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Original Article

Cross-cultural adaptation and validation of the Turkish version of the Functional Index for Hand Osteoarthritis (FIHOA)

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ABSTRACT

Background: To perform reliability and validity study of the Functional Index for Hand Osteoarthritis (FIHOA) in the Turkish language.
Methods: FIHOA was translated into Turkish following the principles of cross-cultural adaptation. Our translation was firstly tested in 40 patients with hand osteoarthritis. Adapted FIHOA questionnaire was then administrated to 100 hand OA patients successively with Modified Health Assessment Questionnaire (mHAQ), Numerical Rating Scale (NRS), and Short Form-36 (SF-36). Patients filled out the FIHOA questionnaire one more time after five days for test-retest assessment. Patients were divided into two groups as symptomatic or asymptomatic, with a NRS score of 5 or above defining symptomatic OA. Internal consistency was assessed by Cronbach's alpha and intraclass correlation coefficient (ICC) of test-retest reliability. Spearman correlation analysis was used to determine the correlation and validity between data. External construct validity was assessed using the correlation between FIHOA, mHAQ, hand pain NRS, and negative correlation with SF-36 subgroups.
Results: According to the total score, Cronbach-alpha was found as 0.90, while ICC was determined as 0.98 for test-retest reliability. When the correlations between the FIHOA questionnaire, mHAQ, and NRS questionnaires were examined, significant correlations were determined, and negative correlations between FIHOA and SF-36 subgroups were observed.
Conclusion: Turkish FIHOA is a reliable and valid method for assessing functionality in Turkish patients with hand osteoarthritis.

1. Introduction

Osteoarthritis is a progressive disease with a high prevalence causing damage to the involved joints [1,2]. The most common sites involved are hip, knee, and hand [2,3]. Hand osteoarthritis is a common illness and is mainly seen in women and leads to pain and significant functional restriction due to hand involvement [4]. As described by the American College of Rheumatology and other teams, hand osteoarthritis has a high burden on quality of life, pain, morning stiffness, decreased range of motion, and deformity on hands. Therefore, it is essential to assess the functional capacity of patients with hand osteoarthritis [5]. Several questionnaires have been developed to measure pain and functional capacity in hand osteoarthritis [6]. FIHOA, a 10-item questionnaire, was developed by Dreiser and Maheu et al. in the early 90s in French, and its English validated version was published in 1995 [7]. It is the first questionnaire to be developed for hand osteoarthritis. FIHOA is a valid and reliable questionnaire, which internal and external reliability was verified in 1995 [7]. Its interobserver reproducibility was assessed in 1997 [8], and its sensitivity to change was published in 2000 [9].

The Functional Index for Hand Osteoarthritis has been translated into 20 languages until now. The validity and reliability of linguistic adaptations of the FIHOA have been studied and

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published in Dutch, Persian, Italian, Norwegian, Korean, Japanese, and Arabic [10–16]. However, there is not any validated Turkish version of the FIHOA. This study aimed to translate FIHOA into Turkish and assess the reliability and validity of our cross-culturally adapted Turkish version.

2. Materials and methods

2.1. Participants

This observational study included 115 outpatients with bilateral hand osteoarthritis admitted to the Physical Medicine and Rehabilitation outpatient clinic of the corresponding author's University between February and December 2018. The criteria specified for including patients in the study were as follows: a) To speak Turkish as native language; b) To be diagnosed with hand osteoarthritis according to ACR criteria [17]. The criteria determined for excluding patients were as follows: a) Having been diagnosed with other known rheumatic diseases; b) Having a history of a psychiatric disease; c) Having a history of orthopedic surgery on his/her hand; d) Having Dupuytren's contracture on his/her hand, De Quervain tendinitis, Carpal tunnel syndrome, and recent trauma history; e) Having a history of advanced medical illness preventing his/her participation in the study); f) Using steroid/NSAID or anesthetic injections during the last six months.

The purpose of this study was explained to the patients by a physiatrist, and those interested in and wishing to participate in the study signed the consent form. Therefore, 100 patients with hand osteoarthritis were included in the study. Whether the patients answered all questions or not was checked by the clinical secretary. Patients were warned about the options they left blank. There was no particular patient among included who preferred to leave it blank. The options left blank for forgetting were read and marked by the patients again.

Before the study, permission was received from the developers of this questionnaire.

2.2. Translation and cross-cultural adaptation

The questionnaire was translated from the original English FIHOA following the cross-cultural adaptation guide suggested by Beaton et al. [18]. First, two Turkish individuals, a medical doctor (informed) and a non-health professional translator (uninformed), translated FIHOA into Turkish. The translators discussed differences between the two translations, English and Turkish questionnaires were examined together, and a draft version was created in accordance with the first consensus. Later, two native English-speaking translators, unaware of the purpose of the study and without access to the original English version, made retrospective translations. In order to form the final version of the questionnaire, translation and back translations were discussed in a reconciliation meeting, and the final version of the questionnaire was created after achieving a second consensus.

A total of 40 Turkish hand osteoarthritis patients admitted to the corresponding author's outpatient clinic were asked to answer this final version. These patients were then asked whether they understood all the items of the questionnaire and whether these items were clear and understandable. All patients found the first nine questions clear, understandable, and meaningful. All of the patients urged that the 10th question, “Do you feel reluctance to shake hands?” was not conforming to Turkish culture. They stated that shaking hands is important in Turkish culture, and not shaking hands is disrespectful; thus, they will not feel any reluctance. Accordingly, the 10th question was changed to “Do you have difficulty shaking hands because of pain?" thus performing a cultural adaptation. All 40 patients found this version of the question clear, understandable, and appropriate. Cultural adaptations were made, and the final version of the questionnaire used in our study is shown in Table 1.

2.3. Ethics committee approval

This study protocol was approved by the ethics committee of the corresponding author's university. Researchers signed the Helsinki Declaration. Written informed consent was obtained from all patients regarding their consent to participate in the study.

2.4. Functional Index for Hand Osteoarthritis (FIHOA)

It is a questionnaire consisting of 10 questions. The questionnaire was filled out by the patients themselves in this study. The answers were scored on a 4–points scale: 0 = Possible without difficulty; 1 = possible with some difficulty; 2 = Possible with much difficulty; 3 = Impossible. The total score of the questionnaire ranges from 0 to 30. A high score indicates a more severe functional restriction.

2.5. Numeric rating scale (NRS)

The severity of patients' hand pain was assessed by a verbal numerical scale on pain during the last 48 h on an 11-points scale ranging from 0 (no pain) to 10 (most severe pain).

Patients with a NRS score of 5 or above were evaluated as a symptomatic group per the threshold value reported by the developers of the original validation study to classify patients as symptomatic or not [7]. To test whether the loss of function may be higher in symptomatic patients and whether the FIHOA indicates this, we divided the patients into two according to NRS scores.

2.6. Modified Health Assessment Questionnaire (mHAQ)

The mHAQ is frequently used to show the degree of physical dysfunction in daily life due to the disease in arthritis patients [19–21]. The mHAQ has been translated into various languages, including Turkish [22]. The questionnaire consists of 20 questions and eight activities: dressing, rising, eating, hygiene, walking, reach, grip, and usual activities. Each question is scored between 0 and 3 (0 = I do it without difficulty; 1 = I do it with some difficulty; 2 = I do it with much difficulty; 3 = I am unable to do it).

We assessed the answers related to 3 activities: dressing, eating, and grip as they are functions related to hand and made the results of the health assessment questionnaire more specific for hand arthritis.

2.7. Short form 36 (SF-36)

The short form 36 is a Quality of Life (QOL) questionnaire assessing eight health-related conditions on its own. Scoring was performed according to the published guideline by the developers [23]. In all subgroups except pain, high scores indicate a low restriction or a lack of psychological affection on different parameters. The suitability for use and validation of the SF-36 was carried out in Turkish, and patients could usually fill out the questionnaire in less than 10 min [24].

2.8. Statistical analysis

Statistical analyses were performed on the IBM SPSS Statistics v11.5 statistical software (Armonk, NY, USA). Categorical variables were summarized using percentages, and continuous variables were given by mean, median, interquartile range, and standard

Table 1
Turkish version of Functional Index for Hand Osteoarthritis (FIHOA).

EL OSTEOARTRİTİ FONKSİYONEL İNDEKSİ (FIHOA)

Puanlama Sistemi
0 Zorlanmadan yapıyorum
1 Biraz zorlanarak yapıyorum
2 Çok zorlanarak yapıyorum
3 Hiç yapamıyorum

1. Kapı anahtarını anahtar deliğinde çevirebiliyormusunuz?	☐0 ☐1 ☐2 ☐3
2. Bıçakla et kesebiliyor musunuz?	☐0 ☐1 ☐2 ☐3
3. Makasla kumaş ya da kağıdı kesebiliyor musunuz?	☐0 ☐1 ☐2 ☐3
4. Dolu bir şişeyi elinizle kaldırabiliyor musunuz?	☐0 ☐1 ☐2 ☐3
5. Yumruğunuzu sıkabiliyor musunuz?	☐0 ☐1 ☐2 ☐3
6. Düğüm atabiliyor musunuz?	☐0 ☐1 ☐2 ☐3
7. *Kadınlar için*- Dikiş dikebiliyor musunuz?	☐0 ☐1 ☐2 ☐3
Erkekler için- Tornavida kullanabiliyor musunuz?	☐0 ☐1 ☐2 ☐3
8. Düğmelerinizi ilikleyebiliyor musunuz?	☐0 ☐1 ☐2 ☐3
9. Uzun süre yazı yazabiliyor musunuz? (10 dk)	☐0 ☐1 ☐2 ☐3
10.Ağrınızdan dolayı el sıkışırken zorlanıyormusunuz?	☐0 ☐1 ☐2 ☐3

deviation. Whether data distributed normally were analyzed with the Kolmogorov–Smirnov test and histograms. Statistical comparisons between subgroups were evaluated using a t-test for continuous variables with a normal distribution. When the distribution of continuous data was not normal, the Mann–Whitney U test was used. Correlations between variables were investigated using Spearman's coefficient. Confidence intervals were calculated for 95%. $p < 0.05$ was considered significant.

2.9. Test-retest reliability

FIHOA was administered to the patients at an interval of 5 days. No change occurred in the condition or treatment of the patients during this period.

Test-retest reliability was measured with Spearman's rho, ICC, and weighted kappa. ICCs were measured for the total score and each question separately by a two-way mixed single measurement. Spearman's rho values between 0.1 and 0.3 were evaluated as weak, values between 0.31 and 0.5 as moderate, and values above 0.5 as strong [25]. Values of ICC above 0.7 were considered sufficient at the scale level [26].

2.10. Internal consistency

Internal consistency reliability was assessed by measuring the general correlation of all questions in the questionnaire with Cronbach's alpha. Values above 0.7 were considered acceptable [27].

2.11. Internal construction and external validity

Internal construct validity was measured by the factor analysis method. External construct validity was measured for the Turkish FIHOA by studying its correlation with hand pain on a NRS, the Turkish Modified Health Assessment Questionnaire (mHAQ), and its negative correlation with the Turkish Short form-36 questionnaire using Spearman's correlation coefficient method.

2.12. Floor and ceiling effects

Floor and ceiling effects of FIHOA were assessed and said to be present when more than 15% of participants achieved the lowest or highest possible total score [28].

3. Results

3.1. Demographic and clinical characteristics

The Turkish FIHOA was administered to 100 patients. Patients' clinical and demographic data are shown in Table 2. The mean FIHOA score was higher in the symptomatic hand osteoarthritis group compared to the non-/mildly symptomatic group. There was no statistically significant difference between the two groups in terms of age, body mass index (BMI), and female gender. There was a statistically significant difference between the two groups in terms of disease duration and hand dominancy.

Turkish FIHOA score, pain on NRS, modified Health Assessment Questionnaire, and SF-36 scores were higher in the symptomatic group than the group with no or few symptoms, and a negative correlation was observed between FIHOA and SF-36 subscores.

3.2. Test-retest reliability

Mean scores for each question, total scores and reliability evaluation for the Turkish FIHOA test-retest are shown in Table 3. The mean score of FIHOA was 10.22 (SD 8.68) in the first test and 10.58 (SD 8.27) in the second test. (Wilcoxon signed-rank test, p 0.11).

While the Spearman's rho value for the total score was 0.97, Spearman's rho values for each question ranged from 0.71 to 0.92.

The ICC value for the total score was excellent (ICC 0.98), and ICC scores for each question were also good to excellent (range: 0.72–0.92) (Table 3).

Table 2
Patients' demographics and clinical characteristics Descriptive Statistics.

Variable	Total population (n = 100)	Symptomatic[b] hand OA group (n = 74)	Non-/Mildly Symptomatic hand OA group (n = 26)	p
Age(y), Mean ± SD	60.9 ± 9.9	61.0 ± 9.9	60.7 ± 9.7	0.14
Disease duration, months, Mean ± SD	49.5 ± 45.4	56.1 ± 49.9	30.6 ± 19.7	<0.01[a]
Body mass index, kg/m2, Mean ± SD	301 ± 5.1	30.0 ± 5.0	30.2 ± 5.5	0.95
Female gender, N (%)	97 (97)	72 (97)	25 (96)	0.77
Employed, N (%)	26 (26)	19 (25)	5 (20)	0.50
Right hand dominant, N (%)	95 (95)	73 (96)	22 (91)	0.01
Turkish FIHOA score, 0–30, Mean ± SD	10.2 ± 8.7	11.8 ± 8.3	4.8 ± 2.9	<0.01[a]
mHAQ, 0–24, Mean ± SD	6.7 ± 4.8	7.9 ± 4.8	3.1 ± 2.2	<0.01[a]
Hand pain NRS, 0–10, Mean ± SD	5.8 ± 2.0	6.7 ± 1.4	3.2 ± 0.8	<0.01[a]
SF-36 Subscales				
Physical functioning (PF), 0–100, Mean ± SD	49.5 ± 26.1	44.4 ± 25.4	64.0 ± 22.6	<0.01[a]
Role-physical (RP) 0–100, Mean ± SD	30.5 ± 40.1	21.3 ± 34.0	56.7 ± 45.0	<0.01[a]
Bodily pain (BP) 0–100, Mean ± SD	39.9 ± 22.7	34.2 ± 19.3	56.4 ± 24.0	<0.01[a]
General health (GH) 0–100, Mean ± SD	42.8 ± 21.6	37.9 ± 19.6	56.9 ± 21.5	<0.01[a]
Vitality (VT) 0–100, Mean ± SD	39.9 ± 23.2	33.8 ± 20.2	57.5 ± 22.5	<0.01[a]
Social functioning (SF) 0–100, Mean ± SD	54.9 ± 27.2	51.1 ± 28.4	65.9 ± 20.2	<0.01[a]
Role emotional (RE) 0–100, Mean ± SD	33.3 ± 42.9	23.9 ± 37.6	60.2 ± 46.2	<0.01[a]
Mental health (MH) 0–100, Mean ± SD	49.0 ± 21.1	44.9 ± 20.1	61.0 ± 19.5	<0.01[a]

FIHOA, Functional Index of Hand Osteoarthritis; mHAQ, modified Health Assessment Questionnaire; NRS, numeric rating scale; SF-36, Short Form Health Survey.
[a] P for comparisons between the two groups using Student's T-Test; statistical significance set at a value < 0.05.
[b] NRS score ≥5 defined symptomatic hand OA.

3.3. Internal consistency

Cronbach's alpha value was high (0.90), indicating the internal consistency between the different questions composing the Turkish FIHOA. These values remained high after the step-by-step deletion of each question (0.89–0.90).

These values prove that there is an internal consistency within the questionnaire. FIHOA showed a good one question to total questions correlation, excluding question 1 (correlation coefficient 0.69). All correlations were statistically significant ($p < 0.001$) (Table 4).

3.4. Internal construct validity

A factor analysis was conducted in order to measure the internal construct validity of the Turkish FIHOA. Kaiser-Meyer-Olkin value was 0.92, which suggests that it meets the adequate sample size recommendations.

Bartlett's Spheric test produced a high chi-square score (499.9, $p < 0.01$), and this value indicates that the factor model was appropriate. The general variance ratio of the four selected components was 76.8%. The four factors demonstrated 55.1, 8.3, 7.0, and 6.4% of the general variance, respectively.

All ten items in FIHOA were positively correlated with factor 1 (measured as 55.1% variance). For this reason, factor 1 may reflect the rate of realizing activities in FIHOA.

The first factor; consists of four items, including Item 6 (Can you tie a knot?), Item 9 (Can you write for a long time?), Item 8 (Can you tie the buttons?), and Item 7 (Can you sew? Or use a screwdriver?); therefore, it included activities that required the person to use their fingers.

The second factor consisted of item 4 (Can you lift a full bottle with the affected hand?) and item 2 (Can you cut the meat with a knife); therefore, it was associated with items, including grip strength.

3.5. External construct validity

We assessed the Spearman's rho values between the Turkish FIHOA score, hand pain on NRS, mHAQ, mHAQ hand function, and

Table 3
Test-Retest reliability of the Turkish FIHOA.

FIHOA test - FIHOA retest	Test	Retest	Spearman Rho[a]	ICC	p[d]	%95 CI
Item 1 - Item 1 retest	0.80 ± 0.86	0.86 ± 0.83	0.83 ([b])	0.89	<0.001	0.82–0.94
Item 2 - Item 2 retest	1.24 ± 0.87	1.32 ± 0.84	0.91 ([b])	0.95	<0.001	0.92–0.97
Item 3 - Item 3 retest	0.98 ± 0.98	0.90 ± 0.97	0.92 ([b])	0.96	<0.001	0.91–0.98
Item 4 - Item 4 retest	1.28 ± 0.81	1.36 ± 0.66	0.80 ([b])	0.87	<0.001	0.78–0.93
Item 5 - Item 5 retest	0.90 ± 0.91	1.04 ± 0.83	0.75 ([b])	0.89	<0.001	0.81–0.94
Item 6 - Item 6 retest	0.90 ± 0.95	0.84 ± 0.93	0.88 ([b])	0.95	<0.001	0.92–0.97
Item 7 - Item 7 retest	1.24 ± 1.00	1.32 ± 0.89	0.80 ([b])	0.88	<0.001	0.80–0.93
Item 8 - Item 8 retest	0.60 ± 0.67	0.54 ± 0.73	0.79 ([b])	0.89	<0.001	0.80–0.94
Item 9 - Item 9 retest	1.52 ± 0.81	1.54 ± 0.73	0.71 ([b])	0.83	<0.001	0.70–0.90
Item 10 - Item 10 retest	0.76 ± 0.82	0.86 ± 0.86	0.75 ([b])	0.86	<0.001	0.76–0.92
FIHOA total score[c]	10.22 ± 8.68	10.58 ± 8.27	0.97 ([b])	0.98	<0.001	0.95–0.97

FIHOA, Functional Index of Hand Osteoarthritis; ICC, intra-class correlation coefficient; CI, confidence interval.
Values are given as mean ± standard deviation.
[a] Spearman's rho indicates Spearman's correlation coefficient.
[b] Correlation is significant at the 0.01 level (2-tailed).
[c] The *p-value* from Wilcoxon's rank-sum test for FIHOA total scores between test and retest is p = 0.11.
[d] p ICC test.

Table 4
Internal consistency of the Turkish FIHOA.

Items	Score	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Adjusted item-total Spearman's rho	Item–item correlation Spearman's rho[a]	Cronbach's Alpha if Item Deleted[b]
Item 1	0.80 ± 0.86	9.11	32.75	0.69	0.38–0.62	0.90
Item 2	1.24 ± 0.87	8.71	32.07	0.79	0.45–0.67	0.89
Item 3	0.98 ± 0.98	8.99	32.05	0.73	0.39–0.67	0.89
Item 4	1.28 ± 0.81	8.60	34.08	0.53	0.34–0.54	0.90
Item 5	0.90 ± 0.91	8.88	32.25	0.64	0.40–0.55	0.90
Item 6	0.90 ± 0.95	9.09	31.94	0.72	0.34–0.67	0.89
Item 7	1.24 ± 1.00	8.73	30.68	0.72	0.36–0.64	0.89
Item 8	0,60 ± 0.67	9.29	33.68	0.72	0.34–0.67	0.89
Item 9	1.52 ± 0.81	8.23	32.79	0.59	0.36–0.48	0.90
Item 10	0.76 ± 0.82	9.20	33.89	0.58	0.36–0.46	0.90

FIHOA, Functional Index of Hand Osteoarthritis.
Values are given as mean ± standard deviation or range.
[a] Spearman's rho indicates Spearman's correlation coefficient.
[b] Overall Cronbach's alpha for all 10 items is 0.90.

SF-36 subscales. There were adequately significant direct high correlations between FIHOA and hand pain NRS and mHAQ hand function score (Table 5).

SF-36 subscales (Physical Functioning (PF), Role-Physical (RP), General Health (GH), Vitality (VT), Social Functioning (SF), Role Emotional (RE), Mental Health (MH)) had weak correlations with FIHOA while Bodily Pain (BP) subscale moderately correlated to the FIHOA (Table 5).

3.6. Floor and ceiling effects

The lowest possible score was achieved by two participants (2%) and the highest possible score by four participants (4%), indicating that the FIHOA did not demonstrate significant floor or ceiling effects.

4. Discussion

In this study, we translated a current widely used instrument for assessing dysfunction in hand OA, the FIHOA in Turkish, and adapted the questionnaire to Turkish culture. This is the first study in which a Turkish translation is performed following standard rules for translation and cultural adaptation of a questionnaire. We then conducted a validation study of our Turkish version of the FIHOA, assessing its test-retest validity, internal consistency, internal and external construct validities. We supposed FIHOA scores to be higher in symptomatic patients than those without symptoms due to limitations in hand functions. Likewise, due to pain and disability, similar scores of NRS and mHAQ questionnaires were expected. On the other hand, low SF-36 scores were expected in patients with more severe symptoms. In this context, we evaluated whether FIHOA scores in symptomatic and non/mildly symptomatic patients positively correlated with NRS, the Turkish Modified Health Assessment Questionnaire (mHAQ) scores, and a negative correlation with the Turkish Short form-36 questionnaire subscores. Our results show that the Turkish adapted FIHOA has strong correlations with NRS and mHAQ and weak–moderate correlations with SF-36 subscales; so is a valid and reliable questionnaire in Turkish patients with hand osteoarthritis.

Table 5
External construct validity of FIHOA with hand pain NRS, mHAQ, mHAQ hand function score, and SF-36 Subscales.

	Spearman's rho[c]
NRS	0.63[b]
mHAQ	0.73[b]
mHAQ HAND FUNCTION	0.83[b]
PHYSICAL FUNCTIONING (PF)	0.39[b]
ROLE-PHYSICAL (RP)	0.33[b]
BODILY PAIN (BP)	0.52[b]
GENERAL HEALTH (GH)	0.37[b]
VITALITY (VT)	0.38[b]
SOCIAL FUNCTIONING (SF)	0.37[b]
ROLE EMOTIONAL (RE)	0.34[b]
MENTAL HEALTH (MH)	0.24[a]

VAS, visual analog scale; NRS, numeric rating scale, mHAQ, modified Health Assessment Questionnaire; FIHOA, the Functional Index of Hand Osteoarthritis.
[a] $p < 0.05$.
[b] $p < 0.01$.
[c] Spearman's rho indicates Spearman's correlation coefficient.

Analyses of the reliability of the questionnaire were conducted using Spearman's Rho and ICC, and the results were found to be satisfactory. Administrations of the questionnaire for the first and second times showed no significant difference and correlated well. This result confirms that, although time has passed by, the answers of patients to the questions remain almost identical and consistent. Since the FIHOA questionnaire consists of simple and straightforward questions, the results were found to be satisfactory in this way.

Turkish FIHOA's internal consistency was also good. The results of this analysis show there was a strong internal consistency between different test items. Cronbach's alpha value decreased when any item was deleted. Accordingly, each of these items is suitable for use. Internal consistency results were similar to those reported in previous studies [7,9–16].

Construct validity tests the hypothesis a questionnaire is measuring. Construct validity should demonstrate that scores on a particular questionnaire predict the theoretical feature it says it does [29]. To assess construct validity, we asserted three hypotheses: (1) Turkish version of FIHOA has good construct validity, (2) Factor analysis would support internal construct validity, (3) strong correlation between Turkish version FIHOA and previous validated scales (NRS, mHAQ, SF-36) would support external construct validity. We performed hypothesis testing by focusing on correlations between the FIHOA and the other validated scales to evaluate construct validity. According to our results, the internal and external construct validity of the questionnaire was good. Although FIHOA is a questionnaire assessing hand function, its external validity was confirmed by a strong correlation with hand pain NRS and correlated very well with mHAQ assessing hand functionality. Finally, external construct validity was also confirmed in

Table 6
Comparison of the published cross-cultural validation studies of the FIHOA.

	Persian Mean ± SD or N (%)	Dutch Mean ± SD or N (%)	Italian Mean ± SD or N (%)	Norwegian Mean ± SD or N (%)	Korean Mean ± SD or N (%)	Japanese Mean ± SD or N (%)	Arabic Mean ± SD or N (%)	Turkish Mean ± SD or N (%)
Age (y)	55.8 ± 9.2	61.9 ± 7.4	66.3 ± 9.8	68.6 ± 5.8	61.0 ± 7.6	64.6 ± 9.1	64.4 ± 8.1	60.9 ± 9.9
Total number of analyzed patients	72	72	72	128	100	210	101	100
Male sex, N (%)	45 (62.5)	8 (11.1)	7 (9.7)	11 (8.6)	6 (6.0)	32 (12.5)	7 (6.9)	3 (3.0)
Body mass index, kg/m2	–	–	26.9 ± 16.5	–	24.4 ± 3.0	22.4 ± 3.1		30.1 ± 5.1
Disease duration, years	–	12.5 ± 8.0	11.9 ± 7.5	17.6 ± 7.1	4.8 ± 4.7	5.2 ± 5.5		4.1 ± 3.8
VAS pain	–	42.9 ± 28.4	35 (25–50)	41.7 ± 23.8	35.2 ± 24.3	–	20 (1.5–40)	–
NRS	4 (3–6)	–	–	–	–	4.2 ± 2.6		5.8 ± 2.0
mHAQ,0–3	–	–	0.38 (0.13–1.13)	1.0 ± 0.7	1.0 ± 1.6	0.44 ± 0.49	0.53 ± 0.35	–
mHAQ,0–24	–	–	–	–	–	–		6.7 ± 4.8
AUSCAN,0–60	–	18.9 ± 14.7	–	1.7 ± 0.8	–	–		–
FIHOA, 0–30	9.9 ± 4.6	10.9 ± 7.0	6.5 ± 4.8	9.3 ± 6.2	4.4 ± 5.6	5.5 ± 5.8	5 (1–11)	9.8 ± 6.3

VAS, visual analog scale; NRS, numeric rating scale, mHAQ, modified Health Assessment Questionnaire; FIHOA, the Functional Index of Hand Osteoarthritis; AUSCAN, The AUStralian CANadian Osteoarthritis Hand Index.

correlation with SF-36 measuring functionality and its psychological effects.

The correlation rate between SF-36 subscales and FIHAO was low. One of the main reasons for this may be that SF 36 is a systemic evaluation form and is not directed towards hand-specific diseases such as hand OA. The relatively better correlation with pain from SF-36 subscales suggests that patients with hand pain are affected for both pain and function. Therefore, it can be thought that specific evaluation questionnaires are more reliable for evaluating hand OA patients than general evaluation tools. Our study shows that FIHOA correlates well with pain assessment and other hand function assessment instruments. Moreover, we used hand function-related questions in mHAQ; so, a strong correlation between Turkish version FIHOA score and mHAQ hand function score, a questionnaire evaluating the disability for hand, demonstrated that FIHOA could be used to assess the disability of a patient with hand osteoarthritis.

In our study, the mean total score of FIHOA in symptomatic hand OA patients was 10.2 (SD 8.68). The mean score of NRS for hand pain was 5.8 (SD 2.0). When comparing our study with previous linguistic validation studies, the mean values of hand pain and functional impairment were similar except for the Korean and Italian papers. Scores of our study were higher than the Korean and Italian validation papers (Table 6).

There are some limitations to our study. For example, there were two questions initially gender-specific in the 7th Question of FIHOA. This question asks about screwdrivers use for men and sewing for women. However, we could not investigate whether the two activities had the same psychometric function. Because only three men participated in this study and the responses of women and men were analyzed in the same way. In this regard, the validity and reliability of this question were not carried out separately. The total score was 30 for both men and women, based on whichever version was answered according to gender. However, considering the diversity of male/female patient ratios in previous validation studies (from 10.8 to 62.5) and the validity and reliability of FIHOA's homogeneity, it seems to be acceptable that only three male patients participated in this study [7,9–16]. As shown in previous studies, hand osteoarthritis is much more common in women than men [7,9–16]. Given these studies, the low participation of male patients is not an unexpected situation, and it does not affect the validity of the questionnaire [7,9–16]. When adapting the 10th question, we did not consider hesitation due to cosmetic appearance as a probable cause for reluctance to shake hands; because not shaking hands is dispraised in Turkish culture. In our opinion, the only good reason for unwillingness to shake hands in the Turkish population may be due to pain. However, this may have caused misinterpretation.

A total of 15 patients did not fill out the FIHOA questionnaire or retest questionnaire and were excluded from the analysis. Nine of these patients did not answer question 9, and six of them did not answer questions 6 and 7 together. These 15 patients were excluded from the study. We asked the patients why they did not answer some of the items. These patients stated that they did never perform the activity-related item (writing for at least 10 min with a pen, knitting, or sewing). While the FIHOA questionnaire is administered to patients in the clinic, patients can underestimate the job for a task they have not done before, and thus answer as 'I have little difficulty". For this reason, this may lead to a lower score since they underestimate their current functional impairment.

AUSCAN was not used in this study because it is not freely available for use by the community (i.e., its use is restricted because it is copyrighted). AUSCAN is the second questionnaire that has been specifically developed for hand OA after the FIHOA. Although the Turkish language translation has been done, it has not yet been validated.

In conclusion, in our study, we performed a good translation and cultural adaptation in Turkish of the FIHOA, which has shown to be a valid and reliable questionnaire to assess functional impairment in hand OA. Our study shows that the Turkish FIHOA is validated and can now be easily used to assess functional impairment in Turkish patients with hand osteoarthritis either in clinical studies or daily practice.

Ethics committee approval

This study protocol was approved by Bezmialem Vakif University ethics committee (No: 2018–4418).

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Declaration of competing interest

None.

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