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ORIGINAL ARTICLE

Greek cultural adaption and validation of the Kujala anterior knee pain scale in patients with patellofemoral pain syndrome

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ABSTRACT

Purpose: To cross-culturally adapt and validate the Greek version of the Kujala anterior knee pain scale (KAKPS). **Methods**: The Greek KAKPS was translated from the original English version following standard forward and backward translation procedures. The survey was then conducted in clinical settings by a questionnaire comprising the Greek KAKPS and patellofemoral pain syndrome (PFPS) severity scale. A total of 130 (62 women and 68 men) Greek-reading patients between 18 and 45 years old with anterior knee pain (AKP) for at least four weeks were recruited from physical therapy clinics. To establish test–retest reliability, the patients were asked to complete the KAKPS at initial visit and 2–3 days after the initial visit. The Greek version of the PFPS severity scale was also administered once at initial visit. Internal consistency of the translated instrument was measured using Cronbach's α. An intraclass correlation coefficient was used to assess the test–retest reliability of the KAKPS. Concurrent validity was measured by correlating the KAKPS with the PFPS severity scale using Pearson's correlation coefficient. **Results**: The results showed that the Greek KAKPS has good internal consistency (Cronbach's $\alpha = 0.942$), test–retest reliability (ICC = 0.921) and concurrent validity ($r > 0.7$). **Conclusions**: This study has shown that the Greek KAKPS has good internal consistency, test–retest reliability and concurrent validity when correlated with the PFPS severity scale in adult patients with AKP for at least four weeks.

➤ IMPLICATIONS FOR REHABILITATION

- The Greek version of the KAKPS has been found to be reliable and valid when used in adult patients with AKP for at least four weeks.
- The results of the psychometric characteristics were compatible with those of the original English version.
- The KAKPS could be applied in a Greek-speaking population to assess functional limitations and symptoms in patients aged 18–45 years old with AKP for at least four weeks.

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Anterior knee pain; Kujala anterior knee pain scale; patellofemoral pain syndrome; reliability; validation

Introduction

Anterior knee pain (AKP) is a common clinical entity in patients of all sex, ages and activity levels.[1] In the past, the term used for AKP was chondromalacia patellae to describe pathologic changes in the articular cartilage of the patella, such as fragmentation erosion and softening.[2] The use of the term AKP is confusing with AKP being presented in many clinical conditions.[2,3] The most common AKP conditions are patella tendinopathy (commonly referred as Jumper's knee), fat pad syndrome, patella subluxation or dislocation, traction apophysis, plica syndrome, iliotibial band, friction syndrome, Osgood–Schlatter's disease, Sinding–Larsen–Johansson syndrome and finally patellofemoral pain syndrome (PFPS).[3] PFPS represents 70% of AKP and is associated with abnormal loading of the patellofemoral joint, malalignment of the lower extremity and/or the patella, overactivity, muscular imbalance of the lower extremity.[4] Recent research in eight general practices in North Staffordshire, United Kingdom, has shown that AKP represents 12% of all knee-related consultations and 71% of these cases are diagnosed as PFPS.[5] Due to the increased frequency of PFPS, there is a lot of confusion about the differentiation between AKP and PFPS. However, the two terms are not equivalent and the former includes the latter since PFPS is a major part of AKP.

The anterior knee pain scale (AKPS) also known as Kujala scale [6] is a 13-item knee-specific self-report questionnaire, easy to understand and takes only a few minutes to complete. For the purpose of this article, the AKPS commonly referred as Kujala scale, will also known as Kujala AKPS (KAKPS). It documents response to six activities thought to be associated specifically with AKP (walking, running, jumping, climbing stairs, squatting and sitting for prolonged periods with knee bent), as well as symptoms, such as limp, inability to weight bear through the affected limb, swelling, abnormal patellar movement, muscle atrophy and limitation of knee flexion. The KAKPS asks about the duration of symptoms and limb(s) affected. The maximum score is 100 and lower scores indicate greater pain/disability. Scoring is hierarchical using various types of categorization including "no difficulty – unable" and "no pain – severe pain." Some sections incorporate grading of the distance able to be walked or run without pain. The section on stair climbing distinguishes those with pain only on descending stairs from those who experience pain both ascending and

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Supplemental data for this article can be accessed here.

descending. KAKPS is among the most valid and reliable scales in AKP according to recently published systematic reviews.[7,8] The scale has been translated into different languages, such as Dutch,[9] Brazilian,[10] Turkish,[11] Chinese,[12] Persian [13] and Spanish.[14]

However, there is no Greek version of the KAKPS available at present. In order to administer this questionnaire, to a Greek-speaking population, a rigorous process of cross-cultural adaptation and validation is needed. Therefore, the aim of the current study was to translate and culturally adapt the KAKPS into the Greek language and culture and to test its reliability and validity.

Methods

The official guidelines of the cross-cultural adaptions were used in the current study.[15,16] Therefore, the three phases were as follows: (1) translation and adaption into the Greek language and culture; (2) assessment of the comprehensibility of the prefinal version and modification; and (3) the reliability and validity assessment of the final version. The authors obtained approval from the first author (Prof. Kujala) of the original KAKPS to translate and culturally adapt the scale into the Greek language.

Translation and cultural adaption

The first step was the forward translation of the original KAKPS (English version – Supplementary Appendix 1) into Greek by two independent translators (D.S. and C.P.) who are Greek in origin. Both translators aimed to translate the scale conceptually rather than literally. In their written reports, they recorded their comments and difficulties during the translation process and the criteria to make their decisions. The two reports were then compared and discussed among them until a consensus was reached. Therefore, a single Greek version of the scale was formed from the two reports and the comments of the two translators. This version was then translated back into English by two official English translators (A.C. and AZ.C.), who compared the scale with original one to confirm whether the semantic, conceptual and experimental equivalence was met. The prefinal version was then used for pilot testing.

Piloting the prefinal version

The prefinal version of the KAKPS was tested in a group of 30 participants consisting of staff and students of the European University of Cyprus (EUC) who reported to have AKP (11 men, 19 women) mean age: 30.5 ± 13.3 years. A mail was sent to the EUC staff and students asking whether any of them had to report any knee pain. The four authors, after examining those who reported to have knee pain determined who of the staff and students of the EUC had AKP. All four authors are registered physiotherapists, belong to the physiotherapy program of the EUC and have experience in the diagnosis and treatment for the AKP. The 30 participants were all native Greek speakers and were asked to complete the prefinal version by reading the instructions. Each participant was asked to provide the research team with any words that were difficult to understand or any comments on the scale. No further changes were made to the prefinal version since all questions and answer options were found to be well conceivable by all participants. The final version of the Greek KAKPS was created (Supplementary Appendix 2)

Reliability, validity, ceiling and floor effects of the final Greek version of the KAKPS

Subjects

The data were collected from February 2014 through May 2015. Participants were recruited from 16 different private physiotherapy clinics in Athens, Greece. Patients between 18 and 45 years old were included in the study if, at the time of presentation they had been evaluated as having clinically diagnosed with AKP for at least four weeks.[4,17–19] AKP was defined as a syndrome in which the pain was located around or beneath the patella that could be reproduced with patellar compression or retropatellar palpation.[17,18] The sensitivity of the patella compression and retropatellar palpation tests is known to be 82% and 72%, respectively, and the specificity 54%, and 42%.[20] All patients were referred for physical therapy by the National Health Sector or a private practice doctor. Additionally, all participants were examined by a physiotherapist to evaluate whether their symptoms were attributable to soft-tissue lesions. The reason that patients over the age of 45 were excluded was to control for the possible effects of degenerative joint disease.[21] Finally, informed consent was obtained from all participants. The study protocol was approved by the ethics committee of the European University of Cyprus, Cyprus. The study was conducted in accordance with the Declaration of Helsinki. To determine the sample size in the translation, cultural adaptation and validation of the Greek version of the KAKPS questionnaire, the guidelines recommended by Hair et al.,[22] which recommend using 10 additional subjects per each additional item of the questionnaire, were followed. Given that the KAKPS has 13 items, the sample size consisted of 130 people.

Procedures

To assess test–retest reliability, all participants were asked to complete the Greek version of KAKPS during their initial visit to the physiotherapy clinic. In the case of bilateral involvement, patients were asked to fill out the questionnaire for the most symptomatic leg only.[23,24] The KAKPS was re-administered to a sample of patients 2–3 days [24] after the first session to evaluate test–retest reliability. It was thought this time interval is sufficient for not changing the health status of participants and also not memorizing previous responses of the first session.[23] To evaluate stability in the health status of patients, they were asked to answer whether they believed their symptoms were better, same or worse in the retest session.[23] Only patients with the answer "same" were included in the reliability study. The test–retest reliability was established by comparing the results of the first with the second KAKPS.

In order to assess concurrent validity, the results of the KAKPS were correlated with the Greek version of PFPS severity scale,[25] a scale that all patients were asked to complete along with the KAKPS in both sessions. The reason for choosing the PFPS severity scale was because PFPS is the most common cause of AKP. Therefore, this study hypothesized that the KAKPS would present high validity when compared with the PFPS severity scale. The total score of the PFPS severity scale was normalized to 100 when patients considered that any of the questions were not appropriate to their problem. The PFPS severity scale is a scale comprised of 10 visual analogue scales (VAS) aiming to measure pain and functional disorders of the patellofemoral joint. It has been translated in into different languages, such as Chinese and Brazilian,[10,26] and was found to be reliable in PFPS patients.[8]

Ceiling and floor effects are concerned with the limits of response ranges where no further improvement or deterioration can be detected.[8] Achievement of highest (ceiling effect) or

lowest (floor effect) scores by more than 33% of the patients is considered as a cut-off point for poor content validity.[27]

Statistical analysis

The analysis was performed with SPSS Statistical Package for windows (v(0).20, IBM, NY). The statistical level of significance was set at $p > 0.05$. All data were tested for normal distribution using Kolmogorov–Smirnov test. If the criterion of normality was met, parametric tests were used. Otherwise, non-parametric statistics were used. Test–retest reliability of the item and total scores of the KAKPS was evaluated by using the intraclass correlation coefficient (ICC) with a two-way random model and type: absolute agreement.[16,28] Internal consistency was evaluated using Cronbach's α, a measure that indicates the strength of the relationship between the items within the questionnaire.[29] A Cronbach's α value greater than 0.80 was considered as acceptable.[30] The standard error of measurement (SEM) was calculated from the root mean square error term of the analysis of variance table. The SEM aimed to estimate measurement precision associated with repeated measurements.[31] Therefore, it is useful for computing the smallest detectable change (SDC) which is the smallest change in an individual's performance that can be considered as a real change or the change beyond the measurement error.[32] The SDC was defined as the 95% CI of SEM (±1.96 SEM).[33] Concurrent validity was tested by examining correlation of the PFPS severity scale with KAKPS data collected before and after treatment using Pearson's correlation coefficient. In terms of ceiling and floor effects, the test was analysed as a whole, as a single dimension and considering that the maximum score is 100 points and the minimum is 0.[14]

Results

Patients

The Greek version of the KAKPS was completed by 130 participants (62 women and 68 men; mean age 20.1 years, SD 6.2) with patellofemoral pain syndrome in the first session. The questionnaire was easily understood by the subjects of the study, which took them less than 20 min to complete independently. All participants fully completed the questionnaire, resulting in the maximum response rate. In the reliability study, 112 patients took part since 18 patients believed that their symptoms were better in the second session. Their demographics, which consisted of 58 men (52%) and 55 women (48%), were similar to all completers. The mean (standard deviation) of the age is 19.1 (5.6) years. All patients represented different educational status. Thirty patients (17 women and 13 men) had tertiary education, while the rest 100 (45 women and 55 men) had secondary education. This ensured that the scale was comprehensible for patients with different educational background.

Descriptive statistics

The mean KAKPS recorded in the first assessment was 74.9 (SD = 9.51; range = 44–92). The corresponding score at re-test was 76.2 (SD = 11.4; range = 41–92). The mean value for the PFPS was 53.7 (SD = 16.12; range 13.2–89.2).

Internal consistency and test–retest reliability

The internal consistency was high (Cronbach's α = 0.942) (Table 1). The results of the test–retest reliability analysis showed that KAKPS total score had excellent test–retest reliability (ICC = 0.921; SDC = 6.39). Analysis of individual item scores revealed good test–retest reliability (ICC > 0.8). The question with the lowest ICC was about swelling and the question with the highest ICC was about abnormal painful kneecap (patellar) movements (subluxations) (Table 2).

Table 1. Test–retest reliability and internal consistency of the KAKPS.

ICC	95% confident interval	SEM	SDC	Cronbach α
0.921	0.857–0.927	4.54	6.39	0.942

Cronbach's α = the measurement to assess internal consistency of the scale items; ICC: intraclass correlation coefficient; SDC: smallest detectable change; SEM: standard error of measurement.

Validity

Concurrent validity was estimated by correlating the results of KAKPS (before and after treatment) with those of PFPS severity scale. All correlations were statistically significant. The correlations are presented in Table 3.

Ceiling and floor effects

Analysing the test as a whole, as a single dimension, and taking into account that the maximum score is 100 points and the minimum is 0, no ground or ceiling effects were found in the sample used for the test.

Discussion

This study has shown that the Greek KAKPS has good internal consistency, test–retest reliability and concurrent validity when correlated with the PFPS severity scale in adult patients with AKP for at least four weeks. The above findings reveal that the translated instrument is a reliable and valid outcome measurement for patients aged 18–45 years old with AKP for at least for four weeks who are native Greek speakers. Patients with AKP for at least for four weeks participated in this study, suggesting they were no longer in the acute phase.[17–19]

The Cronbach's α value was used to measure the internal consistency of the Greek KAKPS.[34] A Cronbach's α value between 0.70 and 0.95 is generally considered as satisfactory. A value less than 0.70 may suggest that there are might be limited intercorrelations among the test items and that the items may not be measuring the same attribute. A very high value (more than 0.95) may indicate that some items are redundant.[35] The current study showed internal consistency, close to 0.95. Therefore, the results should be interpreted carefully since by maximizing internal consistency produces a scale that is quite narrow in content. In addition, the data of this study are consistent with the values of Cronbach's α obtained in translation of the same questionnaire translations into other languages,[9–14] which are equal or superior to those obtained for the Greek version. However, high internal consistency ($a > 0.95$) in most questionnaire translations might mean that the original questionnaire may contain questions that most of the patients reported in the same way.

The test–retest reliability was determined using the ICC. In our study, the ICC was 0.92. The highest reliability was found in the Spanish version (ICC = 0.99).[14] The Turkish version has an ICC = 0.94,[11] Brazilian ICC = 0.86,[10] Chinese ICC = 0.97 [12] and Persian ICC = 0.96.[13]

The SDC score of 6.39 for the Greek KAKPS is comparable with the various scores reported in other studies, that is, SDC score of

Table 2. Test–retest reliability of each item of the KAKPS.

Questions	ICC	95% Confidence interval
Limp	0.886	0.812–0.924
Support	0.939	0.841–0.946
Walking	0.866	0.830–0.942
Stairs	0.879	0.811–0.927
Squatting	0.903	0.844–0.947
Running	0.924	0.882–0.970
Jumping	0.872	0.839–0.912
Prolonged sitting with knee flexed	0.910	0.896–0.975
Pain	0.877	0.835–0.911
Swelling	0.851	0.801–0.902
Abnormal painful kneecap (patellar) movements (subluxations)	0.973	0.925–0.989
Atrophy of thighs	0.922	0.916–0.963
Flexion deficiency	0.948	0.912–0.968

ICC: intraclass correlation coefficient between pre- and post-treatment of each question.

Table 3. Correlations between the scores of KAKPS and PFPS severity scale.

	Correlations with PFPS severity scale	p^a
KAKPS (first)	$r = 0.714$	<0.001
KAKPS (second)	$r = 0.761$	<0.001

r = Pearson's correlation coefficient.
[a]$p < 0.001$.

6.44, 7, 10 and 13 in studies by Negahban et al.,[13] Crossley et al.,[23] Bennell et al.[24] and Watson et al.,[24] respectively. Several factors, such as time interval between test and retest sessions, demographic (e.g., age) and clinical characteristics of participants such as duration of symptoms, and type of statistics can all affect the SDC scores [23,24] and this make the comparison difficult between studies.

The Greek version of the PFPS severity scale was used to evaluate the concurrent validity of the Greek KAKPS. Our results showed that the Greek version of the KAKPS was highly correlated with PFPS severity scale, thus demonstrating good concurrent validity. Taken together, the Greek KAKPS demonstrated acceptable psychometric properties.

No ground or ceiling effects were found in the sample, which suggests that the Greek KAKPS is an appropriate tool for patients with chronic AKP between 18–45 years. Instruments with good content validity should have low ceiling and floor effects.[36] In the current study, no ceiling and floor effects were seen for the Greek KAKPS. Similar findings were reported for the Persian version of KAKPS [13] and for the Spanish version of the KAKPS.[14]

Some study limitations must be considered. The authors acknowledge that a limitation of the study was that no responsiveness of the KAKPS was measured and recommended sensitivity measurement of this instrument for future projects. Additionally, comparison of test–retest reliability between female and male patients was not conducted as had been done in other similar studies [37] or other meaningful subgroups based on age or work status was not conducted because our sample would not have provided for adequate power for such subgroup analyses. Further, no particular measure, such as a visual analogue pain scale or a global rating of change, was used to verify that patients' condition remained stable. Another limitation of the current study was the homogeneity of the sample. KAKPS is a syndrome-specific instrument and AKP is mostly common in young adults; however the results may not be generalized (i) to older adults with AKP due to osteoarthritis (ii) to patients with other patellofemoral disorders and (iii) to patients with acute AKP.

Conclusion

This study has shown that the Greek KAKPS has good internal consistency, test–retest reliability and concurrent validity when correlated with the PFPS severity scale in adult patients with AKP for at least four weeks. The results of the psychometric characteristics were compatible with those of the original English version and other cross-cultural adaptations. The Greek KAKPS could be applied in a Greek-speaking population to assess symptoms and functional limitations in patients aged 18–45 years old with AKP for at least for four weeks. It provides a useful assessment tool for cross-cultural research in patients with AKP according to the recommended inclusion criteria of the present trial.

What this study adds

This study has shown that the Greek KAKPS has good internal consistency, test–retest reliability and concurrent validity when correlated with the PFPS severity scale in adult patients with AKP for at least four weeks. The results of the psychometric characteristics were compatible with those of the original English version. The KAKPS could be applied in a Greek-speaking population to assess functional limitations and symptoms in patients aged 18–45 years old with AKP for at least four weeks.

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Disclosure statement

The authors declare that there is no conflict of interest.

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