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Cross-cultural adaptation of the Dutch version of the Functional Index for Hand Osteoarthritis (FIHOA) and a study on its construct validity

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Summary

Objective: To validate a cross-culturally translated and adapted Dutch version of the Functional Index for Hand Osteoarthritis (FIHOA) in patients with osteoarthritis (OA) of the hands and to evaluate its construct validity by comparing with the Australian/Canadian Osteoarthritis Hand Index (AUSCAN).

Methods: The FIHOA was translated into Dutch and cross-culturally adapted. The questionnaire was administered to 72 patients with hand OA (female/male ratio: 64/8, handedness: right: 62/left: 7/both: 3). A visual analogue scale (VAS) pain scale (100 mm) and the AUSCAN questionnaire were also recorded. An item–item analysis was performed. Test–retest reliability (time interval: 5 days) was assessed in 21 patients with intraclass correlation coefficient (ICC) and Bland and Altman graphical method. Construct validity was assessed by Spearman rank correlation coefficient between the FIHOA and AUSCAN.

Results: Internal consistency was high (Cronbach's alpha = 0.89). All items, except for one ('Are you able to clench the fist?'), and the mean total FIHOA scores were statistically different between the subgroups based on the VAS (mean total score = 7.46 and 14.19, in a-/mild symptomatic and symptomatic group, respectively ($P < 0.001$)).
The Spearman's correlation between all subscales of the AUSCAN (pain, stiffness, functionality) and the FIHOA was good, especially with the subscale functionality ($r = 0.81$, $P < 0.01$). Test–retest reliability was excellent with an ICC of 0.96 for the total score and the Bland and Altman plot showing a homogeneous distribution of the differences.

Conclusion: The psychometric properties of the Dutch version of the FIHOA are excellent. There is a good correlation between the FIHOA and all subscales of the AUSCAN, especially the subscale functionality.

Key words: FIHOA, AUSCAN, Validation, Functionality, Osteoarthritis.

Introduction

Hand osteoarthritis (OA) is very common and may severely affect a high proportion of people over 50 and especially women[1]. It is frequently associated with pain and functional impairment. In recent years, assessment of functionality and disability has become an important outcome measure in clinical trials and treatment. The Functional Index for Hand Osteoarthritis (FIHOA) has been developed by Dreiser and colleagues in the early 90s and published for the first time in its English original version in 1995[2]. It is a 10-item investigator-administered questionnaire using a semi-quantitative scoring four-point scale. Its precision has been well studied and documented. The responsiveness has been published in 2000 with the English version of the FIHOA[3]. The FIHOA was demonstrated to be a reliable instrument and sensitive to change with a mean standardized response of 0.58[3].

To be used for both clinical research and clinical trials in other countries than French and English speaking countries, the FIHOA needs to be translated and cross-culturally adapted. The methodology to translate and cross-culturally adapt assessment instruments in other languages is described by Beaton and coworkers[4].

The aim of this study was to translate the FIHOA, assess cultural relevance by an expert panel and finally validate a culturally adapted Dutch version of the FIHOA in patients with hand OA.

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Patients and methods

TRANSLATION AND CROSS-CULTURAL ADAPTATION

The translation process was performed according to the guidelines for the cross-cultural adaptations of the FIHOA measures[4]. First, a forward translation of the original French FIHOA was made into Dutch by three persons (two native Dutch speaking from Belgium (Flanders) and one from the Netherlands) independently of each other. A written report indicating their comments on any difficulties and the rationale for the choice made in case of problematic questions was made. Thereafter, the three – slightly different – translations were compared. The discrepancies and agreements between the translations were discussed with the translators and a consensus Dutch translation was made, aiming to assess the relevance as well as the acceptability of the items in Dutch.

Then, this consensus Dutch version was translated back into French by three native French speaking persons with advanced knowledge of the Dutch language (two from Belgium (Flanders) and one from the Netherlands) and compared to the French original to confirm that the semantic, conceptual and experiential equivalence was met. Finally, a cross-culturally adapted Dutch consensus translation was made by a panel of experts consisting of two rheumatologists (GV and RW) and one methodologist (BVC) that can be applied to the Dutch-speaking population in Belgium as well as in the Netherlands.

PATIENTS

The Dutch version of the FIHOA was tested in 72 patients that presented to the outpatient clinic Rheumatology of the University Hospital in Ghent between April and October 2007. The patients had to meet the criteria of OA of the hands according to the American College of Rheumatology (ACR)[5] and to be native Dutch speaking for understanding and answering the questionnaire. Patients were addressed in consecutive order. They were asked to respond to the questionnaire and 51 patients were interviewed afterwards to indicate if problems with interpreting an item of the questionnaire occurred. An additional 21 patients were asked to respond to the questionnaire twice with an interval of 5 days.

OTHER MEASURES

The patients were asked to grade the global pain in the hands they suffered during the last week on a 100 mm visual analogue scale (VAS). All patients were asked to complete the Dutch version of the Australian/Canadian Osteoarthritis Hand Index (AUSCAN)[6]. The AUSCAN is a self-administered algo-functional instrument developed for the specific assessment of hand function, stiffness and pain.

SCORING

The FIHOA contains 10 questions with one sex specific question included. The responses are scaled on a four-point Likert scale (0 = possible without difficulty, 1 = possible with slight difficulty, 2 = possible with important difficulty, 3 = impossible, to avoid any centralization of the answers). The range of scores is 0–30[2].

The AUSCAN contains five items referring to hand pain (pain at rest, pain when gripping objects, pain when lifting objects, pain when turning objects and pain when squeezing objects); nine items relating to difficulty with hand function (taps, doorknobs or handles, buttons, jewellery, jars, carrying pots, peeling vegetables or fruit, picking up large heavy objects and wringing out washcloths) and one question on severity of morning stiffness in the last 48 h.

The responses are scaled on a five-point Likert scale (0 = no pain/stiffness/difficulty, 4 = most extreme pain/stiffness/difficulties). Total function and total pain subscale scores are created by adding each of the component variables. The possible range of scores is 0–20 for pain, 0–4 for stiffness and 0–36 for function.

STATISTICAL ANALYSIS

All calculations were performed with the SPPS statistical package (version 15.0). The analysis was conducted using descriptive statistics for the semi-quantitative, quantitative and nominal data. Mean and standard deviation (SD) were used for quantitative and semi-quantitative data and absolute numbers and frequencies for nominal data. The population was described for the demographic data (age, gender and handedness), history of diagnosis and VAS pain. They were divided into two subgroups based on a cut-off level of 40 mm on the VAS pain scale as was done in the original validation study[2] (VAS pain $<$ 40 mm = asymptomatic or mild symptomatic; $\geq$40 mm = symptomatic group). The mean results [mean (SD)] were calculated for each item, subscales and total scores for the FIHOA and compared by Mann–Whitney *U* test.

Internal consistency reliability of the FIHOA was examined by calculating the Cronbach's alpha coefficient. A reliability coefficient of 0.8 or more is generally considered to be a reasonable goal for a research instrument. To evaluate internal consistency, we calculated item–total correlations adjusted for the specific item. Correlation between items and quantitative variables was assessed with the nonparametric Spearman rank correlation coefficient (rho), as a normal distribution could not be demonstrated for all the parameters studied. The adjusted item–total correlation for the first item was determined by calculating the correlation of the first item with a rescored FIHOA score calculated without this item to avoid the bias of self-correlation. This procedure was repeated for each item. A correlation of at least 0.4 was assumed as the standard for supporting scale internal consistency. Test–retest reliability was determined in 21 additional patients who were interviewed twice within approximately 5 days. Patients were excluded from these analyses if they reported significant changes to their perceived general health, severity of illness or perceived disease activity between two interviews. Intraclass correlation coefficients (ICCs) with a 95% confidence interval (95% CI) were calculated for each item separately and the total score using a two way random model. The ICC is generally considered to be excellent at 0.75 and above The mean difference and SD between the first and second questionnaires were calculated and visualized by the Bland and Altman graphical method (statistical software package Medcalc, Merelbeke, Belgium)[7].

Item-discriminant validity shows to what extent an item measures what it is not supposed to measure, the degree of discriminatory power. It was assessed by computing the correlation of each item with the others. In order to support high discriminatory power of scales, there should be no high correlation for item discriminance.

The endorsement rate (=the percentage of the responders that rated the item greater than "Without any problem") was determined for each item. Low endorsement rates suggest that the activity queried is not problematic by a large proportion of responders. Construct validity was evaluated by correlating the FIHOA with another measure of functional impairment, the AUSCAN, and measures of pain by VAS. Since both questionnaires intend to measure functional impairment, a strong positive correlation is expected between the FIHOA and the AUSCAN subdomain functionality. The strength of correlation between the FIHOA and the other subdomains of the AUSCAN is less clear. If either the FIHOA or AUSCAN is more sensitive to the presence of pain will be further explored.

Results

PATIENTS DEMOGRAPHIC AND CLINICAL DATA

Seventy-two Dutch-speaking patients with OA were asked to complete the Dutch version of the FIHOA and the AUSCAN. The demographic characteristics of the population are displayed in Table I. The patients were divided into an asymptomatic or mild symptomatic group ($N = 35$) and a symptomatic group ($N = 37$) based on the VAS ($<$40 mm or $\geq$40 mm). The mean age of the 35 patients in the a-/mild symptomatic group was 60.7 years (SD = 7.1) and 62.9 years (SD = 7.6) in the asymptomatic group of 37 patients. The mean disease duration in the a-/mild symptomatic and in the symptomatic group was 12.0 years (SD = 8.0) and 12.9 years (SD = 8.0),

Table I
Demographics: variables in patients with VAS pain $<$40 mm and $\geq$40 mm

Variable	Total population ($n = 72$)	VAS $<$ 40 mm ($n = 35$)	VAS $\geq$ 40 mm ($n = 37$)	*P* value†
Age (years) [mean (SD)]	61.9 (7.4)	60.7 (7.1)	62.9 (7.6)	NS
M/F ratio (%)	8/64 (11%/89%)	4/31 (11%/89%)	4/33 (11%/89%)	NS
Disease duration (years) [mean (SD)]	12.5 (8.0)	12.0 (8.0)	12.9 (8.0)	NS
Handedness: right/left (%)	62/7* (86%/10%)	30/3 (86%/9%)*	32/4 (87%/11%)*	NS
VAS pain (100 mm)	42.9 (28.4)	18.0 (13.5)	66.4 (15.5)	$<$0.001
Total FIHOA (scale: 0–30)	10.9 (7.0)	7.5 (6.0)	14.2 (6.2)	$<$0.001
AUSCAN pain (0–20)	7.3 (5.8)	3.6 (4.1)	10.8 (4.9)	$<$0.001
AUSCAN stiffness (0–4)	1.6 (1.2)	0.9 (0.9)	2.2 (1.2)	$<$0.001
AUSCAN function (0–36)	16.0 (7.7)	7.9 (7.7)	23.6 (8.6)	$<$0.001

*Three patients are both left and right handed from which two patients in the subgroup VAS $<$ 40 mm and one patient in the subgroup VAS $\geq$ 40 mm.

†*P* value by Mann–Whitney for continuous variables and Chi square for dichotomous variables between VAS $<$ 40 mm and VAS $\geq$ 40 mm group ($\alpha = 0.05$).

respectively. No difference between both groups in neither age nor disease duration was found ($P = 0.11$ and $P = 0.55$, respectively). Female gender (64/72) (89%) and right-handed dominance (62/72) (87%) are overrepresented in this cohort, which is inherent to the epidemiologics in the general population. Seven patients were left handed and three reported to be both left and right handed.

TRANSLATION AND CROSS-SECTIONAL ADAPTATION

The French backward translations were compared to the original French FIHOA. Slight differences were found for items 5 ('Are you able to clench your fist?') and 7 for males ('Are you able to use a screwdriver?'). The expert committee preferred to explicitly add 'completely' to item 5 since this was also present in the original French version, although not in the English version. For item 7, applying to males, there is no single word that can indicate the activity ('to screw'), therefore the semantic equivalent and culturally accepted, comparable to the English, translation has been used ('to use a screwdriver'). No semantic or cultural inconsistencies were present between the forward and backward translations of either the Dutch-speaking translators from Belgium and the translators from the Netherlands. For this reason, no specific adaptations had to be made and the same Dutch questionnaire can address both individuals from Belgium and the Netherlands.

PROBLEMS INDICATED BY THE PATIENTS

The majority of the cohort (43 out of 53 patients) had no problem with the interpretation of the questions of the Dutch version of the FIHOA. Four patients had difficulty in responding with an appropriate score because of a discrepancy in symptoms between the dominant and non-dominant hand. This concern can relate to six items of the questionnaire. Two persons specifically report difference in ability to clench the fist of the right and the left hands. Two patients reported a problem with cutting with a pair of scissors because they were unable to put their fingers into the eyes of a scissor due to the presence of Heberden nodules at the distal interphalangeal joints. By consequence the activity of cutting as such could not be evaluated. There was a problem with tying a knot in three patients because the structure of the thread (i.e., sewing thread or shoe laces) was not specified and to them, it would make a difference in ability to perform the task. Based on these remarks, the expert committee decided that no adjustment to the Dutch translation of the FIHOA questionnaire was necessary. Appendix 1 shows the original English and the Dutch version of the FIHOA.

ITEM ANALYSIS

The mean score of each item of the FIHOA and the AUSCAN in the subgroups of the cohort were calculated, as well as the mean total score and scores per subscale of the AUSCAN. All of the items of the FIHOA were found discriminant between both groups ($P < 0.05$), except for item 5 ('Are you able to clench your fist?') ($P = 0.05$).

The discriminant capacity of item 7, applied to males ('Are you able to use a screwdriver?') could not be statistically analyzed due to the small amount of male patients in our population ($n = 8$). The mean total FIHOA scores were statistically significant between the subgroups (mean total score in a-/mild symptomatic group = 7.46 (SD = 6.02) and mean total score in symptomatic group = 14.19 (SD = 6.21), $P < 0.001$).

Each item of the AUSCAN questionnaire was discriminant between the subgroups, as well as the total scores of the subscales (pain, stiffness, functionality) (all $P < 0.001$). The item–item correlation ranged from 0.16 to 0.78 depending on the items (Table II). This suggests that, based on our cohort, some redundancy in the questionnaire is present. These previous results are consistent with previous results of the validation study of the French original version of the FIHOA[2,3].

Table II
Adjusted item–total correlation, item–item correlations and ICC for each item of the FIHOA

Item	*N*	Adjusted item–total correlation*	Item–item correlation	All ($n = 74$)	% of subjects responded > 0		*N*	ICC	95% CI
					VAS < 40 mm ($n = 35$)	VAS ≥ 40 mm ($n = 37$)			
Item 1	74	0.60	0.22–0.74	59.5	42.9	74.4	21	0.95	0.88–0.98
Item 2	74	0.75	0.36–0.78	59.5	40.0	76.9	21	0.89	0.74–0.95
Item 3	74	0.523	0.16–0.63	58.1	45.7	69.2	21	0.82	0.61–0.92
Item 4	74	0.69	0.30–0.67	60.8	42.9	76.9	21	0.83	0.63–0.93
Item 5	74	0.55	0.17–0.63	71.6	62.9	79.5	21	0.89	0.75–0.95
Item 6	74	0.74	0.35–0.74	62.2	42.9	79.5	21	0.90	0.77–0.96
Item 7a	66	0.68	0.31–0.69	72.7†	58.1‡	85.7**	16	0.76	0.44–0.91
Item 7b	8	0.85	0.35–0.78	62.5††	50.0‡‡	75.0‡‡	5	1.00	1.00–1.00
Item 8	74	0.76	0.29–0.69	64.9	42.9	84.6	21	0.93	0.84–0.97
Item 9	74	0.74	0.49–0.73	71.6	54.3	87.2	21	0.93	0.83–0.97
Item 10	74	0.38	0.16–0.40	74.3	68.6	79.5	21	0.96	0.91–0.99
Total score							21	0.96	0.91–0.98

Cronbach's alpha [10 items (7B excluded)] = 0.89; Cronbach's alpha [nine items (7B and 10 excluded)] = 0.89

*Adjusted item–total correlation: to avoid inflating the correlations (adjusted item–total correlation for item X = rescored total score minus the score of item X).

†$n = 66$.

‡$n = 31$.

**$n = 35$.

††$n = 8$.

‡‡$n = 4$.

TEST–RETEST RELIABILITY

The questionnaire was administered twice with an interval of 5 days to 21 patients. The mean total score of the first assessment was 9.86 (SD = 6.49), the mean total score of the second assessment was 10.29 (SD = 6.54). No statistical significant difference between both assessments was observed (Wilcoxon test: $P = 0.37$). The reliability assessed by ICC (shown in Table II) was very good for all items (ICC > 0.80), except item 7a, which still scored well (ICC = 0.75). ICC for the total score was excellent (ICC = 0.96, 95% CI = 0.91–0.98). Bland and Altman analysis showed that means of differences [mean difference = 0.43 (SD = 1.8)] did not differ significantly from zero and no systematic trend was observed (Fig. 1).

INTERNAL CONSISTENCY VALIDITY

Table II shows the results of the adjusted item–total correlation of each item. In general, individual items of the FIHOA correlated well with the total score and all correlations were statistically significant ($P < 0.001$) except for one item ('Would you accept a handshake without reluctance?') having an adjusted item–total score correlation < 0.40. The specific question for males (item 7b) is not included in this analysis because of the low amount of males in the population ($n = 8$).

Individual items of the FIHOA were scored >0 in 58.1 to 74.3% by the subjects, depending on the item. The endorsement rates were clearly higher for the symptomatic group compared to the a-/mild symptomatic group for all items ($P < 0.05$ for all, except item 7b).

Internal consistency was high for the overall FIHOA scale (item 7 for males was excluded) (Cronbach's alpha = 0.89).

CONSTRUCT VALIDITY

All correlations between the FIHOA, the three subscales of the AUSCAN and VAS pain are calculated and shown in Table III. The scores of the subscales of the AUSCAN were correlated with the total FIHOA score. Very good correlation is observed between the FIHOA score and the subscale functionality of the AUSCAN ($r = 0.81$, $P < 0.01$) in all patients. In the subgroup analysis, good correlation remains ($r = 0.81$ in the a-/mild symptomatic group and $r = 0.65$ in the symptomatic group). Moderate correlation was found between the FIHOA score and the subscale stiffness of the AUSCAN ($r = 0.54$, $P < 0.01$). Good correlation was found between the FIHOA score and the AUSCAN subscale pain ($r = 0.66$, $P < 0.01$). In our cohort, the correlation between the VAS pain and the FIHOA was high in the asymptomatic group ($r = 0.60$) but low in the symptomatic group ($r = 0.17$). Correlations between the subscales pain and functionality of the AUSCAN were very high for both groups ($r = 0.78$ in a-/mild symptomatic group and $r = 0.73$). The assessment of functionality by the AUSCAN seems to be more sensitive to the presence of pain than the FIHOA since correlation between AUSCAN subscale function and pain is higher than the correlation between FIHOA and pain. This is true for both the assessment of pain by VAS ($r = 0.58$ with FIHOA vs 0.80 with AUSCAN function) as by AUSCAN subscale (0.66 with FIHOA vs 0.85 with AUSCAN function).

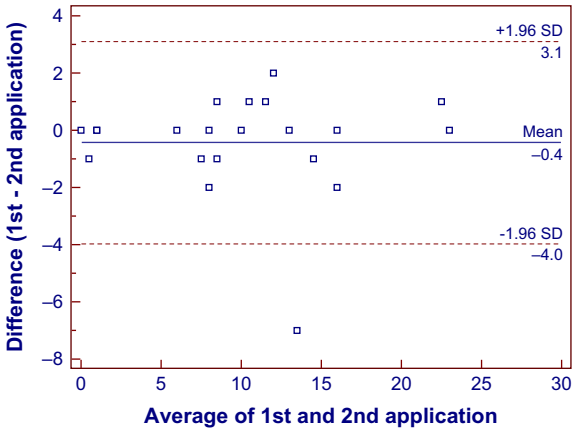

Fig. 1. Bland and Altman plot of total score of FIHOA for test/retest reliability. Mean difference (1st–2nd application) = –0.43 (SD = 1.80).

Discussion

This paper reports the validation of a cross-cultural translation and adaptation of the Dutch version of the FIHOA. This translation has been tested in a Dutch-speaking population in Belgium (Flanders) and the Netherlands. Since no semantic or cultural problems were present in this Dutch translation, it can be used in Dutch-speaking persons in both countries. The results obtained from the first Dutch version of the FIHOA are found to be very consistent with the results of the original French version for its capacity to discriminate between subgroups based on the VAS pain scale, its reliability and internal consistency. The discriminant value of all the items is high and can discriminate between patients based on severity of pain. Internal consistency scores very high (Cronbach's alpha = 0.89) as well as the test–retest reliability (ICC for total score = 0.96), which is nearly identical to the results of the original version. The sample size for assessing reliability is rather small, nevertheless the small ranges of the 95% CIs are reassuring. The subgroups are similar to the original French version concerning the mean VAS scales as well as the total FIHOA scores[2].

Construct validity shows that there is a high correlation between the FIHOA and all of the subscales of the AUSCAN. Especially the AUSCAN function subscale correlates very well with the FIHOA ($r = 0.80$) as expected since the latter is an outcome measure specifically designed for assessing functional impairment. To our knowledge, the relation to the AUSCAN has never been reported previously. Nevertheless, some discrete differences between both questionnaires can be suggested since the correlation with other variables (such as VAS pain) did not score similarly. The correlation between pain and function measured by the respective subscales of the AUSCAN is higher than any other correlation between instruments assessing pain and function, e.g., VAS pain and FIHOA. This may suggest a difference in approach of assessing functional impairment between both questionnaires (i.e., FIHOA and AUSCAN).

It has been indicated by the patients that confusion arises when completing the FIHOA if it is not mentioned specifically to which hand the items apply. To evaluate the functional impairment of the hand affected by OA, it should at least be clinically or radiographically affected by the disease. Conflicting results can occur when the focus is made on the dominant hand rather than on the affected hand. Again, confusion upon completing some items of

Table III
Spearman's rank correlation coefficient between FIHOA, subscales of the AUSCAN and VAS pain in the a-/mild symptomatic and symptomatic patients

	FIHOA	AUSCAN pain	AUSCAN stiffness	AUSCAN function	VAS pain
All patients (n = 72)					
FIHOA	1.00	0.66**	0.54**	0.81**	0.58**
AUSCAN pain	0.66**	1.00	0.68**	0.85**	0.79**
AUSCAN stiffness	0.54**	0.68**	1.00	0.69**	0.58**
AUSCAN function	0.81**	0.85**	0.69**	1.00	0.80**
VAS pain	0.58**	0.79**	0.58**	0.80**	1.00
A-/mild symptomatic patients (n = 35)					
FIHOA	1.00	0.70**	0.46**	0.81**	0.60**
AUSCAN pain	0.70**	1.00	0.66**	0.78**	0.78**
AUSCAN stiffness	0.46**	0.66**	1.00	0.61**	0.58**
AUSCAN function	0.81**	0.78**	0.61**	1.00	0.64**
VAS pain	0.60**	0.78**	0.58**	0.64**	1.00
Symptomatic patients (n = 37)					
FIHOA	1.00	0.36**	0.36*	0.65**	0.17
AUSCAN pain	0.36*	1.00	0.51**	0.73**	0.52**
AUSCAN stiffness	0.36*	0.51**	1.00	0.52**	0.14
AUSCAN function	0.65**	0.73**	0.54**	1.00	0.46**
VAS pain	0.17	0.52**	0.14	0.46**	1.00

**Correlation is significant at the 0.01 level. *Correlation is significant at the 0.05 level.

the questionnaire can arise when both hands are affected and symptom severity differs.

For some items it is clear which hand is concerned; the dominant hand (e.g., writing skills, turn a key, knitting, cutting) or the right hand (e.g., accepting a handshake). For other items both hands are needed (e.g., tying a knot, fasten buttons). But for some items, the activity can be performed by both hands separately (e.g., clenching a fist, lifting a bottle) and for these items it should be specifically indicated if either the dominant hand or the affected hand should be considered by preference. It has previously been reported that the FIHOA is mainly a right-handed dedicated index and therefore it should also be indicated on top of the questionnaire that it concerns the right hand[2].

Some remarks are to be made on items 5, 7 and 10 of the FIHOA. The results of this study show that there is a problem in discriminating capacity of 'clenching a fist' (item 5) between symptomatic and less symptomatic patients in cohort of 72 patients. This question is scored 'zero' (26%) or 'three' (42%) more often than other questions. The phrasing of the original version suggests that this question is more a dichotomous variable in which the answer is either 'yes or no'. In fact, this item illustrates that functional impairment can be due to pain or to structural damage, or both. The response to this question will be more a reflection of presence of structural damage and advanced disease (rather than active disease and presence of pain).

Since more females are affected by hand OA than males[8], there is a serious underrepresentation of males in our cohort, and by consequence, the gender specific question (item 7b) of the FIHOA applying to males cannot be reliably evaluated. However, one can assume that there is no large functional difference in the performance of the two gender specific questions (items 7a and 7b) and that the reason for separate questions is more socio-culturally driven. Therefore, we can expect similar results in performance between the question specific for females and the question for males. On the other hand, the use of a gender specific question in a questionnaire to assess functionality of the hands and its added value is questionable. Therefore, further research should be done to investigate whether this gender specific question can be eliminated or replaced.

The item–item correlation shows relatively high values suggesting that redundancy could be present in the questionnaire and by consequence that some overlapping questions could be eliminated. However, completing the 10-item FIHOA only takes about 2 min for the patient. Adjusted item–total correlation is >0.5 for all items except for item 10 ($r = 0.385$) which has found to be consistent with previous data obtained from the French original version of the FIHOA[2]. Item 10 also scores low on the item–item correlation, suggesting that this concerns an activity ('Would you accept a handshake without reluctance?') that is generally different from the other nine items.

The endorsement rates of all items range between 56.9% and 73.6% suggesting that no item can be performed with ease by all patients and that no item is too difficult to perform by all patients. Moreover, the endorsement rates are higher in the patients group with higher VAS scale, confirming a positive relation between the presence of pain and functional impairment. Nevertheless, the higher functional impairment in the patients with symptomatic disease cannot be simply explained by this presence of pain since the correlation between pain and functional impairment (measured by both FIHOA and subscale of the AUSCAN) is lower than in the a- or mild symptomatic group. Therefore another determinant has to be present that causes functional impairment and is most likely to be the presence of structural disease. A recent cross-sectional study on a large sample of individuals from a population based study of OA of the knee and hip in North Carolina shows a large correlation between the subscale pain and function of the AUSCAN ($r = 0.81$). When controlling for the AUSCAN subscale pain, the function is still significantly associated with grip and pinch strength, indicating that there is an important negative relation between function measured by the AUSCAN and grip and pinch strength[9]. Similar observations have been done previously by the same group[10]. It could be expected that FIHOA and grip strength may also show good (negative) correlation and this should be confirmed in a large sample study.

Future work should investigate the hypothesis that the AUSCAN may be driven more by presence of pain, while the FIHOA could be directed more towards presence of

structural damage. More research should be done on the predictive value of different radiographic stages of the affected joints and joint groups on the functional outcome, and to explain potential differences between the existing outcome measures for functional impairment.

Conclusion

The psychometric properties (test–retest reliability, construct validity and internal consistency) of the Dutch version of the FIHOA were excellent. There was a good correlation between the FIHOA and all subscales of the AUSCAN and especially with the subscale functionality, where it is designed to. Responsiveness and defining the smallest detectable difference need to be done in future research.

Conflict of interest

All authors declare that there is no conflict of interest.

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Appendix 1

English version of the FIHOA:

1. Are you able to turn a key in a lock?
2. Are you able to cut meat with a knife?
3. Are you able to cut cloth or paper with a pair of scissors?
4. Are you able to lift a full bottle with the hand?
5. Are you able to clench your fist?
6. Are you able to tie a knot?
7. *For women* – Are you able to sew?
   For men – Are you able to use a screwdriver?
8. Are you able to fasten buttons?
9. Are you able to write for a long period of time (10 min)?
10. Would you accept a handshake without reluctance?
    0 = possible without difficulty.
    1 = possible with slight difficulty.
    2 = possible with important difficulty.
    3 = impossible.

Dutch version of the FIHOA:

1. Kan U een sleutel in een slot omdraaien?
2. Kan U met een mes vlees snijden?
3. Kan U met een schaar papier of stof (ver)knippen?
4. Kan U met één hand een volle fles opheffen of omhoog houden?
5. Kan U de vuist volledig sluiten?
6. Kan U een knoop leggen?
7. *voor vrouwen*: Kan U naaiwerk verrichten?
   voor mannen: Kan U een schroevendraaier gebruiken?
8. Kan U de knopen van uw kledij vastmaken?
9. Kan U lange tijd schrijven (10 min zonder onderbreking)?
10. Aanvaardt U zonder aarzeling een handdruk?
    0 = mogelijk zonder moeite.
    1 = mogelijk mits beperkte moeite.
    2 = mogelijk mits aanzienlijke moeite.
    3 = onmogelijk.

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