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Translation, Cross-Cultural Adaptation and Psychometric Properties of the Urdu Version of Lysholm Knee Score for Pakistani Population

F. Sharif[1], A. Ahmad[1], S. A. Gilani[2], R. Bacha[3], A. Hanif[4], S. Ahmed[1]

[1] *University Institute of Physical Therapy, The University of Lahore, Lahore, Pakistan*
[2] *Faculty of Allied Health Sciences, The University of Lahore, Lahore, Pakistan*
[3] *University Institute of Radiological Sciences and Medical Imaging Technology, University of Lahore, Lahore, Pakistan*
[4] *University Institute of Public Health, University of Lahore, Lahore, Pakistan*

CORRESPONDING AUTHOR:
Ashfaq Ahmad
University Institute of Physical Therapy
The University of Lahore
1-KM Defence road Off Bhoptian Chowk
Lahore, Pakistan
E-mail: Ashfaq.ahmad@uipt.uol.edu.pk

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SUMMARY

Background. The Lysholm knee score, initially introduced in 1982 and modified in 1985, consists of eight items developed to assess knee function after ligamentous injury. It is widely used tool for measuring patient reported outcomes. However, as the tool evolved in English, makes its use restricted to only English-language populations. The purpose of this study is to translate, culturally adapt and measure the psychometric properties of the Urdu version of Lysholm knee score for Pakistan.

Methods. The Lysholm knee score was translated and culturally adapted into Urdu in accordance with Guillemin's recommendations. A total of 100 participants with patellar tendinopathy were recruited at our hospital. The translation and cross culture adaptation procedure for U-LKS was developed in five steps procedure. Next, Cronbach's alpha, intraclass correlation coefficient (ICC), Pearson's correlation coefficient (r) was calculated to evaluate reliability and validity of U-LKS respectively. The correlations between the Lysholm knee score, Kujala Anterior Knee Pain Scale, and SF-36 was used to evaluate external validity. Floor and ceiling effects were also assessed.

Results. Overall, 100 Patients with patellar tendinopathy successfully completed the Urdu-language Lysholm knee score. Acceptable internal consistency (Cronbach's alpha = 0.769) and excellent test-retest reliability (ICC = 0.823) were calculated for U-LKS. There was strong correlation between Lysholm knee score and Kujala Anterior Knee Pain Scale (r = 0.837), high correlations between Lysholm Urdu version with the physical component domain of SF-36 score (r = 0.523-0.622) and a low association with the SF-36 mental component domain (0.163-0.303).

Conclusions. The Urdu version of the Lysholm knee score is valid and reliable measuring tool and can be used in clinical and research settings for patients with patellar tendinopathy. It is quickly administered and has good psychometric properties.

KEY WORDS

Cross-culture adaptation; Kujala; Lysholm knee score; psychometrics; SF-36; translation; validation.

BACKGROUND

Patellar tendinopathy is most frequent problem suffered by young athletes that give rise to pain and decreased athletic activities (1). These decreased functional capacities can be assessed or quantified using various knee scores or scales, such as the Victorian institute of sport assessment (VISA-P), International Knee Documentation Committee (IKDC) Subjective Knee Form, Tegner Activity Scale (2), Marx Activity Rating Scale (3), Kujala Anterior Knee Pain Scale (4), and Knee Injury and Osteoarthritis Outcome Score (KOOS) (5). These instruments depend on

patients' clinical signs and symptoms, subjective history, or sometimes combinations of both these factors (6). It is important to translate and culturally adapt these instruments before employing in a community, because most of these outcome measuring tools depict the attributes of the language and the social traditions of the population in which they were designed (7).

In orthopedic literature, most of the instruments were designed in English and therefore may represent the culture of Anglo-Saxon from which they originate (8). Majority of these instruments are considered as standards for the global research based community; however, these can only be frequently used if adapted to different languages and cultures by preserving their cultural identity. To avoid the potential confusion during distribution of new questionnaires, a meticulous adaptation process is required and only translation of these instruments is not enough. The availability of culturally equivalent measuring tools allows for multicenter studies to be reliably carried out among different countries. Knee related questionnaire with valid Urdu version in the literature include only the KOOS (9).

The Lysholm knee score questionnaire has been validated for assessment of various knee pathologies (10). The Lysholm knee score shows marked advantages when compared with other validated knee questionnaires. The WOMAC osteoarthritis knee scale and KOOS scale are validated tools for the assessment of patients with osteoarthritis and injuries of the hip and knee joints. Both these questionnaires need adequate time between 5-10 minutes for completion (11). Nonetheless, the Lysholm knee score is more incisive and hence need less time both for completion by the patient and for the health professional to assess. Also, it is not specific to particular disease and therefore can be used for evaluation of various knee pathologies (12).

To our knowledge, only validated Chinese (13), Italian (14), Arabic (10), Dutch (15), Portuguese (16), Greek (17), and German (18) translations of the Lysholm knee score with psychometric properties of different knee disorders have been reported. Therefore, the objectives of our study were to translate and culturally adapt the Lysholm knee score into Urdu version (U-LKS), and to evaluate the psychometric properties of U-LKS in Urdu speaking Pakistani patients with patellar tendinopathy.

MATERIALS AND METHODS

The study was carried out between October 2020 and August 2021 and followed the protocol of Helsinki. The translation of Lysholm knee score into Urdu and cultural adaption was carried out according to stages recommended by Guillemin. The study was divided into two stages: Translation and cross-cultural adaptation and Psychometric testing of Lysholm knee score Urdu version.

Stage I: translation and cross-cultural adaptation process

Step I: forward translation

At least two forward translations of the Lysholm knee score into Urdu by two bilingual translators were constructed. For the intellectual and conceptual translation of Lysholm knee score, two Pakistani individuals (SA, AA) were responsible. One of these was physical therapist (SA) who was informed about our investigation and other a teacher (AA) who was not informed. Both translators are native Urdu speakers and conversant in English.

Step II: synthesis of these translations

Both translations were finalized independently, and then the comparison and review was done by bilingual individual (SS). This review highlighted any conceptual mistakes and discrepancies found in the translations.

Step III: back-translation

After the completion of primary Urdu translation, independent backward translation into English was done by two native English speakers (FA, WA) who were also conversant in Urdu. These translators were blinded about the investigation purpose and had no knowledge about the original Lysholm knee score. The comparison was done between the succeeding versions of the questionnaire and the initial translation.

Step IV: expert committee

The expert committee consisted of four translators (FM, AZ, SF, UA) was formed for the cross-culture equivalence of the translated instrument. This committee evaluated and discussed to solve all the discrepancies, amendments, and issues that appeared in the questionnaire. The important decision of finalizing the translated instrument by the expert committee was done, and all the problems discussed were recorded in written form. The pre-final version of Urdu translation was obtained.

Step V: test of the pre-final version

As a last step, the pre-final version of the U-LKS after the approval from the expert committee was delivered to 20 patients with patellar tendinopathy. The feedbacks by the patients were recorded.

Step VI: documentation submission to the expert Committee for appraisal and final version

All the findings, feedbacks and outcomes were submitted to committee as a final step in the adaptation process. The expert committee has confirmed the implementation of the recommended stages and the final version of U-LKS was obtained.

Stage II: psychometric testing

100 patients (56 male, 44 female patients; mean age 24.3 ± 7.1 years; range 18-45 years) of patellar tendinopathy were recruited in the study. The data was collected from The University of Lahore Teaching Hospital, Department of Physical Terapy after the approval from Institutional review board (IRB) between April 2020 and March 2021.

The inclusion criteria were: 1) 18-45 years; 2) medical diagnosis of patellar tendinopathy; 3) no treatment taken by the patients between the test-retest assessments; and 4) Urdu as their first language and able to read and complete the questionnaire. The participants were excluded if they had: 1) cognitive impairment rendering the form completion; 2) illiteracy or unable to understand Urdu; 3) patients with any serious pathology or systemic disease like carcinomas, serious infections, or inflammatory diseases; and 4) any other disease of nervous or musculoskeletal system other than the knee condition. Two experienced orthopedic specialists clinically examined the patients' knees. For further evaluation, some of the patients had undergone radiography and MRI. Patients independently completed the Urdu version of the Lysholm knee scale, the Kujala Anterior Knee Pain Scale, and SF-36 in a quiet environment. The physical therapist checked any missing responses and asked the patients reasons for skipping the question. The physical therapist noted any difficulty experienced by the patients in understanding the questionnaire and recorded the time required to complete the questionnaires. The time taken to complete the questionnaire was used to measure ease of use. In addition to this, all the problems with comprehension of translated terms as they appeared were also documented. All the participants of the study had thoroughly read and singed the informed consent. This study was approved by Institutional Review Board, The University of Lahore (IRB-UOL-FAHS/694-I/2020).

Questionnaires

The Lysholm knee score is a 100-point scale with eight items that evaluated walking gait, frequency of knee locking, frequency of pain, stair climbing, need for external support, body stability, joint swelling, and squatting ability. A total score of 0-100 was evaluated based on the answers given by the patients depicting knee functional status of the patients. A low and high scores indicate poor, and excellent knee functional status of the patients respectively (19).

The Kujala Anterior Knee Pain Scale developed by Kujala *et al.* consists of 13 questions related to pain and functional ability of the knee joint during different activities. It also ranges from 0-100, with highest scores indicate good functional status and *vice versa* (20).

The SF-36 consists of eight sections used to measure health quality of the patients. This scale depends on patient self-reporting measures to evaluate their physical and mental status. It was initially designed to assess generic health status but also has been used to different disease populations (21). The physical therapist asked the patients to independently complete the listed questionnaires U-LKS, Kujala scale, and SF-36 in a quiet room during their first visit. The demographic details of the participants were also noted. After 3-14 days of the first assessment, same patients were re-tested in the same manner by filling same questionnaires. During this time-period no treatment was given to the patients to reduce any risk of short-term clinical change. The intra-class correlation coefficient (ICC) at 95% confidence interval was evaluated to measure the test-re-test reliability. The Cronbach's alpha was used to assess reliability or internal consistency of U-LKS. The values of > 0.7, > 0.8, > 0.9 are considered as having acceptable, good and excellent reliability respectively.

In this study, validity was evaluated by measuring construct validity, convergent validity, and divergent validity. The construct validity of U-LKS was assessed by measuring its correlation with the Kujala Anterior knee pain scale and the physical components score of SF-36. Convergent validity was assessed by finding out correlation with SF-36 domains of physical functioning, physical role functioning and physical component score. The SF-36 domains of mental health, emotional role functioning, and mental component score were used to evaluate divergent validity. It was believed that there was close correlation between physical domains of SF-36 and disease, or joint-specific questions as compared to the mental domains.

Statistical analysis

The statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS version 24). Data are presented as mean ± standard deviation (SD). Test-retest reliability across repeated measures were taken to measure reliability, an intra-class correlation coefficient (ICC) for internal consistency and measurement error and 95% confidence intervals (CIs). $P < 0.05$. Pearson's correlation coefficient was used to evaluate the construct and convergent and divergent validities (95% CI). A paired t-test was used to find statistically significant differences between the first and repeat assessment. Internal consistency was found by using Cronbach's alpha.

RESULTS

Participants

A total of 100 participants with patellar tendinopathy (56 males, 44 females; mean age 24.3 ± 7.1, range 16-45 years)

participated in the study between April 2020 and March 2021. They all completed the Urdu version of Lysholm knee scale within 3 to 14 days interval with no withdrawn cases. The time required to complete the Lysholm knee scale was 3 minutes. Detailed demographics of participants is given in **table I**.

Translation, cross culture adaptation process, acceptability, and score distribution

Process of forward and backward translations went smoothly. In our formal investigation, all the respondents completed the U-LKS first time without facing any difficulty. So, the response rate was 100% with no missing questions. However, one of the difficulties encountered was understanding the term "instability". Therefore, explanations of difficult words with understandable language were given with the final version of U-LKS questionnaire. "مدغ نزاوت" is the most suitable Urdu word for translating the term "instability," even then some of the patients still find it difficult to understand this term. However, the linguistic committee was unable to find a more appropriate word to replace it. The questionnaire was completed in average 3 mins. Overall, U-LKS had no ceiling effect (1.7 %) or floor effect (0.7 %), but the ceiling effect did exist for items "Locking", "Limp" and "Support" (**table II**).

Table I. Participant's characteristics.

Characteristics	Total sample (N = 100)	Male (n1 = 56)	Female (n2 = 44)	P-value*
Age (years; mean ± SD)	24.3 ± 7.1	24.7 ± 6.8	23.9 ± 7.4	
18-27 years	54 (54%)	24 (42.8%)	22 (50%)	0.535
28-37 years	36 (36%)	20 (35.7%)	14 (31.8%)	
38-45 years	10 (10%)	12 (21.4%)	8 (18.2%)	
Range	18-45	17-37	16-32	
Affected side; numbers (%)				0.740
Right	66 (66%)	43	28	
Left	34 (34%)	13	16	
BMI (Kg/m^2; mean ± SD)	24.3 ± 3.5	23.9 ± 3.2	24.8 ± 3.8	0.141
< 18.5-24.5	73 (73%)	37 (66%)	27 (61.4%)	
25-29.5	21 (21%)	19(34%)	11 (25%)	
> 30	6 (6%)	0 (0.0%)	6 (13.6%)	
Patellar tendinopathy duration (Months; mean ± SD)	5.5 ± 3.4	5.8 ± 3.2	5.1 ± 3.7	0.272
Range	0.5-12	1-12	0.5-11	

BMI: Body mass index; *calculated by Student's t-tests for continuous variables and Chi^2 tests for categorical variables between males and females.

Table II. Score distribution and floor-ceiling effect of U-LKNS.

Item	Mean ± SD	Observed range	Theoretical range	Floor effect (%)*	Ceiling effect (%)*
Pain	11.1 ± 6.9	0-25	0-25	3.9	4.7
Instability	13.8 ± 2.8	0-25	0-25	2.7	3.4
Locking	11.3 ± 4.1	0-15	0-15	3.4	51.9
Stair climbing	5.7 ± 1.4	0-10	0-10	10.2	13.6
Limp	3.4 ± 1.9	0-5	0-5	8.4	27.8
Support	4.2 ± 1.6	0-5	0-5	4.6	71.0
Swelling	6.3 ± 1.7	0-10	0-10	8.3	14.3
Squatting	3.1 ± 1.8	0-5	0-5	8.9	1.7
Overall Lysholm knee scale	64.8 ± 13.1	0-100	0-100	0.7	1.7

*Percentage of patients with the worst (floor effect) and the best (ceiling effect) condition.

Reliability

The Urdu Lysholm knee questionnaire exhibited adequate reliability. The value of Cronbach's alpha of U-LKS was calculated as 0.769, showed acceptable internal consistency. The overall test-retest reliability for each item was "excellent" (ICC = 0.823), and test-retest reliability for each item ranged from acceptable, good to excellent (**table III**). There was no statistical difference between the test-retest means with paired t-test. To calculate the test-retest reliability, all the patients were asked to complete the Lysholm knee questionnaire 3-14 days after the first assessment. During this period no treatment was given to reduce the risk of short-term clinical change.

Validity

The Urdu-language questionnaire showed good to excellent content validity with analysis and evaluation of content by orthopedic and rehabilitation experts and the information gained from the questionnaire was sufficient to evaluate functional status of the patients with patellar tendinopathy. Therefore, it was recommended not to add or delete items. The relevant data for construct validity evaluation is shown in **table IV**. The U-LKS and the Kujala Anterior Knee Pain Scale scores showed correlation coefficient of 0.78, which is considered extremely strong ($p > 0.05$). There was highest correlation among U-LKS, SF-36 physical function, SF-36 role function and SF-36 bodily pain ($r = 0.622$, $r = 0.523$, $r = 0.663$, respectively; $p > 0.05$). Despite that the physical subscales of SF-36 are to evaluate functional status of activity; lowest correlation was recognized between U-LKS and SF-36 role emotion. One possible cause is that SF-36

Table III. Test-retest reliability of U-LKS.

Lysholm Knee Scale	1st-Test (mean ± SD)*	2nd -Test (mean ± SD)*	ICC
Pain (Max. 25 points)	11.1 ± 6.9	11.1 ± 6.7	0.840
Instability (Max. 25 points)	13.8 ± 2.8	12.7 ± 4.3	0.494
Locking (Max. 15 points)	17.2 ± 6.0	19.7 ± 1.9	0.639
Stair climbing (Max. 10 points)	5.7 ± 1.4	5.1 ± 1.7	0.621
Limp (Max. 5 points)	3.4 ± 1.9	3.9 ± 1.9	0.537
Support (Max. 5 points)	4.2 ± 1.6	4.0 ± 1.7	0.655
Swelling (Max. 10 points)	6.3 ± 1.7	6.4 ± 2.5	0.339
Squatting (Max. 5 points)	3.1 ± 1.8	3.8 ± 3.1	0.522
Overall Lysholm knee scale (Max 100 points)	64.8 ± 13.1	67.9 ± 14.7	0.823

ICC: Intraclass correlation coefficient, CI 95 % confidence interval; SD: Standard deviation; *the 1st test was conducted at the beginning of this research, the 2nd test was conducted 1 week later to calculate the test-retest reliability (ICC) of the U-LKS.

Table IV. Construct validity of U-LKS[a].

Scales	Correlation coefficient (r)[b]	P-value
Kujala anterior knee pain scale	0.837	< 0.0001
SF-36		
SF-36 physical function (PF)	0.622	< 0.0001
SF-36 role physical (RP)	0.523	< 0.0001
SF-36 bodily pain (BP)	0.663	< 0.0001
SF-36 general health (GH)	0.471	< 0.0001
SF-36 Vitality (VT)	0.303	0.001
SF-36 Social function (SF)	0.366	< 0.0001
SF-36 Role-emotion (RE)	0.207	0.020
SF-36 Mental health (MH)	0.163	0.068

SF-36 Short-Form 36; [a]the sample size for construct validity was 100; [b]calculated by the Pearson correlation of the Simplified Urdu version of U-LKS with Kujala and SF-36.

is a generic scale and has very low degree of accuracy when evaluating the functional status for certain patients as compared to other specific scales. Similarly, there was weak correlation between U-LKS and SF-36 mental health (r = 0.207 and r = 0.163, respectively or $p > 0.05$). These findings can be expected because the mental state of a patient is affected by various factors in life. There was no floor and ceiling effects found in both assessments for all questionnaires.

DISCUSSION

Different questionnaires measuring function and quality of life in different patients are used in clinical investigations. Researchers compare different questionnaires and evaluate functional status of the patients. Clinical scientific research is rapidly increasing in Pakistan and large number of articles are being published every year. Therefore, effective questionnaires are required to support these rapidly increasing clinical research. The Lysholm knee score is common measuring tool used to evaluate knee function in various knee disorders, and has excellent validity, reliability, and responsiveness (17, 22-26). Hence, it is believed that translation of such scale in a country with large number of knee patients is highly significant, which is also one of the objectives of current study.

The most important outcome of this study is that the Urdu version of the Lysholm knee score showed good reliability, validity, easy to use and good psychometric properties of this scale for patients with patellar tendinopathy in Pakistani population.

Generally, there should be relatively short (3-7days) time interval between test-retest of clinical measuring tool when the condition is supposed to change quickly (27). The literature shows a longer retest interval for Lysholm knee scale than the reported interval. The interval of 3-14 days was selected as of previous studies (14, 24, 28, 29) and hence the limitations related to this selection are accepted.

The test-retest reliability was calculated using ICC with 3 to 14 days interval between each administration of questionnaire. In this study, the ICC calculated 0.823, which shows excellent short-term reliability. This value is like original Lysholm questionnaire and translated versions into other languages (10, 13, 14, 22, 30).

The U-LKS demonstrated acceptable internal consistency (Cronbach alpha = 0.769). These scores are consistent with Cronbach alpha values found in translations of the same questionnaires into other languages (13, 24, 28).

The correlation of U-LKS with Kujala anterior knee pain scale and SF-36 showed good construct validity. The results were in accordance with previous studies (22, 24, 25, 31-33). The correlation between U-LKS and Kujala knee pain scale was strongest (r = 0.837). The physical subscales of SF-36 are to assess the functional level of activity, they did not show strong correlation with U-LKS (r = 0.523-0.622). The possible reason might be the lower value of accuracy of SF-36 when checking the functional status of certain patients, as compared to the other particular scales (34). The mental subscale of SF-36 in particular, showed weak or not at all correlation with U-LKS (r = 0.207-0.303). This finding can be the result of different factors affecting the mental state of patients.

The U-LKS was easily understood by the participants, and it took less than 3 mins to complete it. All the participants fully completed the questionnaire that shows the maximum response rate. Additionally, the floor and ceiling effects shows that the Urdu version of Lysholm knee scale is an appropriate tool for patients with patellar tendinopathy.

Therefore, the present study successfully translated and adapted the Lyhsolm knee scale for patients with patellar tendinopathy and is equivalent to its English version, given its reproducibility, consistency, and validity.

At present, no Urdu version of Lysholm knee score is available and the current study confirms that this scoring system has high test-retest reliability and high correlation with Kujala knee scoring system. In addition, the absence of ceiling and floor effects indicates that this can be used in Pakistani patients with patellar tendinopathy.

Limitations

Some limitations of the present study should be considered. First, a relatively small sample size may not perfectly represent the entire Pakistani knee injury patient population, but the information from 100 patients is adequate to evaluate psychometric properties and is no less than that of similar studies (28, 35). Yet the U-LKS should be applied to large population to find its validity, reliability, and psychometric properties in patients with patellar tendinopathy. Secondly, Urdu language was selected to adapt which does not cover the entire population of Pakistan because multiple minority groups in Pakistan speak own languages which should be noted while applying questionnaires. Additionally, there is lack of standard or ideal interval for reevaluating patients for their health status. The short interval between test-retest has the risk of patients becoming well-acquainted with the questions and answer them relying on their memory of the initial evaluation. Although the long interval can limit this risk, however other factors should be considered to minimize the bias in such investigations. For example, only patients with chronic conditions and long rescanning intervals can

be included in studies because it is unethical to treat an acute condition for longer time duration. Moreover, spontaneous recovery of acute conditions may happen.

CONCLUSIONS

This study has shown that successfully translated U-LKS is reliable and valid tool comparable to available versions in other languages for patients with patellar tendinopathy. The analysis does not indicate major problems with validity and that a confirmatory psychometric validation (using IRT or CFA for ordinal data) in a larger data set could confirm this. This score is good outcome tool for use in Urdu-speaking countries. Therefore, it is suggested to apply translated version U-LKS to assess the knee function and to collect the data for clinicians and researchers.

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None.

DATA AVAILABILITY

The data are contained within the manuscript and the datasets supporting the conclusion of this article are available from the corresponding author upon reasonable request. And the U-LKS is also available from the corresponding author.

CONTRIBUTIONS

FS: revision of the drafting and editing of the manuscript. FS, RB: original idea and protocol, conduction of the study. FS, AA: conceptualization of the work. FS AA, SAG, AH: data analysis. SAG, AH: writing, and drafting/editing of this manuscript. SA: editing of the manuscript.

CONFLICT OF INTERESTS

The authors declare that they have no conflict of interests.

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