ORIGINAL ARTICLE

Adaptation and validation of the Osteoarthritis Knee and Hip Quality of Life (OAKHQOL) questionnaire for use in patients with osteoarthritis in Spain

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Abstract This study aims to adapt and validate the Spanish version of the Osteoarthritis Knee and Hip Quality of Life (OAKHQOL) questionnaire. The OAKHQOL was adapted into Spanish using a forward–backward translation methodology. The Spanish version was then validated in a prospective, mixed-design study of 759 patients with hip or knee osteoarthritis (OA). Patients completed the OAKHQOL, Short Form 36 (SF-36), Western Ontario and McMaster Universities Osteoarthritis Index, and the EQ-5D. The internal consistency was evaluated using Cronbach's alpha. Convergent validity was assessed by examining correlations between the OAKHQOL and other patient-reported instruments; known groups' validity was assessed by determining the capacity of the OAKHQOL to discriminate between patients with different levels of disease severity measured using the Lequesne Index. Test–retest reliability was evaluated by calculating the intraclass correlation coefficient (ICC) for all OAKHQOL domains in 409 stable patients with OA. Responsiveness was evaluated by calculating effect sizes among 129 patients undergoing hip or knee replacement. Cronbach's alpha for the five domains of the OAKHQOL ranged from 0.60 to 0.93 while ICCs ranged from 0.75 to 0.81 for all domains except the two social domains. Statistically significant differences ($p < 0.001$) were observed between

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patients with different degrees of disease severity on all
domains except "social support". The instrument showed
convergent validity among hypothesized domains ($p<$
0.001). Results of the study supported that the Spanish
version OAKHQOL questionnaire was a valid instrument
to measure health-related quality of life in patients with
OA of the lower limb.

Keywords Health-related quality of life · OAKHQOL ·
Osteoarthritis · Validation

Introduction

Osteoarthritis (OA) is a chronic disease whose prevalence
increases with age [1, 2]. From 1995 to 2005, the number of
patients suffering from OA has increased from 21 to nearly
27 millions in USA, probably owed to the aging population
[3]. In Spain, musculoskeletal diseases are a source of pain
and a significant cause of incapacity for work [4]. They
reduce patients' quality of life, fostering the consumption of a
large amount of resources such as medical visits or hospital-
izations [5, 6]. OA also accrues high indirect costs as it often
causes absences from work and extended disability.

Patient-reported outcomes (PROs) have been broadly
defined as subjective assessment by patients of their health
[7]. In the last 30 years, the PROs research has been
consolidated, especially in the Health-Related Quality of Life
(HRQoL) section [8]. HRQoL is an indicator of the impact
of a disease on the population and offers a way to measure
the effects of various therapies [9]. Numerous HRQoL
questionnaires have emerged from this work. Some of these
questionnaires are generic, others are disease specific.

The Western Ontario and McMaster Universities Osteoar-
thritis Index (WOMAC) has been the most widely used
questionnaire to evaluate HRQoL among patients with hip or
knee OA [10]. One drawback of the WOMAC is that it is
limited to measuring pain, stiffness, and function. Yet OA can
also affect mental health (anxiety and/or depression), sleep,
sexuality, social functioning, and other aspects of life [11,
12]. In addition, social support and other variables have been
shown to influence the results of this pathology [13, 14].

The Osteoarthritis Knee and Hip Quality of Life (OAKH-
QOL) questionnaire was specifically designed to assess quality
of life among patients with OA of the hip or knee. The original
instrument was developed in French. It was shown to capture
patients' perceptions of their disease, and possesses the
necessary psychometric properties of validity and reliability
for use in clinical trials and observational studies [15, 16].

The aim of our study was to perform a cross-cultural
adaptation of the OAKHQOL questionnaire for use in Spain
and to validate the Spanish version in terms of its psycho-
metric properties of reliability, validity, and responsiveness.

Materials and methods

This prospective study was conducted among patients
diagnosed with OA of the lower limbs. They were recruited
between January 2007 and January 2008 in seven hospitals
that are part of Spain's National Health System: four in the
Basque Country, two in the Canary Islands, and one in
Andalusia. The Institutional Review Boards of each
hospital approved the study.

OAKHQOL questionnaire

The OAKHQOL questionnaire is made up of 43 items,
40 of which form five domains: physical activity, mental
health, pain, social support, and social functioning. It
also includes three independent items about relationships,
sexual activity, and professional life. The Likert response
scales in the items range from 0 (worst) to 10 (best). In
each domain, the mean score of the items is calculated,
yielding a score for each domain. The score is then
standardized on a scale from 0 (worst quality of life) to
100 (best quality of life).

Adaptation of the OAKHQOL

We followed the method of forward translation and back-
translation by professionals [17, 18] and conducted a pilot
study with patients.

The original French questionnaire was independently
translated into Spanish by two translators (one rheumatol-
ogist and one professional translator) whose native lan-
guage was Spanish and who had a high level of fluency in
French. Both scored the difficulty of finding Spanish
expressions that were conceptually equivalent to the
original expressions. The two translations were compared
and discussed in a meeting that included researcher team
and the translators until a consensus was reached on a
single adapted version (version 1.0).

To evaluate the equivalence version 1.0 to the
original, it was independently back-translated from
Spanish to French by two professional translators whose
native language was French and who had a high level of
fluency in Spanish. The two back translations were
compared with the original French version and a
consensus was reached on modifications that needed to
be made to the Spanish version 1.0. The revised version
of the Spanish OAKHQOL was tested on 17 patients
with hip or knee OA in order to evaluate how well
patients understood the items, as well as to determine
the acceptability and feasibility of the questionnaire.
Modifications were made based on the results of this
pilot test, yielding a final version of the Spanish
questionnaire.

Patients and validation process

The patients in the validation study were recruited from the waiting list to be operated on for a joint replacement in the seven participating hospitals from the orthopedic department. Patients with psychiatric diseases were excluded because these conditions could prevent them from completing all the questionnaires included. Patients were asked to fill out the OAKHQOL, the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), the Short Form 36 (SF-36), the Lequesne Index, the EuroQol (EQ-5D), and questions about gender, age, affected joint, weight, and height. Of the total sample of 759 patients, a subsample of 409 patients contacted by mail, filled out the OAKHQOL a second time, 2 weeks after the first evaluation, together with a question on whether there had been any change in their clinical situations. A second subsample of 129 patients, contacted by mail, filled out the WOMAC and the OAKHQOL again 6 months after joint replacement. The sample size for the total sample as well as for the two subsamples exceeded the minimum sample size established by the literature for studies of reliability, validity, and responsiveness [19].

Other instruments

Patients completed the Lequesne Index in order to evaluate the severity of their disease. This index is made up of 15 questions grouped in three sections: pain or discomfort, maximum distance walked, and other difficulties. An overall score is created by adding the scores of each item. This index is categorized in six levels of severity: no severity, medium severity, moderate severity, serious, very serious, and extremely serious [20, 21].

Patients also completed two generic HRQoL instruments, SF-36, and the EQ-5D as well as one disease-specific instrument, the WOMAC. The SF-36 includes 36 questions grouped in eight domains: physical function, physical role, bodily pain, general health, vitality, social function, emotional role, and mental health. Scores vary from 0 (worst health status) to 100 (best health status). The SF-36 generates two summary scores, the physical (PCS) and mental (MCS) summary components. We used a Spanish version of the SF-36 [22]. The EQ-5D is a self-administered questionnaire that describes HRQoL in terms of five domains: mobility, personal care, daily activities, pain or discomfort, and anxiety or depression. The perception of an individual's own health status, measured by an analog visual scale (VAS), also forms part of the EQ-5D. It is evaluated separately and presented in the form of a thermometer whose ends are labeled with "worst imaginable health status" and "best imaginable health status" with scores from 0 to 100, respectively. Besides, this questionnaire presents social rates obtained from the use of the temporal equivalence method (TE rates) and from a visual analogical scale (VAS rates). The EQ-5D has been translated and validated in the Spanish population [23].

The WOMAC is a HRQoL questionnaire designed for patients with OA of the lower limbs. This multidimensional scale [10], is formed by 24 items grouped in three domains: pain (5 items), stiffness (2 items), and function (17 items). The data are standardized, generating scores for each dimension with a range from 0 (best health status) to 100 (worst). The WOMAC has been translated and validated in the Spanish population [24, 25].

Statistical analysis

The distribution of the scores in the Spanish version of the OAKHQOL was evaluated by mean, standard deviation, proportion of patients with one or more lost items, observed range, and the ceiling and floor effect [26]. We used the version 16.0 of the SPSS program to realized statistical analysis (SPSS Inc, Chicago, IL, USA).

Reliability

Reliability was analyzed in two ways: (1) internal consistency by means of Cronbach's alpha [27] and by the scaling success rates, (2) reproducibility by means of test–retest. Patients were explicitly asked whether they had experienced any change in their health status since completing the previous questionnaire. When no change was detected, we calculated the intraclass correlation coefficient (ICC) [28].

Validity

We evaluated the content validity. To accomplish this, we collaborated with a rheumatologist and three orthopedic surgeons who assessed the understanding and relevance of the items of the questionnaire [29].

The construct validity was evaluated through the known groups validation process using the Lequesne Index. Due to the low percentage of patients in the three lowest levels, we collapsed the six groups of severity into four: none/mild/moderate, severe, very severe, and extremely severe. The hypothesis here was that the groups with greater severity would have lower scores in the Spanish OAKHQOL questionnaire in the domains of physical activity, pain, and mental health. We also analyzed differences between groups according to gender, affected joint, and body mass index (BMI) in three groups (<25, 25–35, and >30). The nonparametric Mann–Whitney test was used to analyze difference by gender and joint, and analysis of variance with Scheffé test for multiple comparisons for Lequesne Index and BMI.

To analyze the criterion validity, we examined the convergent and divergent validity of the instrument. We hypothesized that the physical activity domain of the Spanish OAKHQOL would correlate better with the physical domains of the SF-36 and of the WOMAC (function), while the pain domain of the Spanish OAKHQOL would correlate better with pain and other physical domains of the SF-36. For the other domains, we expected lower correlations. The convergent and divergent validity was analyzed by means of the Pearson correlation coefficient.

Responsiveness

To evaluate the responsiveness, we asked patients to complete the questionnaires WOMAC and OAKHQOL, 6 months after the procedure [30, 31]. The changes were evaluated by three methods: the paired t test, the effect size I or standardized effect size (SES), and the effect size II or standardized response mean (SRM) [32–34].

Results

Adaptation process. Face validity

Several difficulties with version 1.0 of the translated OAKHQOL questionnaire emerged in the pilot study. Several patients described problems understanding some expressions or words, such as "dosing", "physical incapacity", or "secondary effects". There was also some confusion regarding the response options, with some participants interpreting "completely agree" as "completely disagree". Structural difficulties in items 11, 12, 22, and 23 were resolved by changing the original layout of the response "not applicable". The patients took a mean time of 15 min to complete the OAKHQOL.

Sample

A sample of 759 patients was recruited. Of these, 409 (53.9%) presented with knee OA and 350 (46.1%) with hip OA. The mean age was 69.81 years (SD 9.29) and 62.8% were women. The majority of patients (65.8%) were in the Lequesne Index greater severity group. Depending on the joint affected, we found statistically significant differences in relation to gender ($p<0.001$), with more women with knee OA; age ($p<0.001$), with patients with knee OA 3 years older; in the different Lequesne Index severity groups ($p=0.003$); and in BMI ($p<0.001$) being higher for patients with knee OA. Among patients with knee OA, 89.4% were in the two highest severity groups compared to 83.2% of the hip OA patients. With regard to the baseline measurement of HRQoL, there were no statistically significant differences between joints in any of the domains

of the OAKHQOL, and most of the domains of the WOMAC or SF-36. The exceptions were in function dimension of WOMAC ($p=0.023$), the PCS of SF-36 ($p=0.024$), and the VAS rates ($p=0.007$) and TE rates ($p=0.011$) of the EQ-5D, with the patients with hip OA showing worse scores (Table 1).

Of the 759 patients who completed the OAKHQOL and other questionnaires, 610 were sent a second mailing 2 weeks after and 409 (67.0%) responded to the OAKHQOL questionnaire a second time. Fifty-eight of these 610 patients were sent a third mailing with the OAKHQOL and WOMAC questionnaires, 6 months after the intervention and 49 patients responded. On the other side, the OAKHQOL and WOMAC questionnaire was sent as well to 149 of the patients who underwent joint replacement 6 months after their operation; 80 (53.7%) responded. So, we get a sample of 129 patients who responded these questionnaires 6 months after the intervention.

The distribution of the domains and reliability coefficients of the Spanish version of the OAKHQOL are shown in Table 2. The lowest scores were in the domains of physical activity (mean, 26.38; SD, 19.39) and pain (mean, 30.39; SD, 24.00); the highest in the domain of social support (mean, 73.29; SD, 22.54). The percentage of missing items did not exceed 9% in any of the domains. The observed theoretical ranges coincided for all the scores (from 0 to 100) and were distributed within the range of values covered. Table 2 shows a low floor effect that varies from 0.1% in the mental health domain to 8.7% in pain, and an equally low ceiling effect that ranged from 0.4% in the physical activity domain to 12.8% in the social support domain. All were within the range considered acceptable (<15%).

Reliability

The results of reliability are listed in Table 2. The questionnaire had good internal consistency with Cronbach's alpha >0.78 in all domains with the exception of the social activities, which had a value of 0.60. The percentage of items in the OAKHQOL that correlated higher with their hypothetical domain than with the remainder of the domains was 100%. In relation to the test–retest, we found an ICC> 0.75 in all domains except for social support (ICC=0.39) and social activities (ICC=0.42).

Content validity

The rheumatologist and orthopedic surgeons who evaluated the understanding and relevance of the items of the questionnaire highlighted the simplicity of the terminology of the questionnaire, the clarity of the questions, and the fact that it included domains affected by osteoarthritis. They did not suggest adding or

Table 1 Baseline clinical, demographic, and HRQoL characteristics of the sample

	Total sample $n=759$ (%)*	Knee OA $n=409$ (%)*	Hip OA $n=350$ (%)*	χ^2 p value
Number (% women)	477 (62.8)	302 (63.3)	175 (36.7)	<0.001
Age groups				
≤59	109 (14.4)	31 (7.6)	78 (22.3)	<0.001
60–69	226 (29.8)	127 (31.1)	99 (28.3)	
70–79	343 (45.2)	205 (50.1)	138 (39.4)	
≥80	81 (10.7)	46 (11.2)	35 (10.0)	
LEQUESNE index				
None/mild/moderate severity	24 (4.2)	8 (2.6)	16 (6)	0.003
Severe	53 (9.3)	24 (7.9)	29 (10.8)	
Very severe	118 (20.7)	51 (16.8)	67 (25.0)	
Extremely severe	376 (65.8)	220 (72.6)	156 (58.2)	
	Mean (SD)	Mean (SD)	Mean (SD)	t test p Value
Age	69.81 (9.29)	71.26 (7.71)	68.13 (10.61)	<0.001
BMI[a]	29.36 (4.37)	30.04 (4.27)	28.57 (4.35)	<0.001
SF-36[b]				
Physical function	23.15 (20.35)	23.55 (19.97)	22.68 (20.80)	0.558
Role physical	29.77 (25.10)	30.64 (24.50)	28.75 (25.79)	0.310
Bodily pain	27.79 (21.38)	29.07 (21.55)	26.28 (21.11)	0.075
General health	44.10 (20.25)	44.47 (19.88)	43.68 (20.70)	0.603
Vitality	42.90 (23.60)	41.60 (22.60)	44.46 (24.70)	0.099
Social function	53.73 (29.94)	54.66 (29.31)	52.62 (30.68)	0.356
Role emotional	65.37 (31.55)	64.58 (31.63)	66.30 (31.48)	0.470
Mental health	55.23 (21.91)	55.60 (21.10)	54.79 (22.87)	0.642
PCS[c]	26.37 (7.75)	27.03 (7.82)	25.57 (7.61)	0.024
MCS[d]	43.78 (13.13)	43.48 (12.69)	44.14 (13.66)	0.545
WOMAC[e]				
Pain	52.25 (19.36)	52.82 (19.61)	51.59 (19.07)	0.389
Stiffness	51.02 (24.33)	51.30 (24.34)	50.69 (24.36)	0.731
Function	57.26 (20.02)	55.72 (20.16)	59.07 (19.73)	0.023
OAKHQOL[f]				
Physical activity	26.38 (19.39)	27.57 (19.33)	24.96 (19.40)	0.069
Pain	30.39 (24.00)	30.93 (24.22)	29.76 (23.75)	0.513
Mental health	50.06 (23.48)	49.16 (22.71)	51.14 (24.36)	0.259
Social support	73.29 (22.54)	72.89 (23.25)	73.77 (21.70)	0.605
Social activities	56.29 (26.05)	55.04 (20.16)	59.07 (19.73)	0.167
EQ-5D				
VAS rates[g]	0.430 (0.208)	0.449 (0.203)	0.408 (0.213)	0.007
TE rates[h]	0.368 (0.329)	0.397 (0.319)	0.335 (0.339)	0.011
VAS[i]	45.68 (19.64)	46.25 (19.28)	45.07 (20.03)	0.457

The percentages for the age groups and Lequesne index, are percentages of the column; the percentages for the gender are percentages of the row

[a]*BMI* Body mass index

[b]*SF-36* Short-Form 36

[c]*PCS* Physical component summary

[d]*MCS* Mental component summary

[e]*WOMAC* Western Ontario and McMaster Universities Osteoarthritis Index

[f]*OAKHQOL* Osteoarthritis Knee Hip Quality of Life

[g]*VAS rates* social rates obtained from the visual analogical scale

[h]*TE rates* social rates obtained from the method of the temporal equivalence

[i]*VAS* visual analogical scale

deleting any item. However, they pointed out that the question related to sexual activity could be uncomfortable for some patients.

Known groups validity

Regarding Lequesne index, in the Spanish OAKHQOL, scores in the physical activity, pain, and mental health domains declined (indicating poorer HRQoL) as the severity increased (Table 3). This confirmed our initial hypothesis, since we found statistically significant differences ($p<0.001$) among the severity groups, verifying that the groups with greater disease severity had worse scores. For the remainder of the analyzed variables, we found statistically significant differences among BMI groups in the physical activity ($p=0.003$) and mental health ($p=0.040$) domains. We also found statistically significant differences ($p<0.001$) by gender in all domains except the

Table 2 Distribution and reliability coefficients for the five domains of the Spanish OAKHQOL

OAKHQOL[a]	Number of items	Mean	SD[b]	Missing items (%)[c]	Observed range	Theoretical range[d]	Floor effect (%)[e]	Ceiling effect (%)[e]	% Scaling success[f]	Cronbach Alpha	ICC[g] (n)
Physical activity (n=737)	16	26.38	19.39	34 (4.4)	0–100	0–100	4.2	0.4	100	0.93	0.81 (361)
Pain (n=726)	4	30.39	24.00	45 (5.8)	0–100	0–100	8.7	1.5	100	0.83	0.75 (358)
Mental health (n=720)	13	50.06	23.48	51 (6.6)	0–100	0–100	0.1	1.1	100	0.91	0.80 (349)
Social support (n=717)	4	73.29	22.54	54 (7)	0–100	0–100	1.5	12.8	100	0.78	0.39 (353)
Social activities (n=705)	3	56.29	26.05	66 (8.6)	0–100	0–100	3.3	7	100	0.60	0.42 (343)

[a] *OAKHQOL* Osteoarthritis Knee Hip Quality of Life

[b] Standard deviation

[c] Number and percentage of patients with some missing items in the domain

[d] The theoretical range in the OAKHQOL questionnaire is 0 (worst HRQoL) to 100 (best HRQoL), except for items 12, 22, and 23, where scale ranges from 0 (best health state) to 10 (worse health state)

[e] Percentage of patients with the worst (floor effect) and the best (ceiling effect) HRQoL

[f] Scaling success rates are the percentages of the items that correlate higher with their domains than with the other domains of the questionnaire

[g] *ICC* intraclass correlation coefficient

two social domains. No differences were observed according to the affected joint in any of the domains.

Convergent and divergent validity

As we hypothesized, the OAKHQOL physical activity domain was moderately correlated with the physical domains of the SF-36 (physical function, $r=0.58$; physical role, $r=0.61$; pain, $r=0.64$; general health, $r=0.41$; and PCS, $r=0.59$) and the WOMAC (function, $r=-0.80$; Table 4). In the same way, the OAKHQOL pain domain was highly correlated with pain ($r=0.61$) and other physical domains of the SF-36 and with the pain domain of the WOMAC ($r=-0.69$). The OAKHQOL mental health domain showed higher correlation with the mental domains of the SF-36 (vitality, $r=0.53$; social function, $r=0.59$; emotional role, $r=0.59$; mental health, $r=0.61$; and MCS, $r=0.65$). However, both the social support ($r=-0.06$) and social activities ($r=0.18$) domains of the OAKHQOL were poorly correlated with social function domain of the SF-36. In addition, the three OAKHQOL domains of physical activity, pain, and mental health were modestly correlated ($r>0.5$) with the two social rates (VAS rates and TE rates) of the EQ-5D.

Responsiveness

A total of 129 patients completed the OAKHQOL questionnaire before joint replacement and 6 months afterward: 77 (59.7%) patients had knee OA, the mean age was 69.82 years (SD=8.74), and 76 (58.9%) were

women. As can be seen in Table 5, OAKHQOL scores improved following surgery. The differences were statistically significant ($p<0.001$) in all domains except the social activities domain ($p=0.211$). The two domains most responsive were pain (SES=1.37, SRM=1.02) and physical activity (SES=1.20, SRM=0.98). Negative values were presented for the social support and social activities domains.

Discussion

The intention when developing OAKHQOL was to introduce elements of QoL that patients with hip and knee OA report as affecting their daily lives. Existing instruments for use in OA like the WOMAC, but provide no information about the overall perceived impact of the disease; patient-reported outcome instruments fail in that respect because they measure only functional status or are not specific to lower limb OA, like the SF-36.

So, the OAKHQOL besides measures the typical domains of the specific questionnaires as physical activity and pain, it analyzes other domains equally important and influential in the HRQoL of patients with OA: mental health, social activities, and social support. These domains are very important to understand patients' family and the social atmosphere, and to know social support networks with patient has. Likewise, the OAKHQOL obtains more global vision of the patients HRQoL than the WOMAC.

In this study, we found that our version of the OAKHQOL had good content, good acceptability, ease of

Table 3 Known groups validity in the Spanish OAKHQOL domains

		OAKHQOL scales														
		Physical activity			Pain			Mental health			Social support			Social activities		
	N	Mean	SD	p^a	Mean	SD	p^a	Mean	SD	p^a	Mean	SD	p^a	Mean	SD	p^a
BMI[b]																
<25 (**a**)	107	29.34 c	21.28	0.003	32.07	25.07	0.242	50.34	25.06	0.040	70.29	25.57	0.252	57.00	26.90	0.928
25–30 (**b**)	311	28.45 c	19.90		31.71	24.57		52.40 c	23.36		73.25	22.35		56.81	26.18	
>30 (**c**)	295	23.65 ab	17.81		28.71	23.00		47.51 b	22.82		74.55	21.34		56.08	25.53	
Gender																
Female	463	23.89	17.97	<0.001	27.46	22.72	<0.001	46.35	22.27	<0.001	74.46	22.24	0.069	55.19	26.51	0.144
Male	274	30.59	20.95		35.38	25.30		56.33	24.17		71.28	22.96		58.17	25.16	
Joint																
Hip	337	24.96	19.40	0.069	29.76	23.75	0.513	51.14	24.36	0.259	73.77	21.70	0.605	57.76	25.26	0.167
Knee	400	27.57	19.33		30.93	24.22		49.16	22.71		72.89	23.25		55.04	26.67	
Severity (Lequesne)																
None/mild/moderate (**a**)	24	51.02 cd	21.32	<0.001	64.27 cd	22.05	<0.001	67.95 d	21.12	<0.001	65.63	24.33	0.202	56.67	29.53	<0.001
Severe (**b**)	53	47.68 cd	19.66		51.70 cd	26.50		65.46 d	23.25		72.29	24.98		65.03 d	28.75	
Very severe (**c**)	117	34.03 abd	14.19		38.80 abd	21.20		56.22 d	21.31		72.99	20.72		63.78 d	22.80	
Extremely severe (**d**)	371	18.62 abc	13.68		22.40 abc	18.23		43.66 abc	21.30		74.75	20.89		52.61 bc	25.59	

Bolded letters indicate statistically significant differences among the marked groups. For example, (ab) in group c means that group c is significantly different from groups a and b

[a] The p-value was calculated for the OAKHQOL domains scores between the different severity groups by means of ANOVA with Scheffé test

[b] *BMI* Body Mass Index

Table 4 Pearson's correlations matrix of the Spanish OAKH-QOL domains with the SF-36, WOMAC and EQ-5D

	OAKHQOL[a]				
	Physical activity	Pain	Mental health	Social support	Social activities
SF-36[b]					
Physical function	0.58**	0.42**	0.34**	−0.04	0.12**
Role physical	0.61**	0.44**	0.40**	−0.10**	0.17**
Bodily pain	0.64**	0.61**	0.47**	−0.14**	0.10**
General health	0.41**	0.39**	0.53**	−0.01	0.20**
Vitality	0.42**	0.43**	0.53**	−0.01	0.17**
Social function	0.52**	0.39**	0.59**	−0.06	0.18**
Role emotional	0.38**	0.36**	0.59**	−0.01	0.22**
Mental health	0.36**	0.31**	0.61**	−0.04	0.16**
PCS[c]	0.59**	0.46**	0.25**	−0.12**	0.09*
MCS[d]	0.36**	0.29**	0.65**	0.01	0.22**
WOMAC[e]					
Pain	−0.63**	−0.69**	−0.46**	0.15**	−0.09*
Stiffness	−0.48**	−0.46**	−0.34**	0.10*	−0.07
Function	−0.80**	−0.66**	−0.50**	0.16**	−0.12**
EQ-5D					
VAS rates[f]	0.64**	0.56**	0.50**	−0.10*	0.12**
TE rates[g]	0.62**	0.54**	0.48**	−0.10**	0.11**
VAS[h]	0.36**	0.34**	0.34**	−0.11**	0.10*

[a] *OAKHQOL* Osteoarthritis Knee Hip Quality of Life

[b] *SF-36* Short-Form 36

[c] *PCS* Physical Component Summary

[d] *MCS* Mental Component Summary

[e] *WOMAC* Western Ontario and McMaster Universities Osteoarthritis Index

[f] *VAS rates* social rates obtained from the visual analogical scale

[g] *TE rates* social rates obtained from the method of the temporal equivalence

[h] *VAS* visual analogical scale

*$p=0.05$, correlation significant level

**$p=0.01$, correlation significant level

administration, moderate-to-high internal consistency, and excellent reproducibility for the physical domains (physical activity and pain) and the mental health domain in a large sample of patients with knee or hip OA. The Spanish OAKHQOL discriminated well among groups of severity, measured by Lequesne index, in the domains mentioned. It has also high responsiveness in these domains.

The questionnaire showed a low floor and ceiling effect as well as a low percentage of missing items. The reliability of the questionnaire was reflected in the good internal consistency we observed with Chronbach's alpha >0.78 in all domains except social activities. This suggests that all the scales can be used to compare groups, and some of them, such as physical activity and mental health, may even be useful at the individual level. The social domains are clearly differentiated from the others, as were the results obtained in the French original validation [15].

With respect to the known group's validity, two matters should be highlighted. One is the capacity of the questionnaire to differentiate between groups of severity, except for the social domains. This could be due to the fact that the social domains are not related to the severity. The variables such as BMI, gender, and affected joint in our study have a similar effect for the known group's validity, with respect to

Table 5 Responsiveness parameters of the Spanish OAKHQOL domains

OAKHQOL[a]	N	Pre intervention mean (SD)	6 months mean (SD)	Difference mean (SD)[b]	P value[c]	SES[d]	SRM[e]
Physical activity	122	26.56 (17.49)	47.63 (26.35)	21.08 (21.59)	<0.001	1.20	0.98
Pain	120	31.47 (23.43)	63.51 (30.33)	32.03 (31.52)	<0.001	1.37	1.02
Mental health	120	50.95 (22.57)	64.86 (23.98)	13.88 (22.14)	<0.001	0.61	0.63
Social support	118	75.16 (19.39)	68.16 (26.35)	−7.00 (25.80)	<0.001	−0.36	−0.27
Social activities	118	59.36 (26.15)	55.85 (30.14)	−3.52 (37.54)	0.211	−0.13	−0.09

[a] *OAKHQOL* Osteoarthritis Knee Hip Quality of Life

[b] Difference=6 months−pre-intervention

[c] *P* value, comparison of means pre intervention−6 months (paired *t* test)

[d] Standardized effect size (SES), the difference between the mean baseline scores and follow-up scores on the measure, divided by the standard deviation of the baseline scores

[e] Standardized Response Mean (SRM), the mean score change divided by the standard deviation of that score change

the original French study. The small differences between our results and those of the original OAKHQOL study by Rat et al. could be due to differences in the sample. The original French study included three different groups of severity (patients managed medically, patients in the waiting list for joint replacement, and patients who had undergone joint replacement) while our study included only patients waiting for joint replacement [15].

In relation to convergent validity, the OAKHQOL was generally well correlated with the pertinent domains of the WOMAC and the SF-36. The exception was in the social domains, where the correlation was weak. A similar trend was observed in the original French validation study. Our results are in line with those obtained by Rat et al. [16], in which good or moderate correlations of the OAKHQOL were found with the SF-36 in all of the domains except the two social domains. This is possibly due to the fact that the social domains of the OAKHQOL do not measure the same aspects of HRQoL as the corresponding domain of the SF-36.

Among patients who underwent joint replacement, we observed an improvement in OAKHQOL scores in the physical activity, pain and mental health domains 6 months after the intervention. In spite of the observed changes the two social domains are different. This was to be expected since the intervention more directly affects physical and mental function than social activities or social support. The decrease in the scores on the social support domain could be related to the four items that constitute it. Of these, two are related to specific support for the osteoarthritis while two are items about support in general. The post-surgery decrease in the OAKHQOL social support domain was largely due to changes in these general items. This could be due to patients' perception of a decrease in global support following surgery, while the support that the patient has due to the disease remains unchanged. Besides, the advanced age could be influencing the lack of change of the social activities domain. At old age, individuals present a high change resistance; they are routinary, can put in changes within a short time but on a long term tend to become accustomed to old habits. These data agree with those obtained by Rat et al. [16], who found an SRM <0.2 for the social domains. The social activities and social support domains are quite relevant for understanding a patient's family and social atmosphere, as well as the support networks he or she has. Likewise, social support can be considered a baseline predictor variable because of has showed to be related with better results in health [35].

The difference in the results of this social domains with respect to French study could be explained because of in our culture both domains are more closely related. In general, social activities in Spain are carried out inside our family's and friends' social support network. On the other side, possibly in France, people have support networks out of family network; there is a deep differentiation between these two social domains. In this way, old people over there are much more independent than in Spain, being more inclined to carry out social activities out of their social support circle.

Our study has several strengths. These include the careful adaptation process following international recommendations [36], the large sample size, the inclusion of patients with hip or knee OA recruited from various hospitals around Spain, the use of several appropriate PRO instruments to assess the validity of the Spanish OAKHQOL, and testing of the instrument's responsiveness after an intervention of recognized clinical efficacy. Due to the growing number of quality-of-life questionnaires developed in other languages and other cultures, we have made every effort to guarantee that the Spanish OAKHQOL was the equivalent of the original French version. For this reason, our findings suggest good comprehension and, therefore, we did not need to modify any item. The only minor modification we made was in layout of the response options for items 11, 12, 22, and 23.

Several limitations of the study must be noted. To date, the OAKHQOL questionnaire has been tested only in France and Spain, thus its conceptual relevance and psychometric properties in other countries and cultures is unknown. Another limitation was the time interval for retesting. In this study, the interval of 2 weeks was somewhat longer than the time interval recommended (no longer than 1 week). It may be supposed that the agreement results decrease when the time interval is increased for retesting.

In conclusion, our results confirmed the psychometric properties of the translated Spanish version of the OAKH-QOL questionnaire. By comparing it with the original, we obtained similar results regarding validity, reliability, and responsiveness. These findings indicates that the Spanish OAKHQOL questionnaire is a valid tool for use in cross-sectional as well as longitudinal studies that evaluate HRQoL in patients with OA of the lower limbs. The Spanish OAKHQOL can also be used to evaluate predictors of the HRQoL after joint replacement surgery, and could facilitate decision making.

Disclosures None

Appendix

Por favor, lea detenidamente las frases, una por una, pensando en su calidad de vida DURANTE LAS ÚLTIMAS 4 SEMANAS.
Marque la casilla que mejor corresponda a su experiencia diaria con la artrosis:

	No/ Ninguno (a)										Muchísimo (a)	
	0	1	2	3	4	5	6	7	8	9	10	
Q1. Tengo dificultad para andar	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Q2. Tengo dificultad para agacharme o levantarme	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Q3. Tengo dificultad para llevar cosas pesadas	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Q4. Tengo dificultad para bajar escaleras	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Q5. Tengo dificultad para subir escaleras	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Q6. Tengo dificultad para bañarme	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Q7. Tengo dificultad para vestirme (calcetines, zapatos, medias, ...)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Q8. Tengo dificultad para cortarme las uñas de los pies	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Q9. Tengo dificultad para moverme después de permanecer mucho tiempo en la misma postura	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Q10. Tengo dificultad para entrar o salir del coche	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Q11. Tengo dificultad para utilizara los transportes públicos (autobús, tren, metro,...)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐ No los utilizo
Q12. La artrosis afecta a mi vida laboral	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐ No trabajo
Q13. Tengo que dosificar mi actividad	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Q14. Tardo más tiempo en hacer las cosas	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Q15. Estoy desanimado/a por el dolor	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Q16. Temo tener que depender de los demás	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Q17. Me asusta la idea de sufrir una discapacidad física	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Q18. Me molesta que me miren	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

No/ Ninguno (a)   **Muchísimo (a)**

Q19. Estoy ansioso/a
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
0 1 2 3 4 5 6 7 8 9 10

Q20. Me siento deprimido/a
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
0 1 2 3 4 5 6 7 8 9 10

Q21. Me siento incómodo/a en mi vida familiar
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
0 1 2 3 4 5 6 7 8 9 10

Q22. Me siento incómodo/a en mi vida de pareja
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐   ☐
0 1 2 3 4 5 6 7 8 9 10   No tengo
                                    pareja

Q23. Tengo limitaciones durante las relaciones sexuales
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐   ☐
0 1 2 3 4 5 6 7 8 9 10   No he
                                    tenido relaciones
                                    sexuales en las últimas
                                    4semanas

Nunca   **Siempre**

Q24. Me cuesta permanecer en la misma postura durante mucho tiempo (sentado/a, de pie, inmóvil...)
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
0 1 2 3 4 5 6 7 8 9 10

Q25. Necesito un bastón (o muletas) para caminar
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
0 1 2 3 4 5 6 7 8 9 10

Q26. Tengo dolor (frecuencia)
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
0 1 2 3 4 5 6 7 8 9 10

Ninguno   **Insoportable**

Q27. Tengo dolor (intensidad)
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
0 1 2 3 4 5 6 7 8 9 10

Totalmente **en desacuerdo**   Totalmente **de acuerdo**

Q28. Necesito ayuda (tareas domésticas, compras,...)
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
0 1 2 3 4 5 6 7 8 9 10

Q29. Tengo la sensación de envejecer prematuramente
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
0 1 2 3 4 5 6 7 8 9 10

Q30. Soy capaz de hacer proyectos a largo plazo
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
0 1 2 3 4 5 6 7 8 9 10

Q31. Salgo de casa cuando me apetece
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
0 1 2 3 4 5 6 7 8 9 10

Q32. Recibo visitas en casa cuando me apetece
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
0 1 2 3 4 5 6 7 8 9 10

Q33. Me cuesta conciliar el sueño o volver a dormirme a causa del dolor
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
0 1 2 3 4 5 6 7 8 9 10

Q34. Me despierta el dolor
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
0 1 2 3 4 5 6 7 8 9 10

	Nunca										Siempre

Q35. Me pregunto qué va a ser de mí
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
0 1 2 3 4 5 6 7 8 9 10

Q36. Estoy irritable, agresivo/a
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
0 1 2 3 4 5 6 7 8 9 10

Q37. Tengo la impresión de agobiar a los que me rodean
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
0 1 2 3 4 5 6 7 8 9 10

	No/ Ninguno (a)										Muchísimo (a)

Q38. Temo los efectos secundarios del tratamiento
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
0 1 2 3 4 5 6 7 8 9 10

Q39. Puedo contar a los demás los problemas que me causa la artrosis siempre que quiero
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
0 1 2 3 4 5 6 7 8 9 10

Q40. Creo que los demás entienden las dificultades que me causa la artrosis
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
0 1 2 3 4 5 6 7 8 9 10

Q41. Me da apuro pedir ayuda si la necesito
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
0 1 2 3 4 5 6 7 8 9 10

Q42. Me siento apoyado/a por mis allegados (pareja, familia...)
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
0 1 2 3 4 5 6 7 8 9 10

Q43. Me siento apoyado/a por mi entorno (amigos, vecinos, compañeros de trabajo,...)
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
0 1 2 3 4 5 6 7 8 9 10

References

1. Felson DT, Lawrence RC, Dieppe PA, Hirsch R, Helmick CG, Jordan JM, Kington RS, Lane NE, Nevitt MC, Zhang Y, Sowers M, McAlindon T, Spector TD, Poole AR, Yanovski SZ, Ateshian G, Sharma L, Buckwalter JA, Brandt KD, Fries JF (2000) Osteoarthritis: new insights. Part 1: the disease and its risk factors. Ann Intern Med 133:635–646

2. Moskowitz RW (2009) The burden of osteoarthritis: clinical and quality-of-life issues. Am J Manag Care 15:S223–S229

3. Lawrence RC, Felson DT, Helmick CG, Arnold LM, Choi H, Deyo RA, Gabriel S, Hirsch R, Hochberg MC, Hunder GG, Jordan JM, Katz JN, Kremers HM, Wolfe F, National Arthritis Data Workgroup (2008) Estimates of the prevalence of arthritis and other rheumatic conditions in the United States. Part II. Arthritis Rheumatism 58:26–35

4. Tornero J, Rodriguez U, Massip M, Vidal J, Fernandez (1992) Rheumatic disease as the cause of permanent work disability in Spain. Revista Española de Reumatología 19:294–297

5. Batlle-Gualda E, Jovani V, Ivorra J, Pascual E (1998) Musculoskeletal diseases in Spain: magnitude and specialised human resources. Revista Española de Reumatología 25:91–105

6. Loza E, Lopez-Gomez JM, Abasolo L, Maese J, Carmona L, Batlle-Gualda E, Artrocad Study Group (2009) Economic burden of knee and hip osteoarthritis in Spain. Arthritis Rheumatism 61:158–165

7. Rothman ML, Beltran P, Cappelleri JC, Lipscomb J, Teschendorf B (2007) Patient-reported outcomes: conceptual issues. Value Health 10:S66–S75

8. Alonso J (2000) The measurement of health related-quality of life in clinical research and practice. Gac Sanit 14:163–167

9. Hill CL, Parsons J, Taylor A, Leach G (1999) Health related quality of life in a population sample with arthritis. J Rheumatol 26:2029–2035

10. Bellamy N, Buchanan WW, Goldsmith CH, Campbell J, Stitt LW (1988) Validation study of WOMAC: a health status instrument for measuring clinically important patient relevant outcomes to antirheumatic drug therapy in patients with osteoarthritis of the hip or knee. J Rheumatol 15:1833–1840

11. Meenan RF, Mason JH, Anderson JJ, Guccione AA, Kazis LE (1992) AIMS2. The content and properties of a revised and expanded Arthritis Impact Measurement Scales Health Status Questionnaire. Arthritis Rheumatism 35:1–10

12. Fielden JM, Gander PH, Horne JG, Lewer BM, Green RM, Devane PA (2003) An assessment of sleep disturbance in patients before and after total hip arthroplasty. J Arthroplast 18:371–376

13. Escobar A, Quintana JM, Bilbao A, Arostegui I, Lafuente I, Vidaurreta I (2007) Responsiveness and clinically important differences for the WOMAC and SF-36 after total knee replacement. Osteoarthr Cartil 15:273–280

14. Fitzgerald JD, Orav EJ, Lee TH, Marcantonio ER, Poss R, Goldman L, Mangione CM (2004) Patient quality of life during the 12 months following joint replacement surgery. Arthritis Rheumatism 51:100–109

15. Rat AC, Coste J, Pouchot J, Baumann M, Spitz E, Retel-Rude N, Le Quintrec JS, Dumont-Fischer D, Guillemin F (2005) OAKH-QOL: a new instrument to measure quality of life in knee and hip osteoarthritis. J Clin Epidemiol 58:47–55

16. Rat AC, Pouchot J, Coste J, Baumann C, Spitz E, Retel-Rude M, Le Quintrec JS, Dumont-Fischer D, Guillemin F, Groupe Qualite de Vie en Rhumatologie (2006) Development and testing of a specific Quality-of-Life Questionnaire for Knee and Hip Osteoar-

thritis: OAKHQOL (OsteoArthritis of Knee Hip Quality Of Life). Joint Bone Spine 73:697–704

17. Guillemin F, Bombardier C, Beaton D (1993) Cross-cultural adaptation of health-related quality of life measures: literature review and proposed guidelines. J Clin Epidemiol 46:1417–1432

18. Beaton DE, Bombardier C, Guillemin F, Ferraz MB (2000) Guidelines for the process of cross-cultural adaptation of self-report measures. Spine 25:3186–3191

19. Terwee CB, Mokkink LB, Steultjens MP, Dekker J (2006) Performance-based methods for measuring the physical function of patients with osteoarthritis of the hip or knee: a systematic review of measurement properties. Rheumatology (Oxford) 45:890–902

20. Lequesne M (1991) Indices of severity and disease activity for osteoarthritis. Semin Arthritis Rheumatism 20:48–54

21. Lequesne MG, Mery C, Samson M, Gerard P (1987) Indexes of severity for osteoarthritis of the hip and knee. Validation—value in comparison with other assessment tests. Scand J Rheumatol Suppl 65:85–89

22. Alonso J, Prieto L, Antó JM (1995) La versión española del SF-36 Health Survey (Cuestionario de Salud SF-36): un instrumento para la medida de los resultados clínicos. Med Clín 104:771–776

23. Badia X, Roset M, Montserrat S, Herdman M, Segura A (1999) The Spanish version of EuroQol: a description and its applications. European Quality of Life scale. Med Clín 112:79–85

24. Batlle Gualda E, Esteve Vives J, Piera Roera M, Hargreaves R, Cutts J (1999) Traducción y adaptación al español del cuestionario WOMAC específico para artrosis de rodilla y cadera. Revista Española de Reumatología 26:38–45

25. Escobar A, Quintana JM, Bilbao A, Azkarate J, Guenaga JI (2002) Validation of the Spanish version of the WOMAC questionnaire for patients with hip or knee osteoarthritis. Western Ontario and McMaster Universities Osteoarthritis Index. Clin Rheumatol 21:466–471

26. McHorney CA, Tarlov AR (1995) Individual-patient monitoring in clinical practice: are available health status surveys adequate? Qual Life Res 4:293–307

27. Cronbach LJ (1951) Coefficient alpha and the internal structure of test. Psichometrika 16:297–334

28. Shrout PE, Fleiss JL (1979) Intraclass correlations: uses in assessing rater reliability. Psychol Bull 86:420–428

29. Mokkink LB, Terwee CB, Stratford PW, Alonso J, Patrick DL, Riphagen I, Knol DL, Bouter LM, de Vet HC (2009) Evaluation of the methodological quality of systematic reviews of health status measurement instruments. Qual Life Res 18:313–333

30. Jones CA, Voaklander DC, Johnston DW, Suarez-Almazor ME (2000) Health related quality of life outcomes after total hip and knee arthroplasties in a community based population. J Rheumatol 27:1745–1752

31. Brazier JE, Harper R, Munro J, Walters SJ, Snaith ML (1999) Generic and condition-specific outcome measures for people with osteoarthritis of the knee. Rheumatology (Oxford) 38:870–877

32. Husted JA, Cook RJ, Farewell VT, Gladman DD (2000) Methods for assessing responsiveness: a critical review and recommendations. J Clin Epidemiol 53:459–468

33. Garratt AM, Ruta DA, Abdalla MI, Russell IT (1994) SF 36 health survey questionnaire: II. responsiveness to changes in health status in four common clinical conditions. Qual Health Care 3:186–192

34. Beaton DE, Hogg-Johnson S, Bombardier C (1997) Evaluating changes in health status: reliability and responsiveness of five generic health status measures in workers with musculoskeletal disorders. J Clin Epidemiol 50:79–93

35. Escobar A, Quintana JM, Bilbao A, Azkarate J, Guenaga JI, Arenaza JC, Gutierrez LF (2007) Effect of patient characteristics on reported outcomes after total knee replacement. Rheumatology (Oxford) 46:112–119

36. Wild D, Grove A, Martin M, Eremenco S, McElroy S, Verjee-Lorenz A, Erikson P (2005) Principles of good practice for the translation and cultural adaptation process for Patient-Reported Outcomes (PRO) measures: report of the ISPOR Task Force for Translation and Cultural Adaptation. Value Health 8:94–104