The Patient-Rated Elbow Evaluation (PREE)© User Manual

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Introduction

What is the Patient-Rated Elbow Evaluation (PREE)?

The PREE is a 20-item questionnaire designed to measure elbow pain and disability in activities of daily living. The PREE allows patients to rate their levels of elbow pain and disability from 0 to 10, and consists of 2 subscales:

1) PAIN subscale (0 = no pain, 10 = worst ever)
   - Pain - 5 items

2) FUNCTION subscale (0 = no difficulty, 10 = unable to do)
   - Specific activities - 11 items
   - Usual activities - 4 items

In addition to the individual subscale scores, a total score can be computed on a scale of 100 (0 = no disability), where pain and functional problems are weighted equally (see "How to Score the PREE" for detailed scoring instructions).

Instrument Development

Designing the PREE

Based on the previously validated and reliable Patient-Rated Wrist Evaluation (PRWE), the PREE was designed to measure elbow pain and disability. The pain items are identical to the PRWE with the term "elbow" replacing "wrist". The "specific activities" items in the function subscale were based on the multi-dimensional Mayo Elbow Performance Index (MEPI) which has been proven to be a valid outcome scale for elbow pathology. Information from biomechanical and clinical literature were also used to generate additional items for the function domain. The "usual activities" items in the function subscale were adapted from the PRWE with the term "elbow" replacing "wrist".

To keep the instrument brief and easy to use in a clinic, the questionnaire format was limited to five pain questions and fifteen function questions. A total score out of 100 can be computed by equally weighting the pain score (sum of five items) and the disability score (sum of fifteen items, divided by 3).

Testing the PREE

For the test-retest reliability study, 50 patients with various elbow pathologies completed a second set of the PREE two to seven days after their clinic visit. The pain subscale's individual items had excellent reliability (ICC = 0.74 to 0.87), whereas the function subscale's individual items demonstrated moderate to high reliability (ICC = 0.60 to 0.88). Both the pain and function subscale scores showed excellent reliability (ICC = 0.88, 0.89, respectively). The highest reliability was demonstrated by the PREE total score (ICC = 0.95).

For the validity study, patients (n=70) with various elbow pathologies completed the PREE, the American Shoulder and Elbow Surgeons Elbow Index (ASES-e), the Disabilities of the Arm, Shoulder, Hand (DASH), and the SF-36 on two separate occasions. High correlations (r = 0.93, 0.96) were found between the PREE and ASES-e pain scales (hypothesis #1). Moderate correlations (r = -0.61, -0.73) were found between the PREE and ASES-e function scales (hypothesis #2). Moderate correlations (r = 0.68 to 0.89) were also found between the PREE subscales and total scores and the DASH (hypothesis #3). The PREE correlated higher with the DASH (r = 0.68 to 0.89) than the SF-36 physical component summary score (r = -0.63 to 0.56) (hypothesis #4). The PREE also correlated higher with the SF-36 physical component summary score (r = -0.63 to 0.56) than the SF-36 mental component summary score (r = -0.23 to 0.23) (hypothesis #5).

(Reference: MacDermid, 2001 [1])

The PREE has been further validated in patients who underwent total arthroplasty (Table 2) and has been used to assess patients with different elbow pathologies (Table 3).

How to Score the PREE

*To minimize nonresponse, check forms once patients complete them.

Computing the Subscales

Pain Score = Sum of the 5 pain items (out of 50) → Best Score = 0, Worst Score = 50

Function Score = Sum of the 15 function items,
Divided by 3 (out of 50) → Best Score = 0, Worst Score = 50

Computing the Total Score

Total Score = Sum of pain + function scores → Best Score = 0, Worst Score = 100

Note: responses to the twenty items are totaled out of 100, where pain and disability are equally weighted

Sample Scoring

1. PAIN

*Rate the average amount of pain in your elbow **over the past week** by circling the number that best describes your pain on a scale from 0 to 10. A **zero (0)** means that you did not have any pain, and a **ten (10)** means that you had the worst pain you have ever experienced.*

Sample scale: 0 1 2 3 4 5 6 7 8 9 10
No Pain Worst Ever

RATE YOUR PAIN:

When it is at its worst 0 1 2 3 4 **5** 6 7 8 9 10

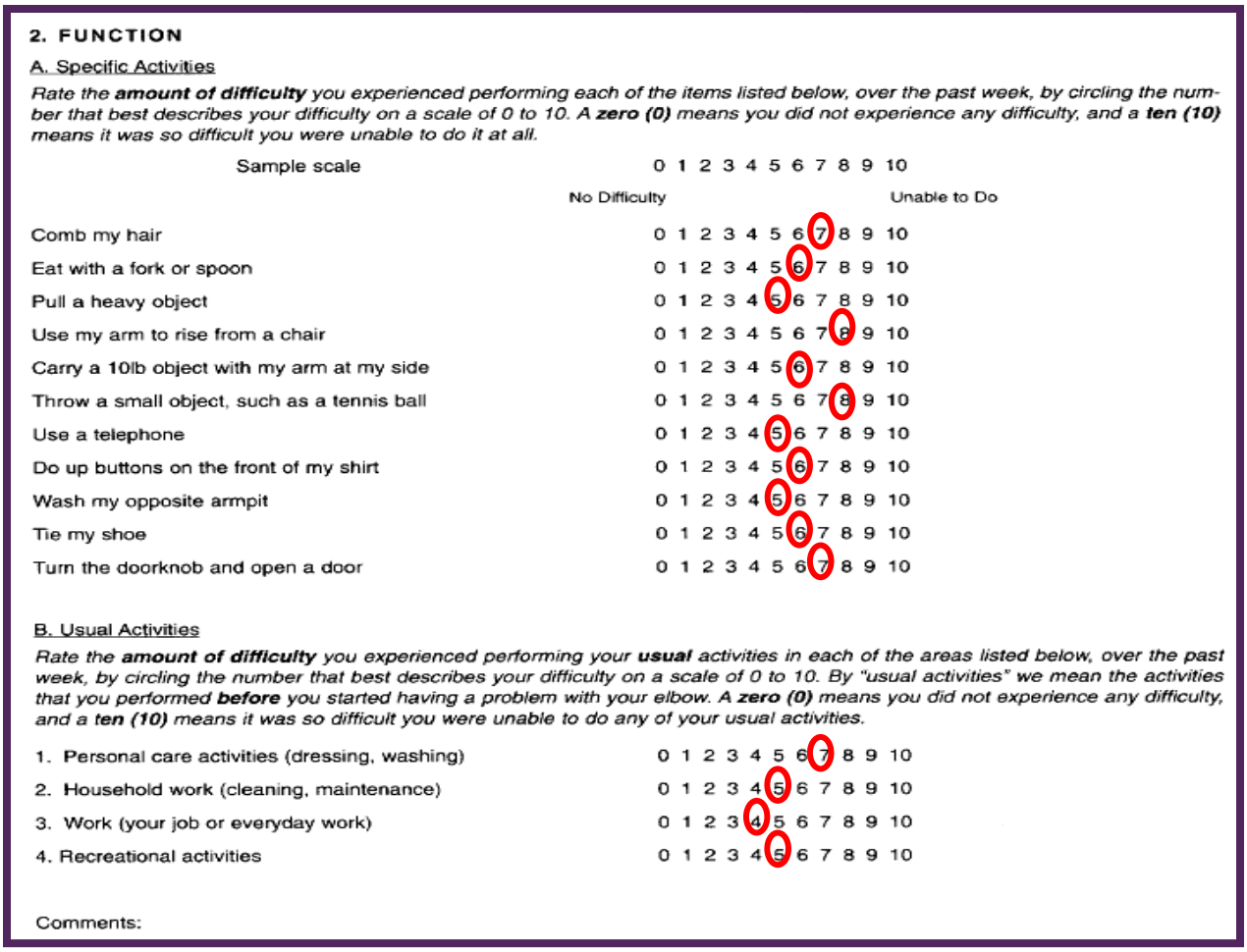
At rest 0 1 2 3 **4** 5 6 7 8 9 10

When lifting a heavy object 0 1 2 3 4 5 6 **7** 8 9 10

When doing a task with repeated elbow movement 0 1 2 3 4 5 6 7 **8** 9 10

How often do you have pain? 0 1 2 3 4 5 6 7 8 **9** 10
Never Always

Pain score = 5 + 4 + 7 +8 +9 = 33/50



2. FUNCTION

A. Specific Activities

*Rate the **amount of difficulty** you experienced performing each of the items listed below, over the past week, by circling the number that best describes your difficulty on a scale of 0 to 10. A **zero (0)** means you did not experience any difficulty, and a **ten (10)** means it was so difficult you were unable to do it at all.*

Sample scale	0 1 2 3 4 5 6 7 8 9 10
	No Difficulty — Unable to Do
Comb my hair	0 1 2 3 4 5 6 **7** 8 9 10
Eat with a fork or spoon	0 1 2 3 4 5 **6** 7 8 9 10
Pull a heavy object	0 1 2 3 4 **5** 6 7 8 9 10
Use my arm to rise from a chair	0 1 2 3 4 5 6 7 **8** 9 10
Carry a 10lb object with my arm at my side	0 1 2 3 4 5 **6** 7 8 9 10
Throw a small object, such as a tennis ball	0 1 2 3 4 5 6 7 **8** 9 10
Use a telephone	0 1 2 3 4 **5** 6 7 8 9 10
Do up buttons on the front of my shirt	0 1 2 3 4 5 **6** 7 8 9 10
Wash my opposite armpit	0 1 2 3 4 **5** 6 7 8 9 10
Tie my shoe	0 1 2 3 4 5 **6** 7 8 9 10
Turn the doorknob and open a door	0 1 2 3 4 5 6 **7** 8 9 10

B. Usual Activities

*Rate the **amount of difficulty** you experienced performing your **usual** activities in each of the areas listed below, over the past week, by circling the number that best describes your difficulty on a scale of 0 to 10. By "usual activities" we mean the activities that you performed **before** you started having a problem with your elbow. A **zero (0)** means you did not experience any difficulty, and a **ten (10)** means it was so difficult you were unable to do any of your usual activities.*

1. Personal care activities (dressing, washing)	0 1 2 3 4 5 6 **7** 8 9 10
2. Household work (cleaning, maintenance)	0 1 2 3 4 **5** 6 7 8 9 10
3. Work (your job or everyday work)	0 1 2 3 **4** 5 6 7 8 9 10
4. Recreational activities	0 1 2 3 4 **5** 6 7 8 9 10

Comments:

Function score = (7+ 6 + 5 + 8 + 6 + 8 + 5 + 6 + 5 + 6 + 7 + 7 + 5 + 4 + 5) / 3 = 30/50

Total score = 33 + 30 = 63/100

Interpretation

- The total PREE score rates pain and disability equally.
- Higher score indicates more pain and functional disability (e.g., 0 = no disability).

Common Questions

1) How are missing data treated?

If there is an item missing, you can replace the item with the mean score of the subscale.

2) What if patients leave the question blank because they cannot do it?

Make sure the patients understand that they should have answered "10" for the item and make corrections, if necessary.

3) What if patients rarely perform the task?

If patients are unsure about how to answer a task that is rarely performed, encourage them to estimate their average difficulty. Their estimate will be more accurate than leaving the question blank.

4) What if patients do not do the task?

If patients never do the task, they should leave the question blank.

Instrument Properties and Outcome Studies

Reliability

Test-Retest Reliability: the stability of the instrument over time.

Validity

Content Validity: the extent to which the instrument adequately covers the concepts of interest.

Construct Validity: the extent to which the instrument corresponds to theoretical constructs.

Criterion/Concurrent Validity: the extent to which the instrument relates with a gold standard or more established measure.

Table 1 – Reliability of the PREE in published studies

Study	Population	Type	PREE Results		Comparators	
MacDermid, 2001 [1]	70 patients (age=49 (16-81); 53% F) with various elbow pathologies	T-R reliability (2-7 days)	(n=50) Pain items ICC = 0.76 to 0.87 Function items ICC = 0.60 to 0.88 Pain subscale ICC = 0.88 Function subscale ICC = 0.89 Total score ICC = 0.95	ASES-e Pain items ICC = 0.68 to 0.82 Function items ICC = 0.58 to 0.84 Pain subscale ICC =0.89 Function subscale ICC = 0.79 Satisfaction ICC = 0.84	DASH ICC = 0.93	SF-36 Subscales ICC = 0.43 to 0.88 SF-36 PCS ICC = 0.90 SF-36 MCS ICC = 0.73
John et al., 2007 [2]	56 patients (age=63.7 (11.4); 66% F) who had undergone elbow arthroplasty (on average 11 years previously)	T-R reliability (3-4 days)	(German PREE) (n=46) Pain items ICC = 0.56 to 0.76 Function items ICC = 0.48 to 0.83 Pain subscale ICC = 0.73 Function subscale ICC = 0.82		None	

Study	Population	Type	PREE Results	Comparators
		I-Reliability	Total score ICC = 0.80 Pain subscale α = 0.93 Function subscale α = 0.95 Total score α = 0.96	

Legend: ICC = intraclass correlation coefficient; T-R reliability = test-retest reliability; I-reliability = internal reliability; α = Cronbach's alpha coefficient

Abbreviations: ASES-e = American Shoulder and Elbow Surgeons Elbow index; DASH = Disabilities of the Arm, Shoulder, Hand; F = female; M = male; SF-36 = 36-Item Short-Form Health Survey

Table 2 – Validity of the PREE in Published Studies

Study	Population	Type	PREE Results		Comparators				
MacDermid, 2001 [1]	70 patients (age=49 (16-81); 53% F) with various elbow pathologies		1st test	2nd test	ASES-e 1st test			ASES-e 2nd test	
		r with ASES-e pain	r = 0.93	r = 0.96					
		r with ASES-e function	r = -0.61	r = -0.73					
		r with DASH	Pain r = 0.71 Function r = 0.78 Total r = 0.85	Pain r = 0.68 Function r = 0.82 Total r = 0.89	Pain r = 0.67 Function r = -0.75			Pain r = 0.72 Function r = -0.65	
		r with SF-36 PCS	Pain r = -0.49 Function r = -0.52 Total r = -0.56	Pain r = -0.63 Function r = -0.57 Total r = -0.55	Pain r = -0.48 Function r = 0.57			Pain r = -0.63 Function r = 0.33	
		r with SF-36 MCS	Pain r = -0.12 Function r = -0.23 Total r = -0.23	Pain r = -0.23 Function r = -0.12 Total r = -0.08	Pain r = -0.27 Function r = 0.10			Pain r = -0.21 Function r = 0.08	
Angst et al., 2005 [3]	79 patients (age=64.1 (24.5-92.3; 56F) who underwent total elbow arthroplasty	Concurrent			DASH	SF-36 PCS	SF-36 MCS	pm-ASES	cm-ASES
		r_s with DASH	r_s = 0.68			r_s = 0.76	r_s = 0.04	r_s = 0.73	r_s = 0.44
		r_s with SF-36 PCS	r_s = 0.59		r_s = 0.76		r_s = -.10	r_s = 0.62	r_s = 0.39
		r_s with SF-36 MCS	r_s = 0.07		r_s = 0.04	r_s = -.10		r_s = 0.02	r_s = -.17

Study	Population	Type	PREE Results			Comparators				
		r_s with pmASES	$r_s = 0.92$				$r_s = 0.62$	$r_s = 0.02$		$r_s = 0.63$
		r_s with cmASES	$r_s = 0.55$			$r_s = 0.73$	$r_s = 0.39$	$r_s = -.17$	$r_s = 0.63$	
		Construct (Factor load)				$r_s = 0.44$				
		Physical unspecific	0.43				0.93	-0.02	0.55	0.14
		Physical specific	0.81			0.86	0.22	0.05	0.77	0.87
		Mental QOL	0.11			0.41	-0.05	0.99	0.07	-0.01
						0.01				
John et al., 2007[2]	56 patients (age=63.7 (11.4); 66% F) who had undergone elbow arthroplasty (on average 11 years previously)	Construct/ concurrent	(German PREE)			None.				
		r_s with SF-36	Pain	Function	Total					
		(Physical functioning)	$r_s = 0.27$	$r_s = 0.64^*$	$r_s = 0.50^*$					
		(Role physical)	$r_s = 0.27$	$r_s = 0.46^*$	$r_s = 0.39$					
		(Bodily pain)	$r_s = 0.49^*$	$r_s = 0.66^*$	$r_s = 0.66^*$					
		(General health)	$r_s = 0.20$	$r_s = 0.32$	$r_s = 0.31$					
		(Vitality)	$r_s = 0.31$	$r_s = 0.29$	$r_s = 0.32$					

Study	Population	Type	PREE Results			Comparators
		(Social functioning)	$r_s = 0.31$	$r_s = 0.31$	$r_s = 0.34$	
		(Role emotional)	$r_s = 0.16$	$r_s = 0.26$	$r_s = 0.22$	
		(Mental health)	$r_s = 0.32$	$r_s = 0.16$	$r_s = 0.26$	
		(SF-36 PCS)	$r_s = 0.32$	$r_s = 0.67^*$	$r_s = 0.57^*$	
		(SF-36 MCS)	$r_s = 0.11$	$r_s = -0.12$	$r_s = -0.02$	
		r_s with DASH	$r_s = 0.45$	$r_s = 0.87$	$r_s = 0.73$	
		(Symptoms)	$r_s = 0.61^*$	$r_s = 0.72^*$	$r_s = 0.73^*$	
		(Function)	$r_s = 0.32$	$r_s = 0.83^*$	$r_s = 0.65^*$	
		r_s with emASES	$r_s = 0.04$	$r_s = 0.35^*$	$r_s = 0.24^*$	
		(Motion)	$r_s = 0.15$	$r_s = 0.03$	$r_s = 0.06$	
		(Stability)	$r = -0.03$	$r = 0.13$	$r_s = 0.08$	
		(Strength)	$r_s = 0.36$	$r_s = 0.38$	$r_s = 0.40^*$	
		(Grip strength)	$r = 0.04$	$r = 0.48^*$	$r = 0.29$	
		(Signs & symptoms)	$r_s = 0.48^*$	$r_s = 0.51^*$	$r_s = 0.54^*$	

Legend: r = Pearson correlation coefficient; r_s = Spearman's correlation coefficient; M = male, F = female; * = $p < 0.001$

Abbreviations: cmASES = clinical modified American Shoulder and Elbow Surgeons; DASH = Disabilities of the Arm, Shoulder, Hand; F = female; M = male; pmASES = patient modified American Shoulder and Elbow Surgeons; QOL = Quality of Life; SF-36 MCS = SF-36 Mental Component Score; SF-36 PCS = SF-36 Physical Component Score

Table 3 - Comparative Scores of the PREE

Study	Population	Follow-up Time	PREE Results Mean (SD)	Other Comparators			
El-Hawary et al., 2003 [4]	Patients with distal bicep tendon repair underwent 1-incision (n=9; age=47 (37-60)) or 2-incision surgery (n=10; age=44 (29-60))	Pre-operative	1-incision group = 48 (19-85) 2-incision group = 33 (8-51)	None			
Angst et al., 2005[3]	79 patients (age=64.1 (24.5-92.3; 56F)) who underwent total elbow arthroplasty		Pain = 71.2 (26.6) Function = 62.4 (26.2) Total = 66.8 (23.2)	SF-36 Subscales = 45.1 to 80.7 SF-36 PCS = 37.2 (12.0) SF-36 MCS = 52.3 (11.5)	DASH Symptoms = 66.1 (22.8) Function = 51.1 (25.2) Total = 55.3 (23.3)	pmASES Pain = 69.6 (27.0) Function = 57.4 (25.6) Satisfaction = 81.0 (26.6) Total = 63.1 (22.6)	cmASES Subscales = 12.5 to 89.8 Total = 68.1 (7.8)
Dubberley et al., 2006 [5]	28 patients (age=43) underwent open reduction internal fixation for capitellar and trochlear fractures	56 months	Total = 16 (21)	SF-36 PCS = 46 (13) MCS = 50 (12)	ASES Function = 29 (9)	MEPI Pain = 39 (9) Function = 24 (5) Motion = 19 (2) Stability = 10 (1) Total = 91 (11)	
Goldhan et al., 2007[6]	Patient (age = 46; F) with 23-year history of rheumatoid arthritis and presentation of	Pre-operative	Pain = 52 Function = 14.7	SF-36 Physical function = 55 Physical role =	DASH Symptoms = 54.2 Function = 37.5	SPADI Pain = 43.6 Function = 27.3	Physical Examination (Elbow) Arc flexion-extension = 75^{o}

Study	Population	Follow-up Time	PREE Results Mean (SD)	Other Comparators			
	severely destructed right should/ elbow/ wrist joints		Total = 33.3	50 Bodily pain = 41 General health = 47 Vitality = 50 Social function = 63 Emotional role = 100 Psych. Health = 88 PCS = 30.7 MCS = 58	Total = 40.8	Total = 35.4	Pronation = 30^{o} Supination = 0^{o} (Shoulder) anteflexion = 110^{o} ER at 0^{o} abduction = 40^{o} ER at 90 abduction = 60^{o} IR at 90^{o} abduction = 20^{o} IR with arms at side = 10^{o}
		Post-operative (6 months)	Pain = 88 Function = 93.3 Total = 90.7	Physical function = 55 Physical role = 75 Bodily pain = 62 General health = 82 Vitality = 65	Symptom = 75 Function = 57.3 Total = 60.8	Pain = 81.8 Function = 77.3 Total = 80	(Elbow) Arc flexion-extension = 140^{o} Pronation = 45^{o} Supination = 50^{o} (Shoulder) anteflexion = 135^{o}

Study	Population	Follow-up Time	PREE Results Mean (SD)		Other Comparators		
					Social function = 88 Emotional role = 100 Psych. Health = 88 PCS = 40.6 MCS = 60.7		ER at 0° abduction = 40° ER at 90 abduction = 70° IR at 90° abduction = 45° IR with arms at side = 40°
John et al., 2007[2]	56 patients (age=63.7 (11.4); 66% F) who had undergone elbow arthroplasty (on average 11 years previously)	Post-operative	(German PREE) Pain = 14.8 (13.2) Function = 16.7 (12.8) Total = 31.5 (23.8)		None.		
Weitoft et al., 2010[7]	90 patients with rheumatoid arthritis and elbow synovitis who were treated with intraarticular triamcinolone hexacetonide and were randomized to: i) normal activity (n=46; age=63 (23-86); 65% F); ii) immobilization in a triangular sling (n=44; age=64 (17-85); 84% F)	Baseline Post-operative (1 week) (3 months)	Activity group Pain = 31 (10.6) Function = 57.5 (27.6) Pain = 14 (13.2) Function = 26 (23.1) Pain = 14	Rest group Pain = 31 (11.5) Function = 57 (23.8) Pain = 16 (10.3) Function = 27 (23.4) Pain = 17	Ossur goniometer+ (degrees) Baseline Post-operative (1 week) (3 months)	Activity group 156 (10.6) 14 (12.9) 15 (20.2)	Rest group 156 (13.2) 12 (10.3) 14 (11.4)

Study	Population	Follow-up Time	PREE Results Mean (SD)		Other Comparators		
			(15.1)	(12.0)			
			Function = 26 (27.5)	Function = 30 (26.6)			
		(6 months)	Pain = 17 (13.9)	Pain = 16 (12.7)	(6 months)	18 (22.4)	15 (11.3)
			Function = 31 (27.1)	Function = 29 (26.3)			

Abbreviations: cmASES = clinical modified American Shoulder and Elbow Surgeons; DASH = Disabilities of the Arm, Shoulder, Hand; F = Female; M = Male; MEPI = Mayo Elbow Performance Index; pmASES = patient modified American Shoulder and Elbow Surgeons; SF-36 MCS = SF-36 Mental Component Score; SF-36 PCS = SF-36 Physical Component Score; SPADI = Shoulder Pain and Disability Index; ER= external rotation; IR = internal rotation; $^{+}$ = device that measures mobility (maximum elbow extension)

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