

	Original version of FIHOA	Japanese version of FIHOA
Question 1	Are you able to turn a key in a lock?	<small>かぎあな</small> 鍵穴にさした <small>かぎ</small> 鍵を回すことができますか？
Question 2	Are you able to cut meat with a knife?	ナイフでステーキを切ることができますか？
Question 3	Are you able to cut cloth or paper with a pair of scissors?	布や紙をはさみで切ることができますか？
Question 4	Are you able to lift a full bottle with the hand?	<small>まんぱい</small> <small>びん</small> 満杯の瓶を片手で持ち上げることができますか？
Question 5	Are you able to clench your fist?	こぶしを <small>にぎ</small> 握りしめることができますか？
Question 6	Are you able to tie a knot?	ひもを結ぶことができますか？
Question 7A	For women* - Are you able to sew?	女性の方* - 針で <small>ぬいもの</small> 縫物をすることができますか？
Question 7B	For men* - Are you able to use a screwdriver?	男性の方* - ドライバー（ねじ回し）を使うことができますか？
Question 8	Are you able to fasten buttons?	ボタンをはめることができますか？
Question 9	Are you able to write for a long period of time (10 min)?	文章を長い時間（10分）書くことができますか？
Question 10	Would you accept a handshake without reluctance?	ためらわずに <small>あくしゅ</small> 握手に応じますか？
Scoring system		
0	possible without difficulty	問題なくできる
1	possible with slight difficulty	少し難しいができる
2	possible with important difficulty	かなり難しいができる
3	impossible	全くできない

Table 1. Original and Japanese versions of the Functional Index for Hand Osteoarthritis (FIHOA)

The FIHOA consists of 10 questions. Question 7 has two gender-role specific items requesting a separate response from female and male patients (Questions 7A and 7B, respectively). Patients score each item from 0 (possible without difficulty) to 3 (impossible) and the total score ranges from 0 to 30. The Japanese version has kana script above difficult Chinese characters to facilitate comprehension. *In this study, we removed “for women” and “for men” from Question 7 and asked all patients to answer both items to obtain all 11 responses regardless of gender.

	Number (%) or mean \pm SD	Female	Male	p value
Number	210	178 (84.8%)	32 (15.2%)	
Age (yr)	64.6 \pm 9.1	64.3 \pm 9.4	66.0 \pm 7.8	0.32
range	42 to 88	44 to 88	53 to 83	
BMI	22.4 \pm 3.1	22.0 \pm 2.9	24.5 \pm 3.5	0.10
Pain	190 (90.5%)	164 (92.1%)	26 (81.3%)	0.20
Duration (yr)	5.2 \pm 5.5	5.2 \pm 5.6	5.0 \pm 4.9	0.90
Stiffness	134 (63.8%)	115 (64.6%)	19 (59.4%)	0.85
Duration (yr)	5.2 \pm 5.6	5.3 \pm 5.7	4.6 \pm 4.7	0.63
J-FIHOA total score*	5.5 \pm 5.8	5.6 \pm 5.8	5.0 \pm 6.0	0.46
Symptomatic hand OA**	96 (45.7%)	84 (47.2%)	12 (37.5%)	0.31
Missing data	2 (1.0%)	2 (1.1%)	0	
Hand20	26.1 \pm 21.5	26.9 \pm 21.3	21.3 \pm 22.3	0.11
HAQ	0.44 \pm 0.49	0.46 \pm 0.50	0.30 \pm 0.41	0.05
NRS pain	4.2 \pm 2.6	4.2 \pm 2.5	4.2 \pm 2.8	0.99
SF-36 PCS	42.1 \pm 11.6	41.5 \pm 11.9	45.4 \pm 9.4	0.09
SF-36 MCS	49.5 \pm 10.1	49.0 \pm 10.3	51.6 \pm 8.6	0.29
SF-36 RCS	47.4 \pm 12.8	47.1 \pm 13.0	48.8 \pm 11.4	0.58

Table 2. Characteristics and patient reported outcome measures (PROMs)

The values represent number (%) of participants or mean (SD) scores. Gender differences were evaluated using the Student's t-tests for continuous variables or chi-square tests for categorical variables. *Sum of 10 items with a separate answer from female and male participants (Question 7). **Participants with J-FIHOA total scores of 5 or more. BMI: body mass index, NRS: numerical rating scale, PCS: physical component summary score, MCS: mental component summary score, RCS: role-social component summary score.

	Female (n=178)					Male (n=32)				
	Mean (SD)	Item-total correlation	Alpha if item deleted	Item-total correlation (11-item model)	Alpha if item deleted (11-item model)	Mean (SD)	Item-total correlation	Alpha if item deleted	Item-total correlation (11-item model)	Alpha if item deleted (11-item model)
Question 1	0.28 (0.59)	0.657	0.907	0.654	0.922	0.25 (0.44)	0.802	0.923	0.798	0.937
Question 2	0.43 (0.71)	0.722	0.903	0.725	0.918	0.25 (0.44)	0.830	0.922	0.822	0.936
Question 3	0.43 (0.70)	0.745	0.902	0.749	0.917	0.25 (0.44)	0.789	0.923	0.798	0.937
Question 4	0.85 (0.92) [†]	0.712	0.904	0.729	0.918	0.47 (0.72) [†]	0.857	0.915	0.862	0.930
Question 5	0.90 (1.00)	0.614	0.912	0.614	0.926	0.97 (1.12)	0.508	0.942	0.516	0.951
Question 6	0.50 (0.70)	0.772	0.900	0.779	0.916	0.56 (0.91)	0.821	0.916	0.832	0.931
Question 7A	0.66 (0.83)	0.779	0.899	0.798	0.914	0.69 (1.00)	–	–	0.885	0.929
Question 7B	0.60 (0.81)	–	–	0.809	0.914	0.47 (0.76)	0.881	0.913	0.873	0.930
Question 8	0.47 (0.63)	0.722	0.904	0.732	0.918	0.66 (0.83)	0.857	0.914	0.877	0.929
Question 9	0.58 (0.76)	0.644	0.907	0.650	0.921	0.75 (0.95)	0.705	0.924	0.716	0.937
Question 10	0.44 (0.79)	0.580	0.911	0.571	0.925	0.44 (0.72)	0.732	0.921	0.738	0.935
Total score	5.6 (5.8)*					5.1 (6.0)*				
11-item total	6.1 (6.5)**					5.8 (6.9)**				
Cronbach's alfa			0.914		0.926			0.929		0.940

Table 3. Item-total correlations

Item scores and item-total correlations of the J-FIHOA. Mean scores between female and male groups were compared using the Student's t-test. Correlations are shown using both the total J-FIHOA and the 11-item model. *Total score of the J-FIHOA, the sum of 10 items with a separate answer from female and male participants (Question 7). **Total score of the 11-item model, the sum of all 11 items. †p<0.05.

	Construct of each scale	Hypothesis	Correlation coefficient with J-FIHOA	Result	Assessment
J-FIHOA	Instrument for hand functional impairment	–	–	–	–
Hand20	Scale for upper limb disorders	Strongest	0.82*	Strongest	○
HAQ	Half of items assess hand or upper limb dysfunction	Moderate	0.73*	Strong	◐
NRS pain	Global pain	Moderate	0.58*	Moderate	○
SF-36 PCS	Physical component of general health status	Moderate	–0.36*	Weak	◐
SF-36 MCS	Mental component of general health status	No/weak	–0.24*	No	○
SF-36 RCS	Role-social component of general health status	No/weak	–0.26*	No	○

Table 4. Hypotheses and correlations between J-FIHOA and other questionnaires

Hypotheses were based on these fundamental assumptions: the FIHOA scores reflected the severity of physical dysfunction of the hands and the Japanese version was equivalent to the validated versions of the FIHOA. Correlations were shown between the J-FIHOA and other validated PROMs: Hand20, HAQ, NRS pain and each component summary score of SF-36. * $p < 0.05$, Spearman's rank correlation. PCS: physical component summary score, MCS: mental component summary score, RCS: role-social component summary score. ○: met our expectation, ◐: failed to meet our expectation but consistent with construct of the FIHOA, ●: disproved the hypothesis.

Questionnaire	Number	Pre-treatment mean (SD)	Post-treatment mean (SD)	Change mean (SD)	p value	ES	SRM
J-FIHOA	30	11.6 (4.7)	8.4 (5.3)	-3.2 (5.1)	0.003	-0.68	-0.62
major change group	13	10.9 (4.3)	6.5 (5.1)	-4.5 (4.8)	0.008	-1.03	-0.92
minor change group	17	12.1 (5.0)	9.9 (5.0)	-2.2 (5.3)	0.131	-0.44	-0.41
Hand20	30	42.8 (19.5)	33.0 (17.5)	-9.8 (18.0)	0.006	-0.50	-0.54
HAQ	30	0.75 (0.46)	0.54 (0.36)	-0.21 (0.40)	0.013	-0.45	-0.52
NRS pain	30	6.8 (1.8)	4.8 (2.3)	-2.0 (2.5)	<0.001	-1.14	-0.81
SF-36 PCS	30	39.0 (9.6)	39.6 (9.2)	0.6 (6.6)	0.229	0.07	0.10
SF-36 MCS	30	46.6 (8.5)	47.5 (9.5)	0.9 (6.8)	0.530	0.11	0.14
SF-36 RCS	30	43.9 (12.8)	43.5 (14.4)	-0.5 (12.2)	0.910	-0.04	-0.04

Table 5. Responsiveness of J-FIHOA and other questionnaires

Pre- and post-treatment data sets were used to assess the responsiveness. P values were calculated using the Wilcoxon signed-rank test. ES was obtained by dividing the mean change scores by the standard deviation of the scores at pre-treatment. SRM was obtained by dividing the mean change of scores by the SD of that change. Patients who scored their change “very much improved” or “much improved” were categorized into the major change group and the others into the minor change group. The J-FIHOA showed the largest ES and SRM among all questionnaires, except for NRS pain. The major change group had a larger ES and SRM on the J-FIHOA than the minor change group. ES: effect size, SRM: standardized response mean.