)
Wrist/hand	148 (32.3)
Underarm/Elbow	43 (9.4)
Upper arm/shoulder/clavicle	38 (8.3)
Toe	27 (5.9)
Ankle/foot	106 (23.1)
Lower leg/Knee	21 (4.6)
Upper leg/Hip	30 (6.6)

Notes: A total of 458 patients returned at least one of the questionnaire sets. All values, except for age (mean ± standard deviation), are given as the number of patients, with the percentage in parentheses.

Table 2. Factor extraction: principal axis factoring

	Lower extremity fractures	**Upper extremity fractures**
Indices for factor extraction		
Kaiser-Meyer-Olkin measure	.81	.89
Bartlett's Test of Sphericity	$\chi^2 = 4281.75$, $p<.0001$	$\chi^2=6488.95$, $p< .0001$
Kaiser's criterion	Twelve factors ($R^2=73.9\%$)	Nine factors ($R^2=67.5\%$)
Cattell's scree plot	Two-, three-, or four-factor solution	Two-, three-, or four-factor solution
Items removed during iterative process	Six items	Four items

Table 3. Factor loadings in patients with lower and upper extremity fractures in a three-factor solution

	Lower extremity fractures (N=105)			**Upper extremity fractures (N=167)**		
	Lower extremity dysfunction	Upper extremity dysfunction	Daily life consequences	Lower extremity dysfunction	Upper extremity dysfunction	Daily life consequences
Difficulty to…						
1. get in or out a low chair	**.63**	-.01	.21	**-.68**	.18	-.02
2. open bottles[a]	-.02	**.94**	-.02	-.00	**.77**	-.14
3. open jars[a]	-.02	**.82**	.04	.03	**.79**	-.19
4. shop groceries	**.88**	-.02	-.13	-.31	**.60**	-.00
5. climb stairs[b]	**.80**	-.05	.00	**-.85**	.16	-.08
6. descend stairs[b]	**.79**	-.06	.02	**-.83**	.22	-.16
7. make a fist	-.05	**.94**	-.07			
8. use the bathtub or shower	**.68**	.23	.06	-.27	**.68**	-.07
9. get comfortable to sleep	.24	.01	**.49**	-.30	**.54**	.04
10. bend[a]	**.60**	.10	.13	**-.76**	.28	-.13
11. kneel down[a]	**.77**	-.14	.03	**-.84**	.07	-.03
12. use buttons or zippers	.07	**.84**	.03	-.12	**.71**	.06
13. cut own fingernails	-.06	**.87**	.01	.22	**.71**	.04
14. get dressed	**.48**	.36	.13	-.21	**.75**	.00
15. walk	**.63**	-.15	.10	**-.83**	-.01	-.01
16. move after sitting or lying down	.15	.20	**.53**	**-.75**	.08	.11
17. go out by yourself	**.82**	.02	-.14	-.32	**.50**	.10
18. drive	**.68**	.02	-.13	.17	**.63**	.09
19. clean yourself after going to the bathroom	.26	**.44**	.25	-.31	**.44**	-.10
20. turn knobs or levers	.23	**.59**	-.01			
21. write or type	-.07	**.93**	-.04	-.14	**.41**	-.08
22. pivot	**.58**	.01	.09	**-.69**	.11	.02
23. do your physical recreational activities	**.77**	-.12	-.20	.18	**.50**	.20
24. do your leisure activities				-.05	**.47**	.22
25. be sexual active	**.56**	.27	.06	-.23	**.58**	.08
26. do light housework	**.73**	.15	.03	-.22	**.63**	-.01
27. do heavy housework	**.76**	.07	.03	-.05	**.78**	-.07
28. do your usual work	**.49**	.14	.10	.04	**.59**	.05

	Lower extremity fractures (N=105)			**Upper extremity fractures (N=167)**		
	Lower extremity dysfunction	Upper extremity dysfunction	Daily life consequences	Lower extremity dysfunction	Upper extremity dysfunction	Daily life consequences
Frequency…						
29. walk with a limp				**-.72**	-.21	.18
30. avoid using painful limb[a]	**.72**	.02	-.11	.00	**.45**	-.03
31. avoid using your back[a]				**-.49**	.01	.30
32. leg locked[a]	-.04	.09	**.50**	**-.45**	-.10	.18
33. leg giving-away[a]	-.17	-.03	**.57**	**-.65**	-.20	.15
34. problems with concentration	.03	.13	**.48**	-.08	.00	**.55**
35. doing too much one day affecting what you do the next day	-.09	.11	**.43**	-.35	-.06	**.53**
36. acting irritated towards those around you				.07	.10	**.60**
37. being tired	-.04	-.04	**.69**	-.24	.18	**.45**
38. feeling disabled	**.42**	-.10	.37	-.07	**.52**	.18
39. feeling angry or frustrated because of injury	.17	-.09	**.46**	-.07	.30	**.48**
Bothered by…						
40. problems using arms[a]	-.00	**.75**	.12	.07	**.74**	-.00
41. problems using legs[a]	**.53**	-.11	.26	**-.77**	-.12	.17
42. problems using your back				**-.57**	-.02	.27
43. problems doing chores in and around home	**.54**	.03	.23	.01	**.68**	.11
44. problems with taking care of personal hygiene	**.51**	.21	.22	-.03	**.70**	.10
45. problems with sleep and rest	.15	.04	**.59**	-.15	**.47**	.29
46. problems with leisure or recreational activities				-.03	**.44**	.27
47. problems with important people in your life	-.04	-.03	**.49**	-.03	.09	**.58**
48. problems with thinking, concentration, or remembering	.10	.09	**.45**	-.10	.01	**.60**
49. problems coping with your injury or signs of wear	.26	-.22	**.57**	-.17	**.46**	.25
50. problems doing usual work	**.43**	-.03	.15	.23	**.53**	.11
51. problems feeling dependent on others	.28	-.27	**.47**	-.08	**.45**	.39
52. problems with stiffness[a]	.05	-.08	**.64**			
53. pain[a]	-.03	.12	**.58**			

Notes: Lower extremity fractures: removed items with no substantial (<.4) factor loadings during iterative process: 24, 29, 31, 36, 42, 46; Upper extremity fractures: removed items with no substantial (<.4) factor loadings during iterative process: 7, 20, 52, 53; a = double barrelled questions of the original SMFA (i.e., items 2, 8, 27, 28, 35, 46) were divided into two questions; b= a complementary question was designed for item 4 of the original SMFA.

Table 4. Descriptive statistics SMFA-scores, internal consistency, test-retest reliability, floor and ceiling effects, and responsiveness

SMFA	**Mean (SD)** ***Skewness; kurtosis***			**Ceiling score Time-1 (%)**	**Floor score Time-1 (%)**	**Cron-bach's alpha (α) Time-1**	**ICC (95% CI) Time-1 and Time-2**	**Responsiveness Time-0 and Time-1** **(i) t-value, p-value** **(ii) *SRM***
Lower extremity fractures	**Time-0**	**Time-1**	**Time-2**					
Lower extremity dysfunction	17.09 (25.03) *1.57; 1.33*	63.88 (20.44) *-.89; -.52*	54.84 (22.09) *-.31; -.63*	0	0	.95	.69 (.24 - .85)	-16.97, p<.0001 *1.71*
Upper extremity dysfunction	3.82 (8.43) *3.66; 16.35*	8.20 (15.47) *3.64; 14.95*	7.31 (15.74) *3.75; 15.72*	36.8	0	.92	.78 (.69 - .85)	-4.11, p<.0001 *.37*
Daily life consequences	19.50 (16.6) *.78; -.26*	32.29 (14.12) *.43; .51*	27.74 (14.58) *.26; -.54*	0	0	.86	.74 (.40-.87)	-10.77, p<.0001 *1.03*
Upper extremity fractures								
Lower extremity dysfunction	7.53 (12.55) *2.92; 9.36*	11.27 (15.43) *1.82; 3.32*	10.57 (14.78) *2.04; 4.42*	30.5	0	.94	.90 (.86-.93)	-3.79, p<.0001 *.28*
Upper extremity dysfunction	13.82 (20.35) *1.85; 2.70*	50.21 (20.24) *-.25; -.40*	42.16 (22.15) *.05; -.65*	0.6	0	.95	.68 (.39-.82)	-16.68, p<.0001 *1.38*
Daily life consequences	19.81 (13.74) *.70; .11*	25.07 (14.87) *.52; .10*	23.48 (14.87) *.86; 1.89*	4.4	0	.81	.81 (.75-.86)	-6.46, p<.0001 *.47*

Abbreviations: SMFA, Short Musculoskeletal Function Assessment questionnaire; EFA, Exploratory factor analysis; ICC, Intra-class correlation coefficients; CI, Confidence interval; SRM, Standardized response means; Time-0, pre-injury status; Time-1, one week post-fracture; Time-2, two weeks post-fracture

Table 5. Correlation coefficients between SMFA subscales and RAND-36 subscales and WHOQOL-Bref domains

	Lower extremity fractures						**Upper extremity fractures**					
	Lower extremity dysfunction		Upper extremity dysfunction		Daily life consequences		Lower extremity dysfunction		Upper extremity dysfunction		Daily life consequences	
RAND-36	**r**	**p-value**	**r**	**p-value**	**r**	**p-value**	**r**	**p-value**	**r**	**p-value**	**r**	**p-value**
Physical functioning	.80	<.0001	.10	.298	.44	<.0001	.67	<.0001	.68	<.0001	.42	<.0001
Role limitations due to physical problems	.43	<.0001	.17	.089	.40	<.0001	.05	.516	.45	<.0001	.28	<.0001
Bodily pain	.40	<.0001	.28	.005	.54	<.0001	.34	<.0001	.55	<.0001	.29	<.0001
General health perception	.03	.798	.06	.583	.38	<.0001	.51	<.0001	.26	.001	.49	<.0001
Social functioning	.51	<.0001	.16	.116	.48	<.0001	.44	<.0001	.66	<.0001	.58	<.0001
Role limitations due to emotional problems	.22	.024	.15	.137	.46	<.0001	.27	.001	.38	<.0001	.38	<.0001
Vitality	.29	.003	.15	.137	.69	<.0001	.42	<.0001	.45	<.0001	.65	<.0001
Mental health	.30	.002	.15	.131	.65	<.0001	.47	<.0001	.38	<.0001	.68	<.0001
WHOQOL-Bref												
Physical health	.65	<.0001	.21	.034	.69	<.0001	.43	<.0001	.68	<.0001	.59	<.0001
Psychological health	.23	.020	.15	.123	.60	<.0001	.44	<.0001	.36	<.0001	.69	<.0001
Social relationships	.11	.256	.10	.335	.34	<.0001	.24	.002	.23	<.0001	.47	<.0001
Environment	.14	.151	.14	.160	.49	<.0001	.36	<.0001	.36	<.0001	.59	<.0001

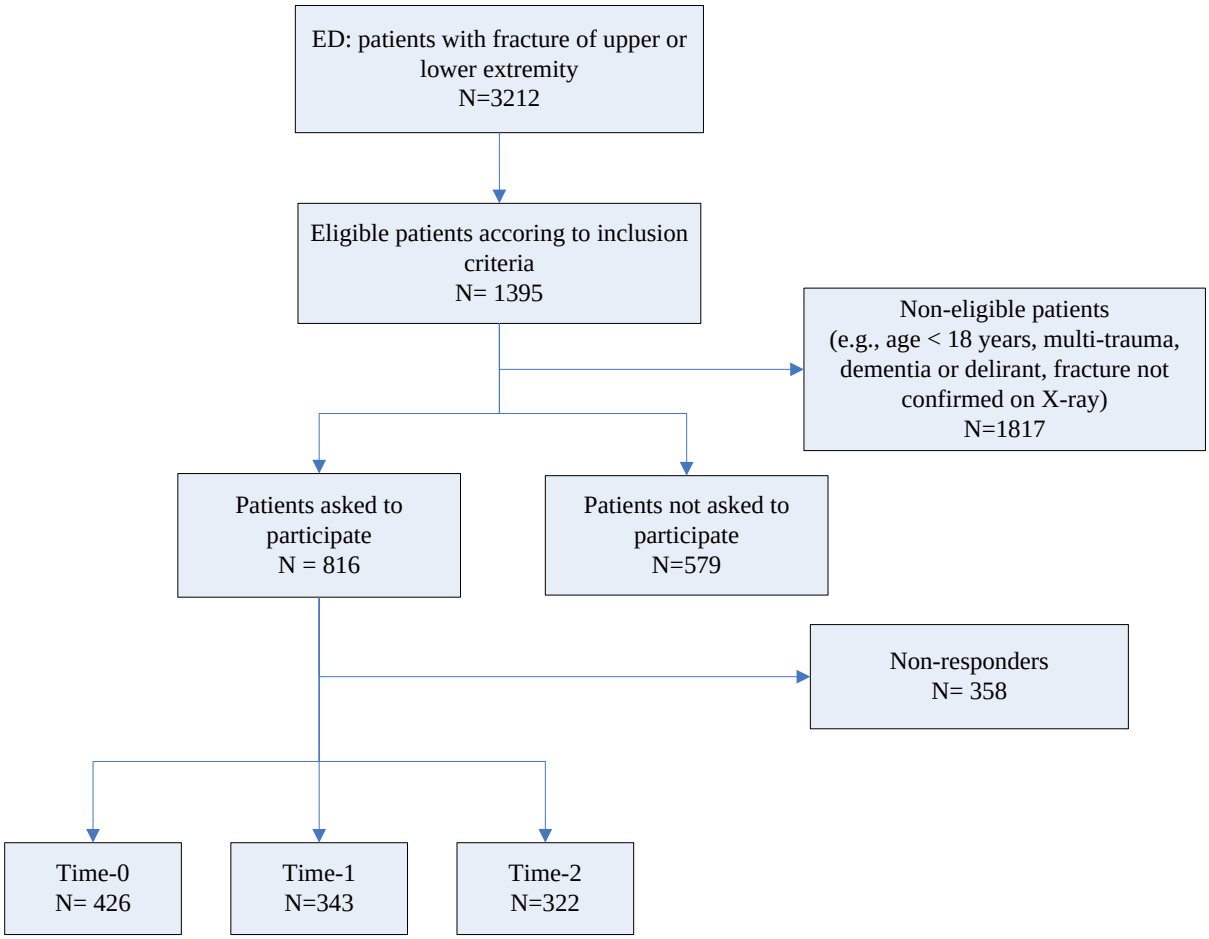
Abbreviations: SMFA, Short Musculoskeletal Function Assessment questionnaire; RAND-36, RAND-36-item Health Survey 1.0; WHOQOL-Bref, World Health Organization Quality of Life assessment instrument-Bref; r, Pearson product-moment correlation coefficient

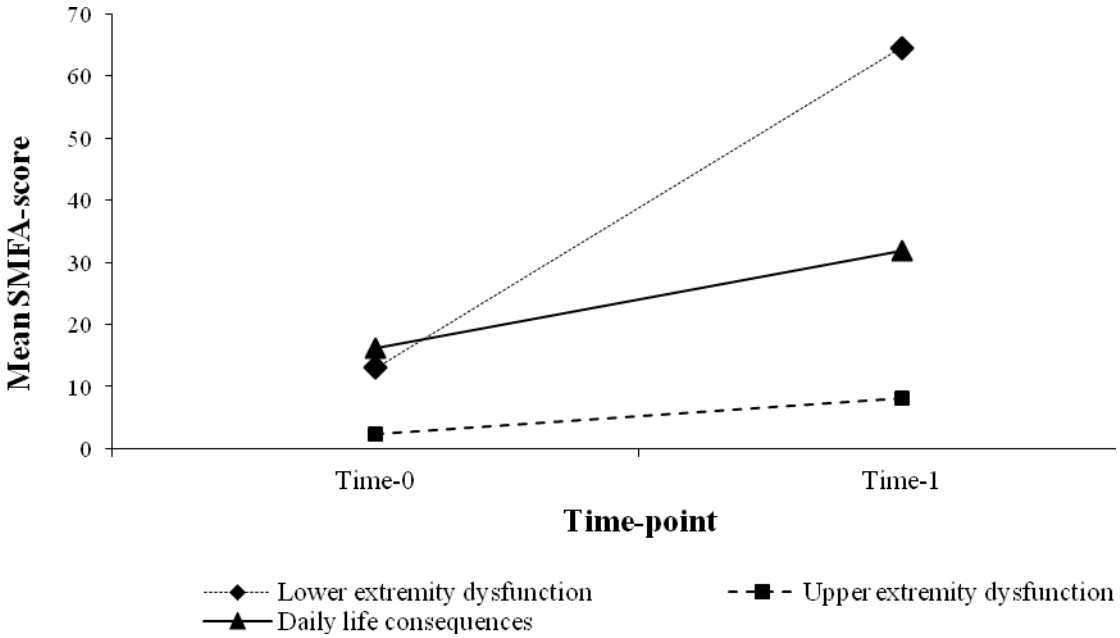
Figure legends

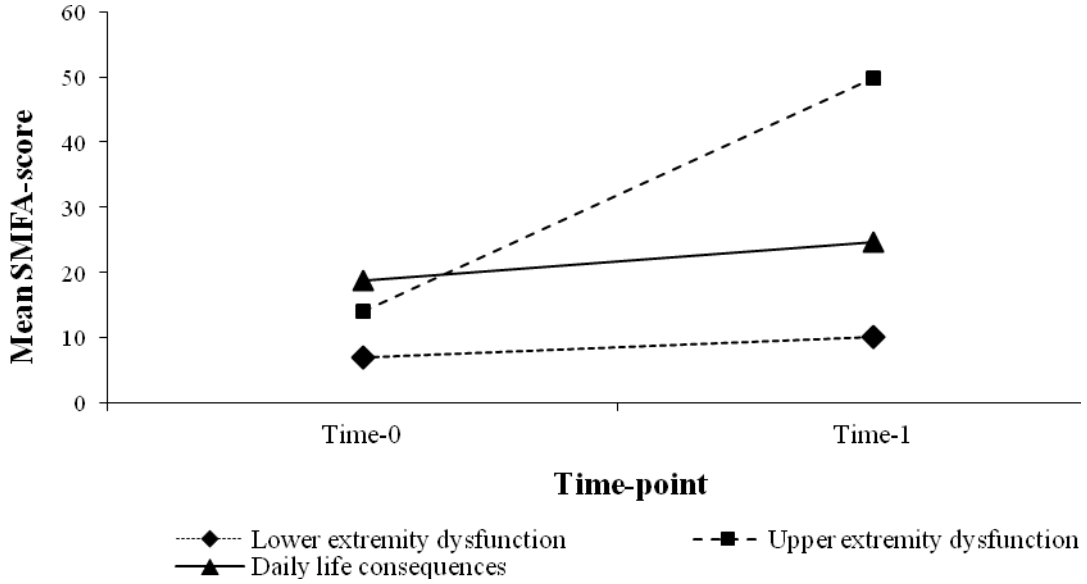
Figure 1 Flow chart of inclusion

Figure 2a Responsiveness in patients with lower extremity fractures

Figure 2b Responsiveness in patients with upper extremity fractures


ED: patients with fracture of upper or lower extremity
N=3212
Eligible patients accoring to inclusion criteria
N= 1395
Non-eligible patients
(e.g., age < 18 years, multi-trauma, dementia or delirant, fracture not confirmed on X-ray)
N=1817
Patients asked to participate
N = 816
Patients not asked to participate
N=579
Non-responders
N= 358
Time-0
N= 426
Time-1
N=343
Time-2
N=322





Abbreviations: Time-0, pre-injury status; Time-1, one week post-fracture
Notes: Higher scores indicate poorer health status or quality of life; Figure 2a and 2b, scores deteriorated from Time-0 to Time-1 on Lower extremity dysfunction ($p<.0001$), Upper extremity dysfunction ($p<.0001$), and Daily life consequences ($p<.0001$).