Psychometric properties of the OARSI/OMERACT osteoarthritis pain and functional impairment scales: ICOAP, KOOS-PS and HOOS-PS

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Abstract

Objectives

To evaluate the psychometric properties of the OARSI-OMERACT questionnaires in comparison to the existing validated scales.

Methods

Consecutive hip or knee osteoarthritis patients consulting in an orthopedic department were enrolled in the study. Data collected were pain using the Intermittent and Constant Osteoarthritis Pain (ICOAP), a Numeric Rating Scale (NRS), the Western Ontario McMaster Universities' Osteoarthritis Index (WOMAC) pain subscale, the Lequesne pain subscale; functional impairment using the Knee disability and Osteoarthritis Outcome Score-Physical Function Shortform (KOOS-PS), the Hip disability and Osteoarthritis Outcome Score-Physical Function Shortform (HOOS-PS), a NRS, the WOMAC function sub-scale, the Lequesne function subscale. Validity was assessed by calculating the Spearman's correlation coefficient between all the scales. Reliability was assessed in out-patients with stable disease comparing the data collected within 2 weeks using the intra-class correlation coefficient (ICC). Responsiveness was assessed on the data from hospitalised patients prior to and 12 weeks after a total joint replacement (TJR) using the standardised response mean.

Results

Three hundred patients (mean age=68 years, females=62%, hip OA=57%) were included. There was a moderate to good correlation between ICOAP, KOOS-PS, HOOS-PS and the WOMAC, NRS and Lequesne scales. Reliability of the ICOAP hip OA HOOS-PS and KOOS-PS was good (ICC range 0.80–0.81) whereas it was moderate for knee ICOAP (ICC=0.65). Responsiveness of the ICOAP, KOOS-PS and HOOS-PS 12 weeks after TJR was comparable to responsiveness of other scales (SRM range: 0.54–1.82).

Conclusions

The psychometric properties of the ICOAP, KOOS-PS and HOOS-PS were comparable to those of the WOMAC, Lequesne and NRS.

Key words

osteoarthritis, hip, knee, pain measurement, disability evaluation

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Introduction

Osteoarthritis (OA) is the most common rheumatic disease and is becoming a major problem of public health with the ageing of the population in developed countries (1). Hip and knee OA often lead to pain and disability in daily activities that significantly reduce independence and quality of life (2).

Total joint replacement (TJR) is a known effective treatment for moderate to severe hip and knee OA (3). Disease modifying agents for OA are of interest (3), but to evaluate these agents, there is a need to define eligibility criteria for clinical trials and appropriate outcomes.

An international working group under the aegis of the Osteoarthritis Research Society International (OARSI) and the Outcome Measures in Rheumatology Clinical Trials (OMERACT) groups determined that TJR was not a feasible outcome in trials of non-surgical management of hip or knee OA because of the discrepancies in access to surgery among the countries and patients' variability in willingness to undergo TJR (4-9). Hence, it was decided by the working group to elaborate a surrogate marker that could replace the "time to surgery" outcome by an alternative as "theoretical time to fulfil the criteria for surgery" and to include the domains of pain, function and joint structure in a composite index in a "surrogate hard endpoint" (5).

For pain, focus group discussions identified 2 distinct types of pain in OA: a constant background pain and an intermittent but intense pain (10). These data led the working group to elaborate a new questionnaire assessing pain in hip or knee OA: the Measure of Intermittent and Constant OsteoArthritis Pain (ICOAP) (11). Preliminary studies suggested that it was valid, reliable and had good responsiveness (11, 12).

To appreciate physical function in hip and knee OA, several scales have been proposed including the Western Ontario McMaster Universities' Osteoarthritis Index (WOMAC) (13) physical function subscale, the Lequesne (14) physical function subscale, the Hip disability and Osteoarthritis Outcome Score (HOOS) (15), the Knee disability and Osteoarthritis Outcome Score (KOOS) (16). Concerns have been expressed that WOMAC, HOOS and KOOS scales had redundancy within their restricted range of difficulty given the number of items and the method used to determine their inclusion (17-18). Hence, the working group developed two subscales of the HOOS and KOOS by Rasch modelling, the HOOS-Physical Function Shortform (HOOS-PS) (19) and the KOOS-Physical Function Shortform (KOOS-PS) (20). These sub-scales have been proven to be valid, reliable and sensitive to change (20-23).

To be useful in international clinical trials, questionnaires need to be cross-culturally translated and validated. The ICOAP, HOOS and KOOS questionnaires have already been cross-cultural adapted and validated in French and the psychometric properties of these translations were comparable to the English version (24-26). Furthermore, several psychometric studies in different populations are advisable for the validation of such questionnaires.

The aim of this work was to study the psychometric properties including internal consistency, construct validity, reliability and sensitivity to change of the French version of theses scales (ICOAP, KOOS-PS and HOOS-PS) and to compare their properties to existing widely-used scales (WOMAC, Lequesne and Numerical Rating Scale (NRS) for pain and function).

Methods

Study design

This was a longitudinal observational study.

Patients

Consecutive inpatients and outpatients consulting in the orthopaedic department of the Cochin Hospital for hip or knee OA were invited to participate in the study and to complete the questionnaires.

Inclusion criteria were patients suffering from OA according to ACR criteria (27-28) and able to answer the questionnaire.

Exclusion criteria were inflammatory rheumatism, revision arthroplasty of

the target joint, psychiatric pathology, cardiac, lung or neurological diseases that could alter physical function (*i.e.* dyspnoea of 3 or more of the New York Health Association classification, Parkinson Disease, Multiple Sclerosis, hemiplegia, Amyotrophic Lateral Sclerosis, OA of another joint that could altered functional scores).

The patients included were separated into two groups: the first group included patients recruited in orthopaedic outpatient clinic who visited their surgeon to discuss a joint replacement. These patients' data were used for the reliability study. Only patients with no immediate change in their usual treatment were included; if a symptomatic treatment was decided by the surgeon during the visit, the patient was not included. The second group included inpatients recruited from the orthopaedic department who underwent a total joint replacement for their hip or knee OA. These patients' data were used for the responsiveness study.

The local ethics committee approved the study; all the patients gave their consent before participating in this study, according to the declaration of Helsinki.

Data collection

The following data were systematically collected: age, sex, height, weight and target joint (hip or knee). Patients had to complete a self-report questionnaire including the target pain scale (ICOAP (29)), target function scale (HOOS-PS for hip OA or KOOS-PS for knee OA (30) available on http://www.koos.nu), WOMAC pain and function subscales Likert-type version 3.0 (14), Lequesne questionnaire (13), pain and function NRS. All the scales addressed pain or functional difficulties of patients within the last week before the assessment.

The ICOAP scale has 11 items including 5 questions for constant background pain and 6 questions for intermittent pain. The HOOS-PS has 5 questions, the KOOS-PS has 7 questions, the WOMAC pain subscale has 5 questions and the WOMAC function subscale has 17 questions. Each item of these scales were scored 0-4 with response options rating the amount of pain or difficulty on activity or circumstance ranging from "None" or "Not at all" (scored 0) to "Extreme" or "Impossible" (scored 4).

The Lequesne questionnaire has 11 questions assessing both pain and function, each item had different system of scoring, the final score ranged from 0 to 24 (0: normal, 24: maximal difficulty and pain).

For the NRS, patients were asked to rate their amount of pain (pain NRS) and functional difficulties (function NRS) on a numeric scale ranging from 0 to 10.

Each scale was presented in its complete form to the patient, therefore 3 questions in the hip OA questionnaire and 4 questions in the knee OA questionnaire were completed twice, both in the new scales and in the WOMAC scale.

To assess reliability, outpatients in stable state visiting a surgeon for their OA were asked to complete the questionnaire once before the visit. The same questionnaire was sent to the patients 2 weeks later and patients were asked to complete it a second time and to send it to the research unit.

To assess sensitivity to change, inpatients hospitalised for a TJR for a knee or hip OA were asked to complete the questionnaire the day before the surgery. The same questionnaire was sent to the patients 12 weeks after the surgery.

The complete questionnaire could be completed in around 20 minutes.

Data analysis

Descriptive analysis was performed to examine the characteristics of patients recruited in the study. For comparison between scales, all the scores were linearly transformed to scores ranging from 0 to 100 as follows; the function scales (KOOS-PS and HOOS-PS) were converted using weights as described previously (19, 20).

Validity

Validity was assessed using all patients' data including the reliability group and the responsiveness group. Internal consistency was assessed by calculation of the Cronbach's alpha. Cronbach's alpha of 0.80 was considered as a minimum standard for creating a summated score (31).

Construct validity of the ICOAP, KOOS-PS and HOOS-PS was assessed by the calculation of Spearman's correlation coefficients in comparison to the WOMAC, the pain and function NRS and the Lequesne scale. It was hypothesized *a priori* that the ICOAP would have a moderate correlation (r_s=0.40–0.70) to the pain NRS, to the WOMAC pain subscale and to the Lequesne pain subscale; the KOOS-PS and HOOS-PS would have a moderate correlation (0.40-–0.70) to the function NRS, to the function WOMAC subscale and to the Lequesne subscale.

Test-retest reliability

The intra-class correlation coefficient (ICC) and its 95% confidence interval were calculated as a measure of test-retest reliability (32) using the data of out-patients who were assessed twice within 2 weeks. An ICC of at least 0.80 is required to minimise measurement error while 0.90 or greater is preferred (33).

Responsiveness

The Standardised Response Mean (SRM) was calculated as a measure of sensitivity to change on the basis of differences in each score between week 12 and week 0 in-patients who underwent TJR. The SRM is the mean change between baseline and week 12 divided by the standard deviation of this change (34). A SRM>0.8 is considered large. The SRM of the ICOAP, KOOS-PS and HOOS-PS were compared to the SRM of the pain and function NRS, to the WOMAC and to the Lequesne scales. The 95% confidence intervals of the SRM were calculated with bootstrap procedures (35).

All statistics were performed using SAS software version 9.1.

Results

Patients

Three hundred OA patients (mean age = 68 years, females = 62%, mean disease duration = 6 years) were included in the study including 172 hip OA patients and 128 knee OA patients. Characteristics of all included patients at baseline are presented in Table I. Among these patients, 24% never sent the question-

Table I. Demographic characteristics of participants.

Characteristics	Validity sample n=300		Reliability sample n=63		Responsiveness sample n=167	
	Hip sample n=172	Knee sample n=128	Hip sample n=33	Knee sample, n=30	Hip sample n=107	Knee sample n=60
Age, mean (SD)	65.1 (12.3)	70.9 (10.5)	64.7 (12.1)	69.3 (10.9)	65.6 (10.2)	71.0 (10.3)
Females, n (%)	92 (53.5)	93 (72.7)	21 (63.6)	20 (66.7)	52 (48.6)	41 (68.3)
BMI; kg/cm^2, mean (SD)	25.7 (4.0)	27.9 (4.8)	25.6 (4.5)	27.5 (4.6)	25.9 (3.9)	28.2 (4.5)
Disease duration, years, mean (SD)	4.6 (4.9)	8.5 (8.7)	4.1 (3.5)	7.7 (7.8)	5.0 (5.6)	9.0 (10.1)
Pain NRS (0–100), mean (SD)	59.8 (20.2)	65.2 (20.2)	55.2 (23.9)	63.7 (19.2)	59.5 (19.1)	64.5 (18.6)
Function NRS (0–100), mean (SD)	65.9 (20.7)	68.2 (19.8)	58.5 (26.5)	58.4 (23.7)	67.4 (18.2)	68.5 (18.8)
ICOAP (0–100), mean (SD)	47.5 (18.2)	48.7 (17.6)	49.2 (22.0)	48.1 (18.4)	46.2 (17.5)	48.5 (16.7)
Constant pain (0–100), mean (SD)	45.5 (19.0)	47.8 (19.7)	46.6 (22.6)	48.3 (20.3)	43.8 (18.7)	47.7 (19.8)
Intermittent pain (0–100), mean (SD)	49.5 (20.4)	50.2 (20.4)	51.6 (21.9)	48.4 (20.2)	48.5 (19.9)	49.4 (20.6)
KOOS-PS (0–100), mean (SD)		56.3 (17.5)		51.8 (17.7)		55.4 (16.6)
HOOS- PS (0–100), mean (SD)	51.3 (16.3)		45.8 (20.3)		52.6 (15.0)	
WOMAC (0–100), pain subscale, mean, (SD)	48.7 (16.9)	52.2 (18.1)	45.2 (22.5)	49.8 (21.2)	48.8 (15.3)	53.7 (14.9)
WOMAC (0–100), function subscale, mean, (SD)	56.6 (14.4)	57.9 (18.3)	51.6 (20.3)	48.9 (20.1)	57.0 (12.4)	58.0 (15.5)
Lequesne (0–100), mean, (SD)	51.6 (15.1)	56.1 (16.6)	44.1 (17.7)	47.5 (15.3)	52.7 (13.1)	56.0 (15.5)
Lequesne pain subscale (0–100), mean (SD)	60.1 (15.4)	56.4 (18.0)	53.4 (19.3)	50.0 (17.3)	61.4 (14.2)	55.8 (17.2)
Lequesne function subscale (0–100), mean (SD)	47.6 (18.6)	56.5 (19.3)	39.5 (21.0)	45.8 (19.2)	48.3 (16.3)	55.9 (17.1)

SD: Standard Deviation; BMI: Body mass index; NRS: Numeric Rating Scale; OA: osteoarthritis; ICOAP: Intermittent and Constant OsteoArthritis Pain scale; KOOS-PS: Knee disability and Osteoarthritis Outcome Score – Physical Function Shortform; HOOS-PS: Hip disability and Osteoarthritis Outcome Score – Physical Function Shortform; WOMAC: Western Ontario McMaster Universities' Osteoarthritis Index.

naire back and were excluded from the analysis of reliability and responsiveness. Analysing their characteristics, the hip OA patients had a higher Lequesne function subscales score, whereas knee OA patients had higher function scores in all scales (p=0.02, data not shown).

Validity of the ICOAP, HOOS-PS and KOOS-PS

Internal consistency was good with a Cronbach's alpha of 0.89 for the hip ICOAP (0.80 for the constant pain score and 0.86 for the intermittent pain scores), 0.86 for the knee ICOAP (0.80 for the constant score and 0.84 for the intermittent score) and 0.84 for KOOS-PS indicating no item redundancy but only 0.69 for HOOS-PS. When analysing inter-item correlation of the HOOS-PS, the item "degree of difficulty when sitting" had a Pearson's correlation coefficient of only 0.30 indicating a lack of homogeneity with other items ("descending stairs", "getting in/out of bath or shower", "running", "twisting/pivoting on your loaded leg").

The construct validity showed a weak (r_s <0.4) to moderate (0.4<r_s <0.7) correlation of the ICOAP to the WOMAC pain subscale, the pain NRS and the Lequesne pain subscale (respectively, for hip OA patients: r_s=0.60, r_s=0.55, r_s=0.31; for the hip constant pain scale: r_s=0.59, r_s=0.52, r_s=0.38; for the hip intermittent scale: r_s=0.55, r_s=0.55, r_s=0.27; for knee OA patients: r_s=0.60, r_s=0.51, r_s=0.48; for the knee constant pain scale: r_s=0.67, r_s=0.57, r_s=0.43; for the knee intermittent scale: r_s=0.52, r_s=0.48, r_s=0.43; all with a p-value <0.0001)) indicating that the ICOAP scale was assessing another area of OA pain and a moderate to good correlation of the KOOS-PS and HOOS-PS to the WOMAC function subscale, the function NRS and the Lequesne function subscale (respectively: for HOOS-PS: r_s=0.80, r_s=0.57, r_s=0.62 and for KOOS-PS , r_s=0.84 ,r_s=0.53, r_s=0.66, all with a p-value <0.0001).

Test-retest reliability

Test-retest reliability was calculated with the data of outpatients who came for a surgeon visit and who were asked to complete the questionnaire twice within 2 weeks (n=63 patients).

For the hip, the ICOAP and HOOS-PS had a good reliability, as good as WOMAC and Lequesne scales.

For the knee, a primary analysis revealed that all scales had poor to moderate reliability. When examining the variables, one patient had an extreme improvement within two weeks (NRS about 9/10 to 2/10). Excluding this outlier, the scales had moderate to good reliability, except the Lequesne pain subscale which was not reliable. The intermittent subscale of the ICOAP was not reliable whereas the reliability of the constant pain subscale was better. KOOS-PS reliability was as good as WOMAC pain subscale one.

The results of the different ICC with 95% confidence intervals for each score, excluding the outlier of the knee sample, are presented in Table II.

Responsiveness

Sensitivity to change was calculated with the data of inpatients that underwent a TJR and who were asked to complete the questionnaire before surgery and 12 weeks after the surgical procedure (n=223 patients).

The responsiveness calculated as SRM are presented in Table III. For hip assessment, the ICOAP SRM was significantly better than the WOMAC pain subscale and the Lequesne pain subscale but significantly lower than the

Table II. Test-retest reliability: results of the intra-class correlation coefficients with 95% confidence intervals of 7 different scales between 2 assessments within 2 weeks in patients with stable hip/knee OA, excluding one outlier of the knee OA sample.

ICC	Hip OA patients n=33	Knee OA patients n=29
Pain NRS	0.60 (0.32–0.78)	0.74 (0.52–0.87)
Function NRS	0.74 (0.54–0.86)	0.80 (0.62–0.90)
ICOAP	0.81 (0.65–0.90)	0.65 (0.34– 0.83)
– Constant pain	0.84 (0.70–0.92)	0.76 (0.52–0.89)
– Intermittent pain	0.82 (0.66–0.91)	0.38 (-0.03–0.68)
KOOS–PS		0.89 (0.78–0.95)
HOOS–PS	0.80 (0.63–0.90)	
WOMAC pain subscale	0.91 (0.83–0.96)	0.83 (0.66–0.92)
WOMAC function subscale	0.91 (0.83–0.96)	0.89 (0.78–0.95)
Lequesne	0.82 (0.67–0.91)	0.70 (0.44–0.86)
Lequesne pain subscale	0.69 (0.47–0.84)	0.16 (-0.24–0.52)
Lequesne function subscale	0.78 (0.59–0.88)	0.74 (0.51–0.88)

ICC: Intra-Class Correlation Coefficient; OA: osteoarthritis; NRS: Numeric Rating Scale; ICOAP: Intermittent and Constant OsteoArthritis Pain scale; KOOS-PS: Knee disability and Osteoarthritis Outcome Score -Physical Function Shortform; HOOS-PS: Hip disability and Osteoarthritis Outcome Score -Physical Function Shortform; WOMAC: Western Ontario McMaster Universities' Osteoarthritis Index.
Missing data: hip pain NRS: n=2, hip function NRS: n=0, hip ICOAP: n=1, HOOS-PS: n=2, hip WOMAC pain subscale :n=1, hip WOMAC function subscale: n=1, hip Lequesne pain subscale: n=0, hip Lequesne function subscale: n=0, knee pain NRS: n=1, knee function NRS: n=1, knee ICOAP: n=6, KOOS-PS: n=6, knee WOMAC pain subscale: n=1, knee WOMAC function subscale: n=1, knee Lequesne pain subscale: n=5, knee Lequesne function subscale: n=5.

Table III. Responsiveness of 7 different scales in patients with hip/knee OA after TJR: results of the Standardised Response Means and 95% Confidence Intervals (Bootstraps).

Standardised Response Means and 95% Confidence Interval	Hip	Knee
Number of patients	107	60
Pain assessment		
Pain NRS	1.80 (1.76–1.83)	1.15 (1.10–1.19)
ICOAP	1.63 (1.60–1.67)	0.62 (0.58–0.65)
Constant pain	1.59 (1.55–1.63)	0.65 (0.61–0.69)
Intermittent pain	1.35 (1.32–1.38)	0.45 (0.41–0.49)
WOMAC pain subscale	1.54 (1.52–1.57)	1.11 (1.07–1.15)
Lequesne pain subscale	1.00 (0.98–1.02)	0.54 (0.48–0.60)
Physical function assessment		
Function NRS	1.82 (1.78–1.86)	1.08 (1.03–1.14)
HOOS–PS/KOOS–PS	1.27 (1.24–1.31)	0.89 (0.86–0.93)
WOMAC function subscale	1.80 (1.77–1.83)	1.21 (1.16–1.26)
Lequesne function subscale	1.32 (1.29–1.34)	0.70 (0.66–0.74)

TJR: Total Joint Replacement; OA: osteoarthritis; NRS: Numeric Rating Scale; ICOAP: Intermittent and Constant OsteoArthritis Pain scale; HOOS-PS: Hip disability and Osteoarthritis Outcome Score -Physical Function Shortform; WOMAC: Western Ontario McMaster Universities' Osteoarthritis Index; KOOS-PS: Knee disability and Osteoarthritis Outcome Score -Physical Function Shortform.
Missing data: hip pain NRS: n=7, hip ICOAP: n=8, hip WOMAC pain subscale: n=2, hip Lequesne pain subscale: n=11, hip function NRS: n=3, HOOS-PS: n=29, hip WOMAC function subscale: n=8, hip function Lequesne subscale: n=11, knee pain NRS: n=5, knee ICOAP: n=2, knee WOMAC pain subscale: n=3, knee Lequesne pain subscale: n=13, knee function NRS: n=3, KOOS-PS: n=2, knee WOMAC function subscale, n=7, knee function Lequesne subscale: n=7.

pain NRS SRM. The HOOS SRM was significantly lower than the WOMAC function subscale and the function NRS but was better than the Lequesne function subscale SRM. For the knee assessment, the ICOAP SRM was significantly lower than the WOMAC pain subscale and the pain NRS SRM but comparable to the Lequesne pain subscale SRM. The KOOS had a lower responsiveness than the WOMAC function subscale and function NRS ones but it remained better than the Lequesne function subscale one.

Discussion

In this study, the ICOAP, HOOS-PS and KOOS-PS had good psychometric properties, comparable to the NRS, the WOMAC and the Lequesne scales, confirming previous study findings.

To our knowledge, this is the first study that both evaluated ICOAP, KOOS-PS and HOOS-PS on the same OA patients. Previous articles (21, 22) studied test-retest reliability and responsiveness of the KOOS-PS and HOOS-PS but their data were extracted from the complete HOOS and KOOS questionnaires. In this present study, all the patients completed specifically the KOOS-PS and HOOS-PS and the specific properties of these scales are presented here.

In this study, the internal consistency of the new scales was good for the ICOAP and the KOOS-PS, with a Cronbach's alpha coefficient above 0.84, as it had already been shown in previous studies (11, 23) In this study, for the HOOS-PS, the Cronbach's alpha coefficient was only 0.69. However in Davis et al study (21) the Cronbach's alpha of the HOOS-PS was 0.79 that indicated a homogeneous construct.

As expected, in this study the ICOAP scale had a moderate correlation to the pain NRS and the WOMAC pain subscale whereas Davis *et al*. showed a good correlation of the ICOAP with the WOMAC pain subscale between 0.7 and 0.8. A strong correlation of the KOOS-PS and HOOS-PS with the WOMAC function subscale was noted probably explained by several items that are both in WOMAC and KOOS-PS (5 items) and HOOS-PS (3 items). However, this strong correlation had already been demonstrated in a previous study, and persisted even after exclusion of common items from the WOMAC function subscale (21).

In this study, although the test-retest reliabilities of the KOOS-PS, HOOS-PS, WOMAC pain and function subscale and hip ICOAP were good, the knee ICOAP was lower, this is probably explained by the poor reliability of the Intermittant pain subscale. Usually a value of 0.8 is the minimum expected for the ICC of a tool. Previous studies showed a good reliability of these questionnaires in knee OA (12, 20, 22).

Poor reliability was also noted for the Lequesne questionnaire with a pain subscale not reliable. As the reliability of the WOMAC pain subscale and the function scales were good, the poor reliability of the ICOAP Intermittant pain subscale and Lequesne pain subscale could be explain by intrinsic properties of the scales. Thus, the ICOAP Intermittant Pain subscale is defined to catch fleeting pain that could vary within both assessments. However, this was not observed with hip scales.

In this study, the responsiveness was better after hip replacement than after knee replacement. Usually a response with a SRM above one is expected. This endpoint was achieved after hip replacement with all the scales but was not reached after knee replacement for the ICOAP, KOOS and Lequesne scales. The endpoint of 12 weeks after knee replacement might be too short explaining the lower score of ICOAP and KOOS-PS responsiveness. In Davis *et al*. (21) responsiveness of these tools after total knee replacement were better with SRM of KOOS-PS of 1.4 but the second assessment was performed 6 months after surgery, that can explain such a good response. Responsiveness of the HOOS-PS and KOOS-PS had also been studied by Ornetti *et al*. (22), by comparing the scores prior and 1 month after hyaluronic intra-articular knee or hip injection. The authors showed a good response and the SRM were respectively 1.1 and 0.8, that is intriguing since such an effect size (respectively 0.62 and 0.51) had never been demonstrated in randomised controlled trials. Compared to the WOMAC and the NRS, the knee ICOAP, KOOS-PS and HOOS-PS responsiveness were lower but comparable to the Lequesne scale.

In this study, the questionnaire was self-administered. Although it is a commonly accepted way of completion of the WOMAC, KOOS-PS and HOOS-PS, the ICOAP had been designed to be interviewer-administered. This way of completion might have introduced a misunderstanding bias during the ICOAP completion. During the first assessment, an investigator could help the patients to complete the questionnaire and answer to their questions. But during other assessments, over time, the patients were alone. However, the ICOAP had good correlation with other pain scales and this methodological problem should have little effect on our findings.

This study demonstrated that the French version the ICOAP, HOOS-PS and KOOS-PS scales is valid, reliable and sensible to change, and their psychometric properties seem comparable to those of the WOMAC.

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