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Translation, cross-cultural adaptation and establishment of psychometric properties of the Gujarati version of Kujala patellofemoral score in subjects with anterior knee pain

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Keywords

Anterior knee pain, Kujala patellofemoral score, Cross-cultural adaptation, Gujarati translation, psychometric properties

Abstract

Background: Patellofemoral pain syndrome (PFPS), which affects up to 22.7% of people worldwide, is one of the most common causes of knee discomfort.The term patellofemoral pain syndrome (PFPS) refers to diffuse anterior knee discomfort that is non-traumatic and exacerbated by knee joint loading. The KPS developed by Kujala et al., is most frequently used, reliable and valid questionnaire. As Gujarati is a widely used language, the translation, cross-cultural adaptation of Kujala patellofemoral score in Gujarati language will help researchers in examining functional status across a wide range of individuals.

Objective: To Translate and Cross Culturally adapt the KPS in Gujarati language (KPS-G) and establish its psychometric properties.

Methodology: After the formal permission was obtained from the original author Dr. Urho Kujala, a cross-cultural adaptation and testing of the KPS was performed in accordance with the guidelines by Beaton et al. (2000) in five stages which included forward-backward translation, review by an expert committee and test of pre-final version. A total of 65 patients with anterior knee pain between the ages 18-60 years were selected based on inclusion and exclusion criteria and were asked to complete KPS-G, WOMAC, SF-12 and Lysholm knee score questionnaires. Psychometric evaluation included test-retest reliability, internal consistency, agreement, face validity, content validity, construct validity, concurrent validity and factor analysis. The test-retest reliability was checked in 30 patients twice at an interval of 48 hours.

Result: The data were checked for normality using Kolmogorov Smirnov test. The obtained p-value was less than 0.05; hence the data was not normally distributed. The KPS-G scores were well distributed with no ceiling or floor effects. The KPS-G had excellent test-retest reliability with ICC value of 0.997. Internal consistency was found to be excellent (Cronbach's alpha = 0.999). The MDC for KPS-G was 5.15 points. The bland and Altman plot indicated that the bias was very minimal as the mean difference was close to zero (d = 0.307) and the limits of agreements were excellent (-1.82 to 2.44) with minimal outliers. Face and content validity of KPS-G was well established. Construct validity was good as KPS-G highly correlated with Lysholm knee score (r = 0.927) and it weakly correlated with SF-12 PC and MC (r = 0.504 and r = 0.468) respectively. The concurrent validity when compared with WOMAC was good as it highly correlated (r = 0.813). Factor analysis of KPS-G showed a two factor structure considering of 72.5% of total variance.

Conclusion: The Gujarati version of KPS is a reliable and valid questionnaire which demonstrates good psychometric properties. Thus, it can be used in further clinical and research applications.

Introduction

The knee joint is the most vital weight-bearing joint in the body and is used for a variety of daily activities; it is most likely to sustain significant wear and tear, strain, injury, and pain.[1]

The three most prevalent causes of knee pain are: osteoarthritis (OA) which accounts for 23% of knee pain in adults over 40 years of age, patellofemoral pain which accounts for about 25% of knee pain in adults, and meniscal tears which accounts for 12% of all adult knee pain.[2]Patellofemoral pain syndrome (PFPS), which affects up to 22.7% of people worldwide, is one of the most common causes of knee discomfort.[3]

The term patellofemoral pain syndrome (PFPS) refers to diffuse anterior knee discomfort that is non-traumatic and exacerbated by knee joint loading, such as that which occurs when one jumps, squats, runs, climbs stairs, or descends them.[4]The majorities of the time, symptoms are localized around or below the kneecap and manifest as prolonged sitting with the knee flexed (also known as the "movie-goers" or "cinema sign"). They also frequently occur during travelling, stair climbing, and squatting.[5]Regarding the incidence and prevalence of PFPS, there is a 2:1 female predominance.[7]It is more common in female athletes, soldiers, and those who are physically active.[8]Hence, for evaluating the degree of symptoms and physical limitations in individuals with PFPS, Kujala et al. created the Anterior Knee Pain Scale (AKPS), also referred to as "the Kujala score," an independent self-administered questionnaire in 1993. [20]The KPS is an independent self-administered questionnaire developed for evaluating the degree of symptoms and physical limitations in individuals with PFPS. It is also referred to as the "Anterior Knee Pain Scale (AKPS)" or "the Kujala score." It consists of thirteen items about specific activities, pain intensity, and clinical symptoms of patients with PFPS.[10]

With strong reliability and validity noted for the original English-language form, the Kujala score is the most widely used patient-reported outcome evaluation in patients with patellofemoral diseases like anterior knee pain.[21]The AKPS scale demonstrated high internal consistency (α_{coef} = 0.83 to 0.91.Translation and validation of the questionnaire in the appropriate local language is crucial for a scale that is universally relevant and it facilitates better comprehension. Numerous languages have translations for the Kujala score like Thai [11,] German[12,] Spanish [13,] Dutch [14,] Turkish [5]Persian [15,] Indonesian [6,]Greek [16], Chinese [17],Italian [18,]Arabic[19,] French[20,] Norwegian[21] Brazilian[22.] When adapting a self-administered health status questionnaire for use in a new nation, culture, and/or language, a special

technique must be used to ensure that the target and original versions of the questionnaire are equivalent. Nowadays, it is understood that in order to preserve the conceptual content validity of the instrument across cultural boundaries, the items must be culturally adjusted in addition to being accurately translated linguistically. This process is termed as the cross cultural adaptation.

As Kujala Patellofemoral Score is a widely used scale to assess the severity of patellofemoral disorders, the translation of this score will be of extreme benefit to the population of Gujarat where Gujarati is a broadly used language.

Hence, the purpose of this research is to translate, validate, and establish the psychometric qualities of the Kujala patellofemoral score across cultural boundaries for the Gujarati-speaking community in order to facilitate application among patients. Translation, cross-cultural adaptation, and psychometric assessment of the Gujarati version of Kujala patellofemoral score will thereby enable information sharing across linguistic and cultural barriers while also assisting researchers in examining functional status.

Aims and objectives of the study- To translate and cross culturally adapt the Kujala patellofemoral score into Gujarati language in subjects with anterior knee pain and to evaluate the psychometric properties of Gujarati version of Kujala patellofemoral score in subjects with anterior knee pain. Null hypothesisstates that there will be no significant difference between cross culturally adapted English version of KPS and Gujarati version of KPS.

Methodology

Study Design was Biphasic observational study. Study Population consisted of Patients with anterior knee pain. Sample was Gujarati and English speaking patients with anterior knee pain of age 18 to 60 years. The sample size was calculated on the basis of prevalence by using the formula:

$n_{total} = (Z\alpha_{/2})^2 \times p\ (1\text{-}p)/e^2$ [45]Where p = 20.7% [46] (prevalence of PFPS) , $Z\alpha_{/2} = 1.96$, CI = 90% and e = error = 10% was taken into consideration. So the final sample size was calculated as 63.37. The final samples taken in this study were 65 patients. Sampling technique was Purposive Sampling Study Duration was 1 year and Study Setting included SPB Physiotherapy OPD and different OPDs in Surat.

Inclusion criteria: included Age group – 18 to 60 years, Both male and female patients were included. Patients, who were able to read, write and speak Gujarati language and English language. Patients who had unilateral/ bilateral anterior knee pain while any 3 of activities like while ascending/descending stairs, while squatting, while running, while cycling, while sitting with knees flexed for a prolonged duration. Patients with a positive Clark's test.[47]

Exclusion criteria: included Patients with any previous knee injuries. Patients who have undergone any knee surgeries previously. Patients with tibiofemoral arthritis. Patients diagnosed with any knee pathology like patellar tendinopathy. Patients with history of patellar dislocation or subluxation. Patients with communication problem. Materials and Tools used were Laptop, Chair or plinth, Consent form, Assessment form, Score sheet of Kujala patellofemoral score, Score sheet of Lysholm knee score, Score sheet of SF-12 ,Score sheet of WOMAC .

The Kujala score is a 13-item questionnaire for the patient reported assessment of anterior knee pain.[10]. With strong reliability and validity noted for the original English-language form, the Kujala score is the most widely used patient-reported outcome evaluation in patients with patellofemoral diseases.[21]The Lysholm score is a well-established knee outcome score with a specific focus on knee ligament surgery with a confidence interval of 95.[9]One of the most used tools for evaluating self-reported HRQOL is the SF-12. The physical component summary (PCS-12) and mental component summary (MCS-12) are the two subscales that can be used to

summarize the SF-12.[24]. A high degree of acceptability and data quality has been observed in the use of self-administration SF forms. [25]Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) questionnaire is used to assess the health status of osteoarthritis patients and it was introduced in 1988. [26] It has shown to have good validity and reliability and is widely used in evaluation of hip and knee osteoarthritis.[26]

Procedure

Ethical clearance was taken from Institutional Ethical Committee (IEC) and all procedures were conducted in accordance with declaration of Helinski.[27]After getting the ethical approval, the researcher contacted head of different physiotherapy OPDs of Surat for seeking permission. Anterior knee pain subjects diagnosed and referred from orthopaedic surgeon were included in the study. They were screened on the basis of inclusion and exclusion criteria. The purpose and the procedure of the study were explained and a written informed consent and demographic detail was taken from all subjects by an assessment Performa.This study was conducted into 2 phases:

Phase I: Translation and cross-cultural adaptation process

Phase II: Evaluation of psychometric properties Reliability of Gujarati version of KPS ,Face validity, Content validity, Concurrent validity done by comparing with WOMAC score. Construct validity of Gujarati version –done by comparing: Lysholm knee score and SF-12.

For the cultural adaptation and translation of KPS and to establish the psychometric properties of the new formed Gujarati version of KPS, the formal permission was obtained from the original author, Dr. Urho Kujala, prior to commencement of the study. After that, A cross-cultural adaptation and testing of the KPS was performed in accordance with the guidelines by Beaton et al. (2000) in five stages.[31]After the review provided by the translator, and some of the other members of the expert committee, one item of the KPS was modified and culturally adapted for better comprehension in the Indian Gujarati population. In item 5 of KPS i.e. “Squatting”, as per the recommendation of developers, it was interpreted as sitting with knees bent close to the body, similar to “cross leg sitting” as this activity or sitting habit is common in different sections and age groups of the Indian population.

At the end of this stage, the pre-final version of KPS-G was available.

The pre-final version was tested among 30 anterior knee pain subjects to confirm if all the items in the questionnaire were understandable and whether the subjects experienced problems in answering any of them. Since no modifications were needed in the pre-final version, it was accepted as the final version of the KPS-G.

Phase II: Evaluation of Psychometric properties

For the psychometric evaluation of final version of KPS-G, 65 patients with anterior knee pain who were diagnosed by an Orthopaedic surgeon, and who were screened on the basis of inclusion and exclusion criteria were involved. The data included demographics, KPS, KPS-G, Lysholm knee score, WOMAC and SF-12 scores.

Statistical analysis and Result

Statistical analysis for Descriptive statistics (percentages, means, and standard deviations) was used to describe demographic characteristics within the study. All analyses of psychometric properties described in the research methods were conducted using SPSS version 20.0 (IBM, Armonk, NY, USA) for Windows with a 95% confidence interval (CI). The normality was checked by Kolmogorov Smirnov test. The level of significance will be set at $p \leq 0.05$. The test-retest reliability of KPS-G was determined by calculating the Intraclass Correlation Coefficient (ICC), the internal consistency of KPS-G was determined by the Cronbach’s alpha value. To

assess construct validity and concurrent validity of KPS-G, the correlation coefficient (r), spearman's rho was calculated. Factor analysis was performed to determine the dimension ability of the items of the scale.

Total 105 participants were assessed for eligibility. Out of which 40 participants were excluded because they did not meet inclusion criteria or who disagreed to participate. 65 participants with anterior knee pain were enrolled in the study and filled the questionnaires. The table 1 shows the baseline demographic characteristics of 65 patients with anterior knee pain, with 26 males (40%) and 39 (60%) females of age between 18 to 60 years, with mean age of 30.08±10.06.

	N	Mean	Standard Deviation (SD)
Age	65	30.08	10.061
KPS-G	65	77.72	15.026
SF-12 PC	65	46.89	7.011
SF-12 MC	65	54.57	11.387
Womac	65	24.40	9.583
Lysholm	65	73.48	15.423

Table 1: Shows the descriptive statistics

The data were checked for normality using Kolmogorov Smirnov test. The obtained p-value was less than 0.05; hence the data was not normally distributed. Therefore, spearman's rho or correlation coefficient was used to establish the construct and the concurrent validity.Test-retest reliability was checked in 30 patients with anterior knee pain at an interval of 48 hours.

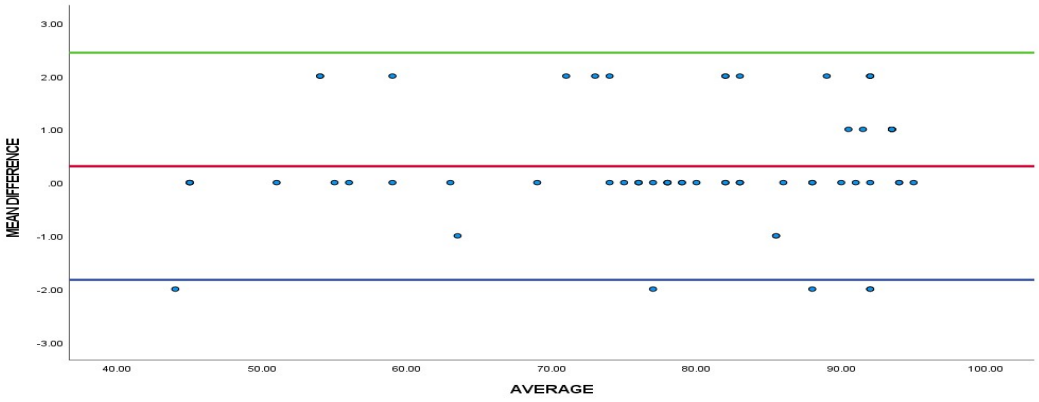
Outcome Measure	Baseline Score Mean±S.D	Retest Score Mean± S.D	ICC (95%CI)	Cronbach's Alpha	SEM	MDC	% of Floor /Ceiling effect
KPS-G	77.72 ± 15.026	77.42 ± 14.951	0.997	0.999	1.864	5.15	0/0

Table 2 Shows the test-retest reliability, internal consistency, SEM, MDC of KPS-G

The Intraclass Correlation Coefficient (ICC) value of KPS-G was 0.997 (Table 2.Hence the KPS-G demonstrated excellent test-retest reliability. Internal consistency, as measured by Cronbach's alpha value for KPS-G was found to be 0.999. Floor and ceiling effects were analyzed on total scores of KPS-G. The percentage of patients who achieved the lowest score (floor effect) and the highest score (ceiling effect) was 1.5% respectively i.e. one patient each. Hence, the KPS-G had no ceiling or floor effect and scores were evenly distributed.The SEM of KPS-G was 1.864 (Table 2.), hence KPS-G is reliable.The Minimal Detectable Change (MDC) at 95% confidence interval was 5.15 points for KPS-G. It was calculated by the formula: 1.96 √2 x SEM

Outcome Measure	Mean	S.D	Upper limit (Mean+1.96×S.D)	Lower limit (Mean-1.96×S.D)
KPS-G	0.3077	1.088	2.44	-1.82

Table 3: Illustrates the bland and altman plotting with limits of agreement of KPS-G



Graph 1: Bland and Altman plotting for KPS-G

The bland and Altman plot indicated that the measure of within subject variation i.e. the bias was very minimal as the mean difference was close to zero (0.307) and the limits of agreements were excellent (-1.82 to 2.44) with minimal outliers.[28]

Face validity-. All patients answered as "Yes", i.e.100%.Content validity: For content equivalence-For content relevance and representativeness,. The answers from expert panel member's fall between "strongly disagree" to "strongly agree". (Average = 5.37)Construct validity: convergent validity was evaluated by a parallel questionnaire Lysholm knee score. Divergent validity was evaluated by the physical and mental component of SF-12 to show that KPS-G concept of measurement is different from SF-12.The Spearman's correlation coefficient was used as the data was not normally distributed. In convergent validity with a parallel questionnaire, the correlation coefficient was found to be 0.927 (Table 4). This indicates very high positive correlation between both the scales. Hence, it is proved that the KPS-G is related to the parallel questionnaire and has good convergent validity. In divergent validity with SF-12, the correlation coefficient was 0.468 with the mental component, which indicates low correlation with KPS-G and 0.504 with the physical component that shows moderate correlation with KPS-G. Hence it is proved that KPS-G is different from SF-12 and it has good divergent validity.

Spearman'scorrelation				
			KPS -G	Lysholm
Spearman's rho	KPS-G	Correlation Coefficient	1.000	0.927
		Sig.(2-tailed)		.00
	Lysholm knee Score	Correlation Coefficient	0.927	1.000
		Sig.(2-tailed)	.00	

Table 4: Spearman's correlation of Lysholm knee score with KPS-G

Spearman's correlation				
			KPS -G	SF-12 MC
Spearman's rho	KPS-G	Correlation Coefficient	1.000	0.468
		Sig.(2-tailed)		.00
	SF-12 MC	Correlation Coefficient	0.468	1.000
		Sig.(2-tailed)	.00	

Table 5: Spearman's correlation of MC of SF-12 with KPS-G

The concurrent validity was checked by comparing with an already established questionnaire for knee i.e. WOMAC. The correlation coefficient was found to be 0.813. This shows that there is high correlation between both the measures.

Spearman's correlation				
			KPS -G	WOMAC
Spearman's rho	KPS-G	Correlation Coefficient	1.000	0.813
		Sig.(2-tailed)		.00
	WOMAC	Correlation Coefficient	0.813	1.000
		Sig.(2-tailed)	.00	

Table 6: spearman's correlation of WOMAC with KPS-G

Exploratory factor analysis was performed to determine the dimensionality of the items of the KPS-G. Kaiser-Meyer-Olkin (KMO) measure of sample adequacy and Barlett's test of Sphericity were applied to test the appropriateness of factor analysis. Principal component analysis with Varimax rotation method was used for extraction. The number of factors loaded was determined based on Eigen value >1 (Kaiser's rule) and scree plot. Items with loading ≥ 0.5 were considered acceptable. [30]The exploratory factor analysis showed that KMO measure of sampling adequacy was 0.846 and Barlett's test of Sphericity was significant ($p < 0.001$). Hence, the data was suitable for factor analysis.

Component	Initial Eigen values		
	Total	% of Variance	Cumulative %
1	7.899	60.761	60.761
2	1.539	11.835	72.596
3	.779	5.990	78.586
4	.698	5.371	83.957
5	.498	3.830	87.787
6	.414	3.183	90.970
7	.316	2.432	93.402
8	.260	2.004	95.406
9	.194	1.489	96.895
10	.142	1.094	97.989
11	.112	.860	98.849
12	.098	.754	99.603
13	.052	.397	100.000

Table 7: Result of Principal Component Analysis by Extraction method

There were two items in the scale which loaded significantly i.e. ≥ 0.5 on both the factors. This included Item 4 (0.523, 0.694) and Item 8 (0.688, 0,558). Item 4 has question related to stairs and Item 8 has question related to prolong knee bending which fits in both, the symptom and functional limitation. This suggests that all items are acceptable for inclusion in the Gujarati version of KPS.

Discussion

The study was conducted among 65 patients with anterior knee pain who were asked to fill the KPS-G, SF-12, Lysholm knee score, WOMAC scales which took about 20-30 minutes. The mean age was 30.8 with deviation of 10.06. There were 39 females and 26 males; which justifies the greater predominance of PFP in females.

Before testing the final version of the KPS-G, after the review provided by the translator, and some of the other members of the expert committee, one item of the KPS was modified and culturally adapted. In item 5 of KPS i.e. "Squatting" was modified to "cross leg sitting". Squatting was interpreted as sitting with knees bent close to the body, similar to "cross leg sitting" as this activity or sitting habit is common in different sections and age groups of the Indian population.The ICC value of KPS-G was 0.997. Hence the KPS-G demonstrated excellent test-retest reliability. This is comparable to findings in similar studies done in other languages; 0.98 by Ummels et al[14]., 0.99 by Edi et al[7]. 0.98 by Apivatgaroon et al[11]who did the Dutch, Indonesian, Thai translation of KPS.

Internal consistency, as measured by Cronbach's alpha value for KPS-G was found to be 0.999. According to George and Mallery (2003), there is excellent internal consistency.[29] Some studies for translation of KPS showed similar internal consistency. It included 0.9 by Apivatgaroon et al.[11], 0.93 by Cerciello et al.[23], 0.94 by Papadopoulos[16] et al. The KPS-G had no ceiling or floor effect that is percentage of extreme score was minimum (1 patient each). The finding was similar to other translated versions of KPS like Thai [11], German [12], Spanish [13], Greek[16], Persian[15], French[20].

The Minimal Detectable Change (MDC) at 95% confidence interval was 5.15 points for KPS-G. Dammerer et al [12], who translated the KPS into German language found the MDC value for it to be 10 points. Convergent construct validity was done with a parallel questionnaire, the Lysholm knee score. The correlation coefficient was found to be 0.927,it is proved that the KPS-G has good convergent validity. Seen in a study by Dammerer et al, who found low correlation between KPS and SF-12, mainly the mental component.[12]Other study by Negahban et al, correlated KPS with long version of SF-12 which is SF-36, and found similar results with mental component.[15]Hence it is proved that KPS-G is different from SF-12 and it has good divergent validity. Concurrent validity was checked by comparing with an already established questionnaire for knee i.e. WOMAC. The correlation coefficient was found to be 0.813. This shows that there is high correlation between both the measures and that KPS-G has good concurrent validity. This demonstrates that KPS-G has good reproducibility, internal consistency, validity. So, it is an appropriate and useful instrument for the evaluation of anterior knee pain in Gujarati speaking patients.The study cannot be generalized to entire Gujarat state as the samples were only from Surat because the Gujarati language has different versions and dialects throughout the state. Studies with larger sample size can be carried out.Validation studies are suggested to investigate psychometric properties of KPS-G based on categories like acute, sub-acute or chronic patellofemoral pain syndrome.

Conclusion

The current study concluded that the Kujala Patellofemoral score (KPS) has been successfully translated and cross-culturally adapted into the Gujarati version (KPS-G) .The results of this study concluded that the Gujarati version of KPS is a reliable and valid scale which demonstrates good psychometric properties.

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