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ORIGINAL ARTICLE

Cross-cultural adaptation, validity, and reliability of the Turkish version of the Patient-Rated Elbow Evaluation

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Abstract

Introduction The Patient-Rated Elbow Evaluation (PREE) is a joint-specific, self-administered outcome measure used to determine the level of pain and disability in patients with various elbow pathologies. The aim of this study was to cross-culturally adapt the PREE into Turkish (PREE-T) and to test its reliability and validity.

Methods Fifty-nine patients with elbow disorders were included in the present study. The original version of the PREE was translated and culturally adapted into Turkish by following standard procedure. Test-retest reliability and internal consistency were determined using intraclass correlation coefficient and Cronbach's alpha, respectively. Construct validity of PREE-T was determined with Disabilities of the Arm, Shoulder, and Hand (DASH) and Short Form-36 (SF-36) questionnaires by using Pearson's correlation coefficient analysis. Floor and ceiling effects were also analyzed.

Results A high internal consistency (Cronbach's alpha of 0.959) and an excellent test-retest reliability (the intraclass correlation coefficient of 0.970) indicated that the PREE-T was reliable. Neither floor nor ceiling effects were observed in sub-parameters (0–1.7%) and the total score (0%) of PREE-T. Correlation coefficients between the PREE-T total score and DASH disability/symptom and work sub-parameters were 0.636 and 0.461, respectively. PREE-T pain and function sub-parameters correlated with related sub-parameters of the SF-36 bodily pain ($r = -0.721$) and physical functioning ($r = -0.263$).

Conclusion The Turkish version of the PREE is a valid and reliable outcome measure for assessing patients with elbow disorders. It is recommended to be used in research and clinical settings.

Key Points
- *The Turkish version of the Patient-Rated Elbow Evaluation was successfully translated into Turkish and validated in a population with various elbow pathologies according to established guidelines*
- *The Turkish version of the Patient-Rated Elbow Evaluation has high internal consistency and test-retest values*
- *The Turkish version of the Patient-Rated Elbow Evaluation is valid and reliable*

Keywords Elbow · Outcome measure · Reliability · Validity

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Introduction

Outcome measures are essential to evaluate patients' functional status and quality of life. They can be accomplished either by functional and clinical tests or by questionnaires. In recent years, there has been a growing interest in the development of a more patient-centered approach to evaluating treatment outcomes. In this respect, questionnaires are a quick and efficient way to obtain the patients' self-assessment of their symptoms and concerns [1–3]. For elbow disorders, the clinician is provided with a fair amount of assessment tools [2]. They have traditionally consisted of objective measurements such as range of motion, muscle strength, and stability as well as subjective ones, namely pain, and function. However, only a few of these have been validated for reliability and responsiveness [3].

Among these questionnaires, the Patient-Rated Elbow Evaluation (PREE) questionnaire is one of the most commonly used elbow self-report pain and disability outcome measures used in clinical practice and research. It is composed of 20 questions rating the intensity of symptoms and the extent of functional impact using a numerical rating scale from zero to ten. The questionnaire was found to be valid and reliable in patients with various elbow pathologies [4]. Vincent et al. [5] indicated that the PREE is aligned with the International Classification of Functioning Disability and Health (ICF) framework and the core sets for elbow conditions. Furthermore, the cross-cultural adaptation of the PREE has been done for many languages; however, its adaptation into the Turkish language has not been done yet [6–9]. Therefore, the aim of the present study is to translate and culturally adapt the PREE into the Turkish and to investigate its reliability and validity.

Materials and methods

The required permission has been obtained from the original author of the scale (Joy MacDermid) via e-mail. The translation and cultural adaptation were carried out according to the procedure established by Beaton et al. [10]. Fifty-nine patients with various elbow disorders from the outpatient rehabilitation clinic were recruited and completed the questionnaire (Fig. 1). Demographic and clinical characteristics of the patients are summarized in Table 1. The test-retest analysis was performed with all patients in a 7-day interval, and they received no treatment during these 7 days. This study was approved by the Ethics Committee of Gazi University (77082166-604.01.02/14). Informed consent was obtained from all participants.

Subjects

The inclusion criteria were as follows:

- Patients who were literate in Turkish
- Patients between the ages of 18–65 years and with elbow disorder

The exclusion criteria were as follows:

- Patients with cognitive impairment
- Patients with neurological disorders
- Patients with dysfunctions in other structures of the upper limb

Translation and cultural adaptation procedure

- Forward translation of the English version of the PREE into Turkish was performed by two independent, bilingual translators (one medical healthcare professional and one non-medical translator).
- All two versions were discussed and combined in a consensus meeting to provide a preliminary Turkish version.
- The preliminary Turkish version was translated back to English by two independent, native English bilingual translators (non-medical translators). Both translators had no knowledge of the research concepts and no access to the original English version.
- The back-translated version of the PREE was compared with the initial English version of the PREE by a committee consisting of the two translators.
- The committee composed of all translators came together to discuss the final version of the questionnaire. A minor variation was made to the Turkish version. As the "pound" weight system is not used in Turkey, the phrase "carry a10-Ib objects with my arm at my side" was revised as "carry a 4.5-kg object with my arm at my side." After discussing the discrepancies, the committee approved the Turkish version of the PREE (PREE-T).
- The comprehensiveness of the questionnaire was tested in a pilot group of 20 people consisting of 10 patients with elbow disorders and 10 healthy individuals, and they were asked to rate the comprehensibility of each item in the scale.
- The subjects found the whole question to be comprehensible, and then, the final form of the questionnaire was established by the translation committee. Supplementary Table 1. Turkish version of the PREE (in Turkish language).

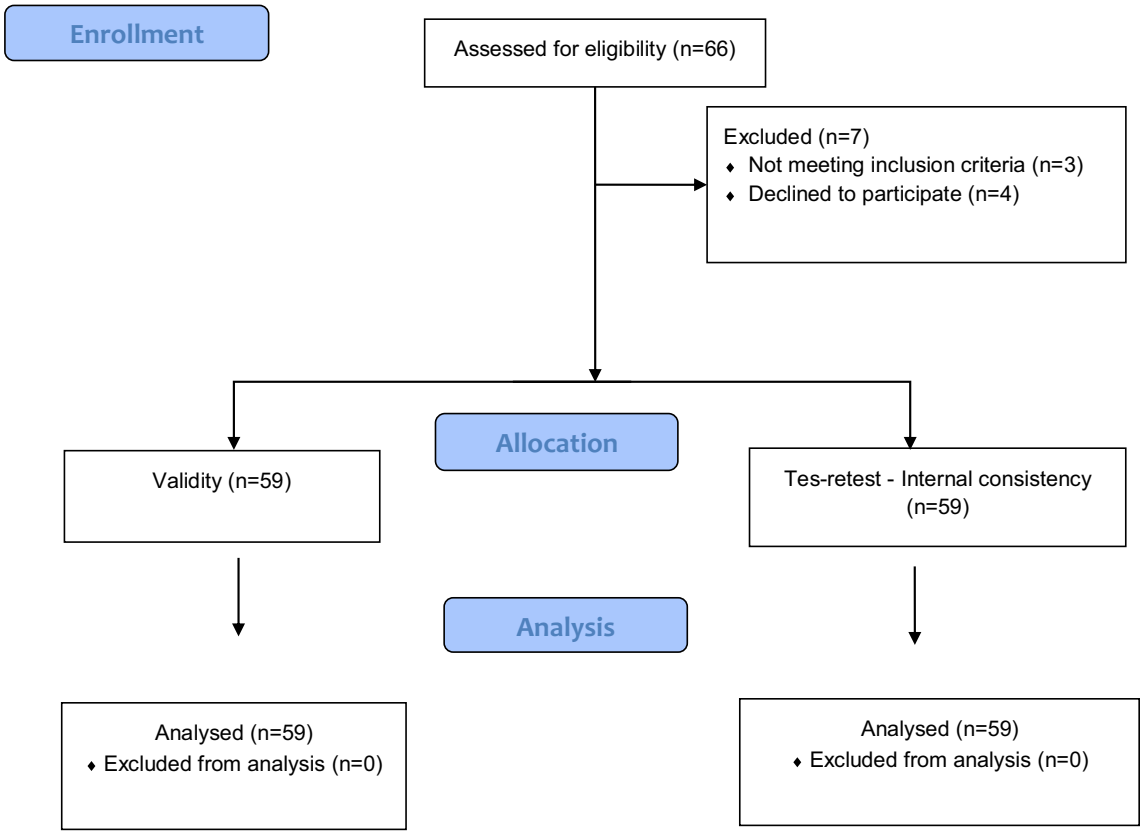

Fig. 1 Flow diagram of the patients

Outcome measures

Patient-Rated Elbow Evaluation

The PREE is a 20-item questionnaire designed to measure elbow pain and disability in activities of daily living. The PREE consists of 2 subscales pain (5 items) and function (specific activities 11 items and usual activities 4 items). All items on the questionnaire are scored on a 0 to 10 numeric pain rating scale (0 = no pain/difficulty; 10 = worst ever/unable to do). The total score ranges from 0 to 100, with a higher score reflecting the greater the pain and disability [4].

Disabilities of the Arm, Shoulder, and Hand

The Disabilities of the Arm, Shoulder, and Hand (DASH) is a 30-item patient-reported questionnaire that determines impairments and activity limitations, as well as participation restrictions in both leisure activities and work due to disorders of the upper extremity. There are optional components that can be added to evaluate the function with respect to sports and performing arts or work. There are 5 response options for each item, from 1 (no difficulty to perform, no symptom, or no impact) to 5 (unable to do, very severe symptom, or high impact). The total DASH score ranges from 0 (no disability) to 100 (severe disability), with higher DASH scores indicating greater disability [2]. Düger et al. [11] adapted the DASH into Turkish and found it is valid and reliable.

Short Form Health Survey

Short Form-36 (SF-36) is a self-assessment questionnaire consists of 36 items with 8 subscales (physical functioning, social functioning, role limitations due to physical problems, bodily pain, general health perception, vitality, role limitations due to emotional problems and mental health). Each subscale score ranges from 0 to 100, and higher scores represent better health (less disability). The Turkish version of SF-36 was found valid and reliable [12, 13].

Statistical analysis

All statistical analyses were performed using the Statistical Package for the Social Sciences 22.0 (SPSS ® 22.0, Chicago, IL, USA). The analyses were expressed as mean ± standard deviation and percentages. Test-retest and internal consistency analyses were performed to determine the reliability of the PREE. Intraclass correlation coefficient (ICC) (95% confidence interval) was used for test-retest value, and

Table 1 Demographic and clinical characteristics of the patients

		$n = 59$
Age ($X \pm$ SD)		38.81 ± 13.72
Gender (n) (%)		
	Female	33 (55.9)
	Male	26 (44.1)
Affected elbow (n) (%)		
	Dominant	33 (55.93)
	Non-dominant	26 (44.07)
Pain duration (month) (n) (%)		
	< 1	10 (16.95)
	1–6	32 (54.24)
	6–12	10 (16.95)
	> 12	7 (11.86)
Employment (n) (%)		
	Working	31 (52.54)
	Not working	26 (44.07)
	Pensioner	2 (3.39)
Elbow disorders (n) (%)		
	Lateral epicondylitis	9 (15.3)
	Medial epicondylitis	5 (8.5)
	Fracture	15 (25.4)
	Cubital tunnel syndrome	8 (13.6)
	Osteoarthritis	2 (3.4)
	Rheumatoid arthritis	7 (11.9)
	Joint contracture	7 (11.9)
	Olecranon Bursitis	3 (5.1)
	Ligament sprain	1 (1.7)
	Other	2 (3.4)

Cronbach's alpha was utilized for the internal consistency analysis. Cronbach alpha value was considered excellent for above 0.70. ICC values less than 0.4, between 0.4 and 0.74, and greater than 0.75 are indicative of poor, moderate, and good reliability, respectively [14]. Construct validity of the questionnaire was assessed by convergent validity. For convergent validity of the scale, the PREE-T total score and its subscales were correlated by Pearson's correlation coefficient with the total scores of the DASH and SF-36 and related subscales. For the Pearson correlation coefficient, 0.81 to 1.00, 0.61 to 0.80, 0.41 to 0.60, 0.21 to 0.40, and 0 to 0.20 were assumed to be indicating excellent, very good, good, poor, and no correlation, respectively [15, 16]. The statistical significance level was accepted as $p < 0.05$.

Results

No major difficulties were encountered during the translation and cultural adaptation process. In the original version of the PREE, "pound" was used as weight unit in question 10. However, "kilogram" is used as the weight unit in Turkey, so "pound" was converted to "kilogram" by the committee.

As a result of the internal consistency analysis, Cronbach's alpha coefficient was found to be 0.959 (Table 2). This value indicates that the scale has a high level of internal consistency. Further analyses were conducted to determine the contribution of items to the internal consistency of the questionnaire. Cronbach alpha value decreased when each item was excluded, except items 10 and 19 (Table 3). This indicates that the items contribute to the internal consistency of the questionnaire.

For the test-retest analysis of the PREE, ICC value of each item, except item 2 (0.402), was found high (Table 4). Similarly, high ICC values were recorded in pain (0.924) and function (0.989) sub-parameters and the total score of the questionnaire (0.970).

The floor and ceiling effects of the PREE-T are shown in Table 5. When the floor-ceiling effect was computed separately for each question, no floor effects were found. However, the ceiling effects were observed in 10 items (items 2, 6, 7, 12–17, 20). Nevertheless, there were no floor and ceiling effects in pain and function sub-parameters and in the total score of PREE-T.

Convergent validity revealed that the pain sub-parameter of the PREE had a very good correlation with the SF-36 bodily pain sub-parameter (0.721). Function sub-parameter of the PREE was found to be statistically significant but weak correlation with SF-36 physical function sub-parameter (−0.263), good correlation with DASH work sub-parameter (0.418), and very good correlation with DASH disability/symptom sub-parameter (0.638). The total score of the PREE was shown to have a good–very good correlation with DASH parameters (0.461–0.636). The detailed analysis is shown in Table 6.

Discussion

The aim of the present study is to determine the validity and reliability of the Turkish version of the PREE in patients with elbow disorders. The cross-cultural adaptation was successfully completed, and according to the statistical results, the PREE-T is a valid and reliable assessment tool for patients with elbow disorders in the Turkish population.

Table 2 Internal consistency of PREE-T

PREE	Cronbach's alpha
Pain	0.963
Function	0.944
Total	0.959

Table 3 Cronbach's alpha coefficient when each item in the PREE-T questionnaire was omitted

Item	Cronbach's alpha when item is deleted	Item	Cronbach's alpha when item is deleted
Item 1	0.956	Item 11	0.958
Item 2	0.958	Item 12	0.957
Item 3	0.955	Item 13	0.957
Item 4	0.955	Item 14	0.957
Item 5	0.956	Item 15	0.956
Item 6	0.958	Item 16	0.956
Item 7	0.957	Item 17	0.958
Item 8	0.956	Item 18	0.959
Item 9	0.954	İtem 19	0.958
Item 10	0.959	Item 20	0.958

The internal consistency analysis of the PREE-T was evaluated by Cronbach alpha value, and it was found as 0.959. This value indicates that the PREE-T is quite reliable. In previous studies, Cronbach alpha values of the PREE were analyzed and found as 0.96 in the German version [6], 0.97 in the Japanese version [8], and 0.91 in the Persian version [9]. The internal consistency of the PREE-T could not be discussed as the original PREE does not report this coefficient [4]. The Cronbach alpha value of the PREE- T was found to be reliable, similar to the German, Japanese, and the Persian version. As a result, it is possible to say that the Turkish version of the PREE has a high level of internal consistency.

Test-retest reliability of the PREE-T was determined using the ICC with 7 days between each administration of the questionnaire and it was found as 0.97. ICC value was found as 0.95 in the original version of the PREE [4], 0.80 in the German version [6], 0.89 in the French version [7], 0.94 in the Japanese version [8], and 0.98 in the Persian version [9]. ICC value of the PREE-T was found to be quite high similar to the versions in other languages. When the ICC value for each sub-parameter of PREE was analyzed, it was found as 0.92 for pain sub-parameter and 0.98 for the function sub-parameter. In the original version, the ICC value for the sub-parameters was 0.88 and 0.89 [4], while it was between 0.73 and 0.82 in the German version [6], between 0.92 and 0.93 in the Japanese version [8], and between 0.95 and 0.97 in the Persian version [9]. ICC value for each question of the PREE-T varied between 0.402 and 0.999. ICC value for each question of PREE-T could not be discussed as the original PREE or the other version does not report this value [4, 6–8]. Considering the ICC values for each question, sub-parameters and the total score of the questionnaire, it is possible to say that the PREE-T is stable over time.

Floor and ceiling effects are significantly available if more than 15% of the subjects received lower or higher scores, respectively [17]. Neither floor nor ceiling effects were observed in the sub-parameters and in the total score. The floor and ceiling effects were not reported in the original [4], Japanese [8], and the Persian version of PREE [9]. When the floor-ceiling effect for each question of PREE was analyzed, no floor effect was found. In contrast, the ceiling effects were found for 10 items (one item for pain subscale and nine items for function subscale). In the German PREE, eight patients were shown to achieve the best possible score for pain subscale, three patients for function subscale, and three for the total score. It may reflect the narrow discriminating capacity

Table 4 Intraclass correlation coefficient (ICC) for the test-retest reliability of the PREE-T

Item	ICC	(%95 confidence interval) (lower-upper bound)	Item	ICC	(%95 confidence interval) (lower-upper bound)
Item 1	0.965	0.941–0.979	Item 11	0.978	0.963–0.987
Item 2	0.402	0.006–0.644	Item 12	0.998	0.996–0.999
Item 3	0.970	0.949–0.982	Item 13	0.978	0.963–0.987
Item 4	0.989	0.982–0.994	Item 14	0.975	0.958–0.985
Item 5	0.984	0.973–0.990	Item 15	0.823	0.702–0.894
Item 6	0.992	0.987–0.995	Item 16	0.925	0.875–0.956
Item 7	0.986	0.976–0.991	Item 17	0.999	0.998–0.999
Item 8	0.968	0.946–0.981	Item 18	0.969	0.947–0.981
Item 9	0.982	0.969–0.989	Item 19	0.979	0.964–0.987
Item 10	0.963	0.938–0.978	Item 20	0.904	0.839–0.943

Table 5 Floor and ceiling effects of PREE-T

Item	Floor effect (%)	Ceiling effect (%)	Item	Floor effect (%)	Ceiling effect (%)
Item 1	10.2	5.1	Item 11	3.4	5.1
Item 2	1.7	39	Item 12	3.4	66.1
Item 3	5.1	1.7	Item 13	0	69.5
Item 4	6.8	6.8	Item 14	3.4	78
Item 5	3.4	1.7	Item 15	1.7	72.9
Item 6	5.1	81.4	Item 16	1.7	30.5
Item 7	1.7	57.6	Item 17	1.7	64.4
Item 8	5.1	3.4	Item 18	1.7	1.7
Item 9	1.7	13.6	Item 19	1.7	1.7
Item 10	6.8	3.4	Item 20	0	30.5
Pain	1.7	0	Function	0	0
Total	0	0			

of these PREE domains in the studied population. Some selection bias might have played a role, as patients had to be physically and mentally fit to participate.

In the present study, the convergent validity of the total score of the PREE was assessed by the Pearson correlation coefficient. The convergent validity of the PREE-T total score with DASH sub-parameters was determined as 0.461 and 0.636. These values suggest that the correlation of the PREE-T with DASH was at a good–very good level. PREE and DASH score values were reported to have a strong correlation in the original version [4] and the Japanese version [8], very good correlation in the German version [6], and moderate correlation in the Persian version [9]. Convergent validity revealed that the pain sub-parameter of the PREE-T had a very good correlation with the SF-36 bodily pain sub-parameter.

Table 6 Correlation between PREE-T and DASH and SF-36 questionnaires

PREE-T	Pain sub-parameter *r*	Function sub-parameter *r*	Total score *r*
SF-36 PF	− 0.450**	− 0.263*	− 0.395**
SF-36 RP	− 0.456**	− 0.427**	− 0.475**
SF-36 RE	− 0.377**	− 0.360**	− 0.397**
SF-36 VT	− 0.394**	− 0.033	− 0.253
SF-36 MH	− 0.218	0.001	− 0.131
SF36 SF	− 0.202	− 0.076	− 0.158
SF-36 BP	− 0.721**	− 0.572**	− 0.703**
SF-36 GH	− 0.137	0.191	0.007
DASH-DS	0.559**	0.638**	0.636**
DASH-W	0.438**	0.418**	0.461**

PF Physical Functioning, *RP* Role Physical, *RE* Role Emotional, *VT* Vitality, *MH* Mental Health, *SF* Social Functioning, *BP* Bodily Pain, *GH* General Health, *DASH-DS* Disability/symptom scale of DASH, *DASH-W* Work module of DASH

*$P < 0.05$; ** $P < 0.001$

Function sub-parameter of the PREE-T was found to be a weak correlation with SF-36 physical function sub-parameter. This result was expected to be achieved since SF-36 is more related to the general health condition, rather than being disorder specific. Similarly, PREE and SF-36 bodily pain and physical functioning were reported to have a moderate correlation in the original version [4], German version [6], Japanese version [8], and the Persian version [9]. These results are very similar to the correlation values recorded in the other related version studies, and the results support each other.

This study has some limitations which have to be pointed out. The responsiveness analysis which is an important parameter in determining the sensitivity to clinical changes of questionnaires was not conducted in our study. Another limitation of the present study was the untested factor analysis which evaluates construct validity from another aspect. Further studies are necessary in order to test responsibility and factor analyses to support the clinical significance of the PREE-T.

The strength of this study is that using the standard procedure in translation and cultural adaptation and psychometric assessment of the PREE-T. This consequently expands the available specific number of patient-reported outcome measures for Turkish-speaking patients and professions.

Conclusion

As a result of this study, the PREE was successfully translated and cross-culturally adapted into Turkish and it was shown that it presented acceptable psychometric properties of reliability and validity consistent with the original version. The Turkish version of the PREE has high test-retest and internal consistency, sufficient test-retest reliability, and high convergent validity. Therefore, the Turkish version of the PREE is found to be reliable and valid in patients with elbow disorders. PREE-T can use to measure elbow pain and disability in

activities of daily living in patients with affected elbow region and population speaking Turkish.

Compliance with ethical standards

Disclosures None.

Human and animal rights statement All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from all individual participants included in the study.

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