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FRENCH TRANSLATION AND VALIDATION OF THE "ANTERIOR KNEE PAIN SCALE" (AKPS)

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ABSTRACT

Purpose: To linguistically and cross-culturally translate the Anterior Knee Pain Scale into French and to evaluate the reliability and validity of this translated version of the questionnaire.

Methods: The translation part was performed in six stages, according to international guidelines: (i) two initial translations from English to French; (ii) synthesis of the two translations; (iii) backward translations into the original language; (iv) expert committee to compare the backward translations with the original questionnaire; (v) pre-final version testing and (VI) expert committee appraisal. To validate the French version of the Anterior Knee Pain Scale, we assessed its validity, reliability and floor/ceiling effects. To do this, volunteer patients from the French part of Belgium and from France, with patellofemoral pain were asked to answer the French version of the Anterior Knee Pain Scale at baseline and after 7 days, as well as the generic SF-36 questionnaire.

Results: The Anterior Knee Pain Scale was translated without any major difficulties. A total of 101 subjects aged 34.5 ± 11.4 years (58.4% of women) were included in this study. Results indicated an excellent test-retest reliability (Intra-class correlation coefficient (ICC) = 0.97, 95%CI: 0.96–0.98), a high internal consistency (Cronbach's alpha = 0.87), a consistent construct validity (high correlations with the SF-36 questionnaire were found with domains related to physical function (r = 0.80), physical role (r = 0.70) and pain (r = 0.64)) and low or moderate correlations with domains related to mental health (r = 0.26), vitality (r = 0.32) and social function (r = 0.41). Moreover, no floor/ceiling effects have been found.

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Conclusions: A valid French version of the Anterior Knee Pain Scale is now available and can be used with confidence to better assess the disease burden associated with patellofemoral pain. It was successfully cross-culturally adapted into French.

Implications for rehabilitation

- The results on psychometric properties of the French Anterior Knee Pain Scale are comparable with six validated versions obtained for the Finnish, the Turkish, the Chinese, the Dutch, the Thai and the Persian populations.
- The French translated version of the Anterior Knee Pain Scale is a reliable and valid instrument for assessing the functional limitations associated with patellofemoral pain.
- The test–retest reliability of the French Anterior Knee Pain Scale was excellent, the internal consistency was high and the construct validity was consistent. There were no floor/ceiling effects.

KEYWORDS: Cross-cultural adaptation ; patellofemoral pain ; Anterior Knee Pain Scale ; French translation ; psychometric properties ; Kujala Patellofemoral ; Questionnaire

Introduction

Patellofemoral pain (PFP) is an overuse condition that is not generally linked to injuries or any known intra-articular damage to the knee [1]. PFP is defined as pain behind or around the patella, which is aggravated by at least one activity that loads the patellofemoral joint during weight bearing on a flexed knee (e.g., Squatting, stair ambulation, jogging/running, hopping/jumping) [2,3]. The risk factors associated with PFP are multifactorial. These include abnormal patellofemoral joint alignment and trochlear morphology, quadriceps muscle weakness, abnormal biomechanics during gait [2]. An anterior cruciate ligament reconstruction increases the risk of PFP [2,4]. This disorder can have a big effect on patients' quality of life. Other associated symptoms include crepitus and functional deficit. PFP symptoms cause many athletes to limit their sportive activities [5] and affect participation in activities of daily living [6]. According to some authors, PFP will eventually lead to osteoarthritis [4,7]. PFP is one of the most common knee problems experienced by active adults and adolescents [8]. This syndrome, constitutes 5% of all injuries and 25% of all knee-related injuries [1,9]. It occurs more frequently in women than in men [3]. It is also more common among obese people and athletes [10,11].

Several questionnaires have been developed to assess the functional ability of patients with knee pain. A recent systematic review identified 24 studies about five different self-reported questionnaires for PFP [8]. Among them, the Kujala Patellofemoral Questionnaire, also called the Anterior Knee Pain Scale (AKPS) which was first developed in 1993, provides a functional assessment for knee complaints related to patellofemoral structure [12]. It was found to be one of the most interesting validated instruments to evaluate the functional ability, especially in patients with PFP

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[13]. It is easy to understand [2], time efficient (i.e., taking no more than 20 min to complete) and comprehensive [14]. Originally developed in English, previous studies performed a cross-cultural adaptation of the AKPS in various languages (i.e., Turkish [15], Portuguese [13], Persian [14], Chinese [16], Dutch [17], Thai [18]) and have shown good validity and reliability of this questionnaire in determining functional abilities in patients with knee pain [14–16, 18]. Reliability and validity are population-specific properties, and if an instrument shows satisfactory properties in one population, there is no guarantee that it is appropriate for use in another culturally different population. No French version of this questionnaire is currently available [1].

Because appropriate use of a questionnaire in any specific population requires the process of a reliability study [7], the purposes of this study were first to linguistically and cross-culturally translate the AKPS in French and then to investigate its measurement properties.

Methods

TRANSLATION AND CROSS-CULTURAL ADAPTATION OF THE "AKPS"

The AKPS was translated according to the "Guidelines for the Process of Cross-Cultural Adaptation of Self-Report Measures". This implies a succession of six stages in order to achieve a linguistic and cultural equivalence between the original version and the translated version of the questionnaire [11].

STAGE 1: INITIAL TRANSLATION

The first step was to translate the questionnaire from the original language (English) into the target language (French). Two bilingual translators (who are not part of the author team), both native French speakers (one in the medical field and one outside the medical field) provided two independent translations (T1 and T2) of the original questionnaire.

STAGE 2: SYNTHESIS OF THE FIRST TWO TRANSLATIONS

The two translators and a recording observer sat down to synthesize the results of T1 and T2, to provide a single "version 1" of the translated questionnaire.

STAGE 3: BACK TRANSLATION

Two independent bilingual translators (one who was not part of the author team and SB), blinded to the original version of the questionnaire and having English as their first language (one in the medical field and one outside the medical field), translated version 1 back into the original language. This is a process of validity checking that the translated version is reflecting the same item content as the original version.

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STAGE 4: EXPERT COMMITTEE

The expert committee composed of one health professional (JFK), one expert in French language (JVB) and all the translators met to compare the backward translations with the original questionnaire and agreed by consensus on a "version 2" of the translated questionnaire, with semantic, idiomatic, experiential and conceptual equivalence.

STAGE 5: PRE-FINAL VERSION TESTING

Version 2 of the questionnaire was tested on a group of 30 subjects, to ensure good comprehension of each question and conclude with a "version 3", final version of the French AKPS (F-AKPS).

STEP 6: EXPERT COMMITTEE APPROVAL

Following the information gathered from the previous steps (i.e., no difficulties to answer the questionnaire and no misunderstanding or confusion about any item), version 3 of the questionnaire was approved.

PSYCHOMETRIC VALIDATION OF THE "F-AKPS"

All of the analyzes described below were performed using Statistica 10 software (Chicago, IL). Results were considered statistically significant at the 5% critical level ($p < 0.05$).

ASSESSMENT OF THE TEST–RETEST RELIABILITY

This assessment tests the stability over time of the results using intraclass correlation coefficients (ICC). The patients completed the questionnaire two times, at 7 days intervals while the subjects' status remained unchanged [19]. During the 7 days, patients were not engaged in rehabilitation and did not get any treatment for their condition. The closer the coefficient is to 1, the higher is the reliability. An intraclass correlation coefficient (ICC) over 0.7 was considered as an acceptable reliability [20]. The absolute reliability was examined by means of the standard error of measurement (SEM) and minimal detectable change (MDC) [21], which evaluate respectively the stability of the answers and the minimum amount of change in a patient's score that ensures that this change is not the result of a measurement error.

ASSESSMENT OF THE CONSTRUCT VALIDITY

The construct validity was investigated by measuring the convergent and divergent validity. The correlation between the F-AKPS and other questionnaires or domains of questionnaires which have similar dimensions (convergent validity) or different dimensions (divergent validity) was assessed. To account for a good construct validity, the correlation is respectively expected to be strong for the convergent validity and weak or not existing for the divergent validity. Therefore, the participants were asked to complete the SF-36 questionnaire, validated in French [22], which is composed of 36

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items measuring eight Health-Related Quality of Life Domains (i.e., physical functioning, role limitation due to physical problems, bodily pain, general health, vitality, social functioning, role limitation due to emotional problem and mental health). Data of the SF-36 were not normally distributed and we used therefore Spearman's correlations to measure to correlation of the total score of the F-AKPS with the different scales of the SF-36 questionnaire.

ASSESSMENT OF INTERNAL CONSISTENCY

Internal consistency is the estimation of the questionnaire homogeneity. Cronbach's alpha coefficient assesses internal consistency of a set of items, scale or subscale, corresponding to a single clinical dimension. The aim is to estimate the strength of the inter-correlations between items. The alpha value ranges from 0 to 1: internal consistency increases as alpha approaches 1 and a coefficient value greater than 0.70 indicates a high level of internal consistency [19].

ASSESSMENT OF FLOOR AND CEILING EFFECTS

Floor and ceiling effects were defined when a high percentage of the population had the lowest or the highest score, respectively. Floor and ceiling effects higher than 15% were considered to be significant [20].

The priori hypothesis is that the F-AKPS will have good psychometric properties, as do the other versions of the questionnaire.

INSTRUMENTS

THE ANTERIOR KNEE PAIN SCALE (AKPS)

The AKPS is a 13-item knee-specific, self-reported questionnaire [12]. It contains six sections that documents responses to six activities thought to be associated specifically with PFP (walking, running, jumping, climbing stairs, squatting and sitting for prolonged periods with knee bent), as well as symptoms such as limping, inability to weight bear through the affected limb, swelling, abnormal patellar movement, muscle atrophy and limitation of knee flexion. The AKPS asks about duration of symptoms and limb(s) affected. The maximum score is 100 and lower scores indicate greater pain or disability. Scoring is hierarchical using various types of categorizations including "no difficulty-unable" and "no pain-severe pain". Some questions incorporate grading of the distance able to walk or run without pain. The question on stair climbing distinguishes those with pain only on descending stairs from those who experience pain both ascending and descending [12, 15]. The AKPS has been shown to be easy to understand and takes only a few minutes to complete.

SHORT-FORM 36 QUESTIONNAIRE (SF-36)

The short-form 36 questionnaire (SF-36) is a 36-item questionnaire that measures quality of life (QoL) across eight domains that are both physically and emotionally based. The eight domains that the SF-36 measures are as follows: physical functioning, role limitations due to physical health, role

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limitations due to emotional problems, energy/fatigue, emotional well-being, social functioning, pain and general health. In summary, an aggregate percentage score is produced for each of the eight domains that the SF-36 measures. The percentage scores range from 0% (lowest or worst possible level of functioning) to 100% (highest or best possible level of functioning) [23].

PARTICIPANTS

The study sample was composed of French-speaking Belgian patients from the Physical Medicine and Rehabilitation (PMR) Department of the University Hospital of Liège. French patients were recruited during consultations with general practitioners (GPs), rheumatologists and physiotherapists.

Patients with associated pathology at the femoro-tibial level, tendon involvement, meniscal involvement or an involvement of another joint in the lower limb, confirmed by radiological assessment, were excluded of this study. These associated pathologies were confirmed by a radiological examination (scanner, radiography,…). All subjects provided their informed consent before starting the study.

STATISTICAL ANALYSIS

Normality of quantitative variables was tested by the Shapiro–Wilk test. Quantitative variables were expressed as mean (± SD), whereas qualitative variables were reported as absolute and relative frequencies (%).

Reliability has been measured by Cronbach7rsquo;s alpha coefficient to test the internal consistency and intra-class correlation coefficient (ICC) to test the reliability between the first and the retest scores of the F-AKPS questionnaire. Finally, Spearman's correlations were used to evaluate the construct validity of the F-AKPS questionnaire and so, to measure the correlations between the F-AKPS questionnaire and the domains of physical functioning, limitation due to physical problems, body pain and general health of the SF-36.

Analyses were performed using Statistica (version 10 for Windows) and SAS (version 9.3 for Windows; used only for the internal consistency analysis). Results were considered statistically significant at the 5% critical level ($p < 0.05$).

Results

POPULATION

A total of 101 subjects, aged 34.5 ± 11.4 years were included in this study. Among them, 58.4% were women and 24 subjects had bilateral PFP. The mean duration of their symptoms was 60.5 ± 47.5 months and the average score obtained to AKPS was 76.5 ± 15.1.

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CROSS-CULTURAL ADAPTATION AND TEST OF THE PREFINAL VERSION

The AKPS was translated in French without any major difficulties. A few differences between the translations T1 and T2 were observed and were resolved during analysis of the two translations. The observed differences were semantic (i.e., "incapable" or "incapacité"; "soutien complet sans douleur" or "soutien total sans douleur"; "soutien du poids impossible" or "port du poids impossible"; "s'accroupir" or "faire des squats";…).

The back translations were conducted without any significant problems, and the versions obtained was very similar to the original English version. During tests of the prefinal version, none of the first 30 subjects included in the study expressed any difficulties understanding the questionnaire's various items. The various members of the Expert Committee gave their approval after expressing their satisfaction with the final version F-AKPS (Table 1).

Table 1. The final version F-AKPS.

Nom: _____ Date: _____

Age: _____

Genou: G/D

Durée des symptômes: _____ années _____ mois

Entourez la proposition correspondant aux symptômes que vous ressentez actuellement au genou:

1. Boiterie
   - (a) Aucune (5)
   - (b) Légère ou intermittente (3)
   - (c) Constante (0)
2. Se tenir debout
   - (a) Station debout complète sans douleur (5)
   - (b) Station debout douloureuse (3)
   - (c) Station debout impossible (0)
3. Marcher
   - (a) Illimité (5)
   - (b) Plus de 2 km (3)
   - (c) 1–2 km (2)

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(d) Incapable (0)

4. Escaliers
   (a) Aucune difficulté (10)
   (b) Légère douleur en descendant les marches (8)
   (c) Douleur en montant et en descendant les marches (5)
   (d) Incapable (0)
5. S'accroupir
   (a) Aucune difficulté (5)
   (b) Douloureux quand les accroupissements sont répétés (4)
   (c) Douloureux à chaque fois (3)
   (d) Possible avec décharge partielle du poids du corps (2)
   (e) Incapable (0)
6. Courir
   (a) Aucune difficulté (10)
   (b) Douleur après plus de 2 km (8)
   (c) Légère douleur dès le début (6)
   (d) Douleur sévère (3)
   (e) Incapable (0)
7. Sauter
   (a) Aucune difficulté (10)
   (b) Légère difficulté (7)
   (c) Douleur constante (2)
   (d) Incapable (0)
8. Position assise prolongée avec les genoux fléchis
   (a) Aucune difficulté (10)
   (b) Douleur après l'exercice (8)

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(c) Douleur constante (6)

(d) Douleur obligeant à étendre les genoux temporairement (4)

(e) Incapable (0)

9. Douleur

(a) Aucune (10)

(b) Légère et occasionnelle (8)

(c) Perturbe le sommeil (6)

(d) Occasionnellement sévère (3)

(e) Constante et sévère (0)

10. Gonflement

(a) Aucun (10)

(b) Après un effort intense (8)

(c) Après des activités quotidiennes (6)

(d) Tous les soirs (4)

(e) Constant (0)

11. Douleur rotulienne anormale lors des mouvements (subluxations)

(a) Aucune (10)

(b) Occasionnellement dans les activités sportives (6)

(c) Occasionnellement dans les activités quotidiennes (4)

(d) Au moins un épisode de luxation documenté (2)

(e) Plus de deux luxations (0)

12. Fonte musculaire de la cuisse

(a) Aucune (5)

(b) Légère (3)

(c) Sévère (0)

13. Perte de flexion

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(a) Aucune (5)

(b) Légère (3)

(c) Sévère (0)

PSYCHOMETRIC VALIDATION OF THE "F-AKPS"

TEST–RETEST RELIABILITY

Excellent agreement was found between the test and the retest with an overall intraclass correlation coefficient (ICC) of 0.97 (95% CI 0.96–0.98). For individual items of the questionnaire, the lowest intraclass correlation coefficient (ICC) was found for item 4 (intraclass correlation coefficient (ICC) of 0.77, 95%CI 0.68–0.84) which is however still considered as acceptable (Table 2).

Table 2. Test–retest reliability.

	Intraclass correlation coefficient (ICC)	**95% CI**
Item 1	0.82	0.75–0.88
Item 2	0.90	0.85–0.93
Item 3	0.95	0.93–0.97
Item 4	0.77	0.68–0.84
Item 5	0.95	0.93–0.97
Item 6	0.85	0.79–0.90
Item 7	0.93	0.90–0.95
Item 8	0.92	0.88–0.94
Item 9	0.89	0.84–0.93
Item 10	0.99	0.98–0.99
Item 11	0.98	0.97–0.99
Item 12	0.93	0.89–0.95
Item 13	0.79	0.71–0.85
Total	0.97	0.96–0.98

The Standard Error of Measurement (SEM) and Minimal Detectable Change (MDC) values were 2.58 (SEM (%) = 3.38) and 7.14 (MDC % = 9.34), respectively.

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CONSTRUCT VALIDITY

Results of construct validity are available in Table 3. As expected, strong correlations were found between the F-AKPS and some domains of the SF-36 questionnaire which have similar dimensions, such as physical functioning ($r = 0.80$, $p < 0.001$), role limitation due to physical problems ($r = 0.60$, $p < 0.001$), body pain ($r = 0.74$, $p < 0.001$) and general health (0.57, $p < 0.001$). We found, also as anticipated, weaker correlations or no correlation between the F-AKPS and the domains of the SF-36 which have different dimensions, such as emotional role ($r = 0.07$, $p = 0.53$), vitality ($r = 0.32$, $p < 0.05$), mental health ($r = 0.26$, $p < 0.05$) and social function ($r = 0.41$, $p < 0.001$).

Table 3. Correlations of the total score of the F-AKPS with individual domains of the SF-36 questionnaire.

AKPS vs	**Spearman's correlation (rs)**	***p* value**
Convergent validity		
SF-36 PF	0.80	<0.001
SF-36 RP	0.60	<0.001
SF-36 BP	0.74	<0.001
SF-36 GH	0.57	<0.001
Divergent validity		
SF-36 RE	0.07	0.53
SF-36 VT	0.32	<0.05
SF-36 MH	0.26	<0.05
SF-36 SF	0.41	<0.001

INTERNAL CONSISTENCY

A Cronbach's alpha of 0.87 was calculated indicating a high internal consistency. Cronbach's alpha values varying between 0.86 and 0.88 for each item of the questionnaire and all items showed a significant positive correlation with the total score of the questionnaire, ranging from $r = 0.37$ (item 2) to $r = 0.68$ (item 7) (Table 4).

Table 4. internal consistency of F-AKPS.

	Correlation with the total score (*r*)	**Cronbach's alpha**
Item 1	0.46	0.88
Item 2	0.37	0.88
Item 3	0.60	0.87
Item 4	0.46	0.88

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Item 5	0.64	0.87
Item 6	0.64	0.87
Item 7	0.68	0.86
Item 8	0.33	0.88
Item 9	0.62	0.87
Item 10	0.47	0.87
Item 11	0.37	0.88
Item 12	0.56	0.87
Item 13	0.57	0.87
Total		0.87

FLOOR AND CEILING EFFECTS

No subjects obtained the lowest score to the questionnaire (0 point) or the maximal score (100 points). Therefore, no floor neither ceiling effects were found for the questionnaire.

Discussion

The "Kujala Patellofemoral Questionnaire" or « Anterior Knee Pain Scale (AKPS) » is one of the validated instruments to evaluate the functional limitations in patients with PFP. This study aimed to provide a French version of the questionnaire, validated to be used for research and clinical purposes in French-speaking countries. This research has produced a French version of the AKPS which, after cross-cultural adaptation and translation process has proven to be a discriminant, valid and reliable questionnaire to assess functional limitations in subjects with PFP.

To provide equivalence between the English and the French AKPS, a rigorous translation and cross-cultural adaptation process was followed. No major difficulties were encountered during the translation process, and the expert committee considered the final F-AKPS equivalent to the original English version. Proof of correctness and equivalence between the two questionnaires was provided by the excellent test–retest reliability observed (intraclass correlation coefficient (ICC) = 0.97, 95% CI 0.96–0.98). This result corroborates those observed with the Thai version (ICC = 0.98) [18], the Persian version (ICC = 0.96) [14], the Chinese version (ICC = 0.96) [16], the Turkish version (ICC = 0.96) [15] and the Dutch version (ICC =0.81) [17] of the questionnaire. Since reliability results have not been reported in the original version of the AKPS, we were not able to compare them with ours [12].The Minimal detectable Change (MDC) score of 7.14 for the French version of the AKPS is comparable with the various scores reported for the other versions (i.e., respectively 6.44 and 10 for the Persian and the English versions). The few differences observed could be explained by the time

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interval between test and retest, or/and by differences in clinical characteristics of the participants (i.e., the mean duration of the symptoms was 12 ± 6.24 months in the study of Negahban [14] and 60.5 ± 47.5 months in our study). From the literature review, the recommendation of the time interval for test–retest reliability study was 1–2 days [9].

Furthermore, we observed high internal consistency of the translated questionnaire (Cronbach's alpha of 0.87). It is thus satisfactory because it is both higher than 0.7 and not too close to 1, showing the absence of redundancy between items in the questionnaire. This was also observed for the Chinese (0.81) [16], the Persian (0.81) [14], the Dutch (0.81) [17] and the Turkish (0.84) [15] versions of the questionnaire.

Finally, a consistent construct validity was observed. The construct validity analyzes showed that the F-AKPS was strongly and significantly correlated with some domains of quality of life, assessed by the SF-36 questionnaire which have similar dimensions, such as physical functioning, role limitation due to physical problems, body pain and general health. The originality of this work was that the translated version of the AKPS was compared with the French version of the SF-36 to establish correlations with other items measuring different aspects of individuals' health status.

Just like for the Persian [14] version of the questionnaire, we found no ceiling/floor effect in our study. There is evidence that instruments with good content validity have low ceiling and floor effets [12]. This feature of validity has not been reported in other studies conducted on AKPS [24].

We acknowledge some potential limitations in this study. The first limitation is the external validity of our results. The population is composed of subjects with PFP with or without patellar dislocation, with or without patellofemoral osteoarthritis. These conditions are accompanied by symptoms such as locking and giving way, that were not included in the contents of original AKPS. Thus, the influence of these confounding factors on knee complaints related to the patellofemoral structure should be evaluated in further research. Furthermore, the results of this study are primarily applicable to patients with "chronic" PFP.

The second limitation is related to the fact that sensitivity to change could not be measured in our study given its cross-sectional design and because all subjects reported no change in their status However, we will aim to test the sensitivity to change in further analyzes.

There are already a few knee-specific questionnaires translated into French, such as the WOMAC (Western Ontario and McMaster Universities osteoarthritis index), the FIQ (Fibromyalgia Impact Questionnaire), the IKDC (International Knee Documentation Committee), the KOS-ADLS (The Activities of Daily Living Scale of the Knee Outcome Survey) [25]. The AKPS is the most common questionnaire in the literature for studying anterior knee pain. Most studies use this questionnaire. In order to be able to compare studies on these pains, it is necessary to have the same tools and thus the same scales of evaluation. In addition, each questionnaire has its advantages and disadvantages. This will allow us to be able to compare the specificity of one with respect to the other and to use the one that is the most efficient in French. The French version would allow scientists to use it in epidemiological studies. From a clinical point of view, it will also allow to assess the pain of the patients and to consequently adapt the management of PFP.

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In conclusion, a valid French version of the AKPS is now available and can be used with confidence to assess functional ability in patients with PFP. With this study, we validated it for French speakers. The psychometric properties indicated that the F-AKPS is valid, consistent and reliable which strengthens the evidence that it is a strong and valid questionnaire for the assessment of functional limitations among patients with PFP.

Ethical approval

The study was approved by the Ethics Committee of the University teaching Hospital of Liège.

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Disclosure statement

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