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Joint Awareness in Different Types of Knee Arthroplasty Evaluated With the Forgotten Joint Score

Emmanuel Thienpont, MD, MBA [a], Gaetan Opsomer, MD [a], Angelique Koninckx, MD [a], Frederic Houssiau, MD, PhD [b]

[a] Department of Orthopaedic Surgery, Cliniques Universitaires Saint Luc, Brussels, Belgium
[b] Department of Rheumatology, Pôle de Rhumatologie, Institut de Recherche Expérimentale et Clinique, Université catholique de Louvain et Cliniques Universitaires Saint Luc, Brussels, Belgium

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ABSTRACT

The purpose of this study was to validate the 'Forgotten Joint' score (FJS-12), a 12-item questionnaire designed to analyze the patient's ability to forget the joint in everyday life, in French and to compare the results of this Patient Reported Outcome (PRO) score in patients who had other than total joint arthroplasties. The score was compared in 122 patients that had either medial unicompartmental (N=51), patellofemoral (N=21) or total knee arthroplasty (N=50). After having validated the FJS-12 in French, a similar PRO was observed in unicompartmental and postero-stabilized total knee arthroplasty. Patellofemoral resurfacing had a significantly lower score than the two other types of arthroplasty, which can be explained by a significantly younger and smaller patient group.

Total knee arthroplasty (TKA) has proven to be successful in relieving pain and improving function in osteoarthritis patients [1]. According to some studies, nearly 40% of patients believe their expectations have not been fully met by their joint arthroplasty [2,3]. Functional outcome can be studied with different available scores [4]. Surgeons' ratings and patient-reported outcome (PRO) tools should be combined [5,6]. The most commonly used PRO's after arthritic knee surgery are the Knee Society Score (KSS), the Oxford Knee Score (OKS), the Western Ontario and McMaster Universities Osteo-Arthritis Index (WOMAC) and the Knee injury and Osteoarthritis Outcome Score (KOOS) [7–11]. These different scores are discussed and compared in Table 1. After cross-analysis, the combination of the new Knee Society Score and the KOO Score covers patient's expectations, surgeon's ratings and functional outcome in daily activities, including leisure and sports activities. The limitation of many PRO tools is the difficulty to differentiate between patients with a good and an excellent outcome (ceiling effect). These tools are unable to capture subtle differences in patient satisfaction between different designs or implantation techniques [12].

The ability to forget the artificial joint in everyday life can be regarded as the ultimate goal in joint arthroplasty resulting in the greatest possible patient satisfaction [13,14]. Therefore the utilization of the FJS-12 in combination with the New KSS and KOOS seems to cover the full range of patient reported outcomes [7,11,14].

The purpose of this study was (1) to validate the FJS-12 in French and (2) to compare joint awareness as measured with the FJS-12 in between a medial unicompartmental arthroplasty, a patellofemoral resurfacing arthroplasty (trochlear component and patellar button) and a posterior stabilized total knee arthroplasty.

Materials and Methods

A hundred and twenty-two patients who underwent total knee arthroplasty (N=50), medial unicompartmental arthroplasty (N=51) or patellofemoral arthroplasty (N=21) by a single surgeon (ET) at least one year before evaluation were included (mean follow-up 24 months) in this study. Sociodemographic data like gender, age, type and location of the implant and time since surgery were collected. Patients were matched for BMI and preoperative Knee Society Function Score. Age and gender distribution could not be matched for the different groups. Demographics according to type of arthroplasty are summarized in Table 2.

All TKA's were preoperatively knees with limited varus deformity (HKA 175° maximum) and had been selected for TKA because of focal cartilage lesions in the patellofemoral or lateral compartment on ArthroCT or MRI.

Uncomplicated clinical follow-up of at least one year after surgery and absence of osteolytic lines or other radiographic abnormalities

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Reprint requests: Emmanuel Thienpont, MD, MBA, Department of Orthopaedic Surgery, Cliniques Universitaires Saint Luc, Avenue Hippocrate 10, 1200 Brussels. Belgium.

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Table 1
Comparison of Available PROMS for Knee Surgery.

	Pain	Stiffness	Function	Sport	Quality of Life	Expectations	Satisfaction	Clinical Examination	Demography	Awareness	Limitations
KSS	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Long to complete
WOMAC	Yes	Yes	Yes	No	No	No	No	No	No	No	Generic score, ignores sport, QoL, satisfaction and expectations
KOOS	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No	No	Ignores clinical examination
OKS	Yes	No	Yes	No	No	No	No	No	No	No	Some questions are too complex, there are redundancies within the score Ignores sport, QoL, satisfaction and expectations
FJS	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Last questions on sporting activities are often not answered in elderly women

were requested for inclusion in this study. The postoperative alignment had to be within 180° +/− 3° HKA-angle. Patients were specifically contacted by us for the purpose of this study and were not scheduled for an immediate visit for any orthopedic complaint. The TKA patients underwent minimally invasive TKA with a cemented postero-stabilized (PS) implant with patella resurfacing (Vanguard, Biomet, Warsaw, US). The UKA group had a cemented fixed bearing implant (ZUK, Zimmer, Warsaw, US) and the PFA group had also a cemented trochlear component and patellar button (Gender PFJ, Zimmer, Warsaw, US). All patients had multimodal pain management, were operated under general anesthesia without femoral nerve blocks and the postoperative rehabilitation program was the same allowing weight bearing without crutches the day after surgery.

Questionnaires were sent by mail or collected during outpatient's follow-up. All patients were contacted by telephone if the questionnaire was not sent back within 1 month. Ethical approval for this study was obtained from the Ethics Committee of the Saint Luc University Hospital, Brussels, Belgium.

Forgotten Joint Score

A 12-item questionnaire was developed to identify the awareness of an artificial joint (hip or knee) during various daily life activities. In the FJS-12, high scores indicate good outcome, that is, a high degree of "forgetting" the joint. For ease of interpretation, we use the terms ceiling effect in reference to good outcome and floor effect in reference to bad outcome [14].

Cross-Cultural Adaptation Process

The cross-cultural adaptation was performed according to published recommendations by using a 'translation–back translation" method [15,16]. The entire process is pictured in Fig. 1. Finally, two English native speaking patients who lived for many years in Belgium, speaking French every day tested the final versions. One patient had a PFA, the other an UKA. They completed the score in the French version and in the original English version at a second session. The FJS-12 was then submitted in its definitive French version to our rheumatologist (FH) who himself has a TKA for 18 years.

Table 2
Demographic Parameters of Patients Groups.

Parameters		UKA (N=51)	PFA (N=21)	TKA (N=50)	$P < .05$
Gender	Male	22 (43%)	3 (14%)	24 (48%)	
	Female	29 (56%)	18 (86%)	26 (52%)	
Age (y)	Mean (SD)	61.8 (9.5)	49.6 (10)	68.7 (7.4)	< .001
	Range	45-88	33-74	51-79	
Side	Left	31	10	22	
	Right	20	11	28	
Time since surgery (y)	Mean (SD)	2 (1)	2 (1)	2 (1)	N.S.
	Range	1-3	1-3	1-3	
Preoperative KS-F	Mean (SD)	58 (10)	52 (15)	55 (10)	N.S.
Postoperative KS-F	Mean (SD)	90 (10)	85 (5)	90 (10)	N.S.

Statistical Analysis

Sample characteristics are presented as numbers, percentages, means, standard deviations, and ranges. Ceiling or floor effects of the scales and missing items are described as percentages of patients showing the best or worst possible score on a scale.

For normally distributed data, we performed t tests for independent samples and 1-way analyses of variance.

Results

There was no significant difference in joint awareness between UKA and TKA, however a significant difference was found in between TKA and PFA (Table 3).

No significant difference was found between men and women respectively in the UKA (80.4 (18.2) vs 73.4 (19.7) (N.S.)) and TKA group (73.2 (22) vs 68.7 (7.4) (N.S.)). The PFA group was not evaluated on gender difference because of the demographics (3 men/18 women) and the statistical irrelevance.

A ceiling effect was observed for 40% of patients and more specifically for the first 5 questions. A floor effect was seen for 16% of patients and 14% of questions had no reply (missing items). Questions 11 and 12 of the FJS-12 were significantly less answered with 58.5% of no reply to Question 11 on hiking and 62.8% of no reply on the sporting activities. A significant floor effect was observed for questions 7 to 10 in the patellofemoral arthroplasty group.

Discussion

A newly developed PRO scale, the FJS-12, allows evaluating outcome beyond the traditional measures by analyzing the patients' ability to forget the artificial joint in everyday life. The new score integrates variables such as pain, stiffness, function on activities of daily living, patients' expectations and activity levels and finally psychosocial factors [14]. In this study the FJS-12 was translated and validated in French and is now available to the French speaking orthopaedic community. It was also used to analyze the PRO after UKA, TKA and PFA in patients with comparable preoperative and postoperative Knee Society Function scores and knee alignment. We observed similar PRO with the FJS-12 for UKA and TKA but significantly lower scores for PFA. Lygre et al recently published similar results for UKA and TKA for both pain and function [17] and some authors published superior results for the resurfacing techniques [18–21].

Even in a healthy control sample of comparable age, mean values were well below the maximum score of 100; this finding suggests that the FJS-12 differentiates very well in a highly functioning group [14]. This was the main reason why we selected the FJS to evaluate our three patient groups. This score showed that with a well functioning cemented PS implant joint awareness is limited and that resurfacing

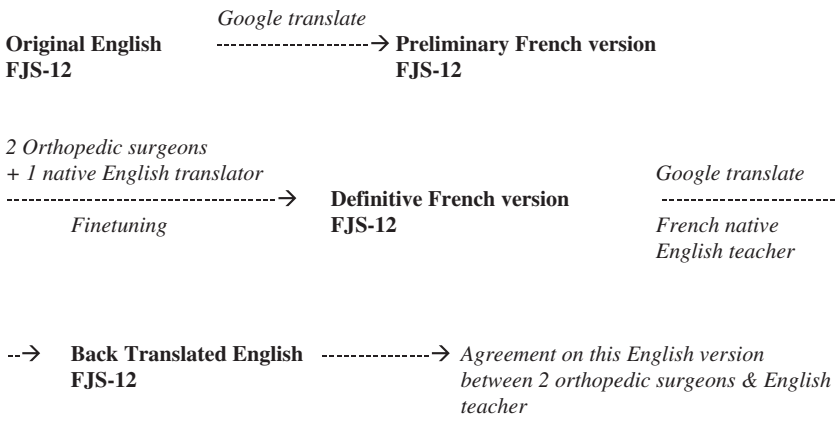

Fig. 1. Cross-cultural adaptation of Forgotten Joint Score (FJS-12).

techniques do not necessarily result in superior but rather equal results, except for patellofemoral arthroplasty which showed inferior results in a much smaller and younger patient group as evaluated by this score.

Noble et al found that patients who had undergone arthroplasty have a lower functional level than age- and gender-matched healthy controls. In their study, 52% of patients after TKA reported remaining knee problems during various activities vs 22% of subjects with no previous knee disorders. The authors concluded that it seemed elusive to think that we could restore normal healthy joint function with an artificial joint in the near future [22]. Behrend et al found an FJS-12 score of 82.5 in healthy subjects [14]. In this study we found lower scores for our post-arthroplasty patients than in the healthy subjects of the Behrend study, confirming that with arthroplasty, even partial arthroplasty, we did not restore the ease associated with normal knee function [14].

Compared to the original publication of Behrend et al (FJS-12 of 50.9 (29)) we observed higher FJ Scores in our TKA-group (73.2 (22)). A possible explanation for this observed difference could be the different design of implant or the surgical technique as of course cultural or sociodemographic parameters.

In this study, a ceiling effect was observed for the first 5 questions in 40% of patients. These questions deal with normal or low demand activities of daily life. The important ceiling effect in the UKA and TKA groups suggests that only few patients suffer from chronic postsurgical pain. Persistent pain is reported to be as high as 53% one year postoperatively [23,24].

Several authors showed better outcome in men compared with women [25,26]. It has been shown that women of that age group are more likely to live alone. Patients who live alone delay joint arthroplasty surgery until they reach an older age and have greater joint pain and dysfunction than those who live with another person, leading to a poorer 1-year outcome [27–30]. In our study, no difference was observed with the FJS between male and female patients despite many women living without a partner.

Behrend et al found that age did not significantly influence the FJS-12 [14]. As patients' activity levels naturally decrease with age, the awareness of the joint during the remaining activities of everyday life may also alter. Furthermore, in an older population, health problems unrelated to the artificial joint often overshadow minor joint-related impairments; that is, the target-performance comparison in the aging patient adjusts itself to some extent [14,30]. We observed the same results for UKA and TKA despite a significant difference in age. However younger age could be one of the reasons less satisfying results were observed in the PFA group.

Behrend et al suggested that the FJS-12 should be tested in other populations [14]. We observed for our patient group that female and older patients often did not answer both questions 11 and 12, this typically is a patient subgroup prone to performing less sports. Literature suggested however that younger patients today keep sporting activities after knee arthroplasty [31]. Therefore the KOO Score is probably more adapted to younger patients than the WOMAC score [10]. A combination of the new KSS to include surgeon's rating and patient's expectations, the KOOS and the FJS make a complete patient reported outcome possible (Table 1) [7,11].

A limitation of this study could be the smaller groups of patients that were compared. However the inclusion criteria were quite strict. Total knee arthroplasty patients had to have a KSS of more than 80, less than 5° of deformity and varus arthritis to have a comparable starting situation with the unicompartmental arthritis group. The patellofemoral group was even smaller and predominantly female but indications are rarer than for the other implants. A single surgeon with the same, minimally invasive subvastus approach for UKA, PFA and TKA, operated all patients and used the same type of implant in each group. A preliminary power analysis showed that we would need 42 patients per group, which was difficult to obtain in the PFA group with the tight inclusion criteria we applied. However a significant difference could already be shown for the smaller PFA group eliminating this burden.

Another possible limitation is that we were unable to isolate enough isolated patellofemoral arthritis patients treated with TKA to be able to compare their FJS-12 with the patellofemoral arthroplasty treated group.

We strongly support the inclusion of the FJS-12 as a pivotal PRO after knee arthroplasty. The lack of "awareness" of the normal healthy joint should be introduced as a new aspect in PRO assessment. In general, one is not aware of a healthy joint during the usual activities of daily living. The joint can therefore be regarded as forgotten. Because this state of a "forgotten joint" rules out any significant subjective impairments like pain, instability, or disabling range of motion, we believe that the patients' ability to forget about their joint is a valuable parameter to evaluate subjective joint function [13].

Table 3
Comparison of FJS-12 Scores Among Different Types of Arthroplasty.

Comparison FJS-12	Mean (SD)	*P* Value
PFA vs UKA	58.2 (27) vs 76.4 (19)	$P = .0018$
PFA vs TKA	58.2 (27) vs 73.2 (22)	$P = .0169$
UKA vs TKA	76.4 (19) vs 73.2 (22)	$P = .4356$

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