Cross-Cultural Adaptation and Psychometric Properties Testing of the Arabic Anterior Knee Pain Scale

Background: PFPS is one of the most frequently occurring overuse injuries affecting the lower limbs. A variety of functional and self-reported outcome measures have been used to assess clinical outcomes of patients with PFPS, however, only the Anterior Knee Pain Scale (AKPS) has been designed for PFPS patients.

Material/Methods: We followed international recommendations to perform a cross-cultural adaptation of the AKPS. The Arabic AKPS and the Arabic RAND 36-item Health Survey were administered to 40 patients who were diagnosed with PFPS. Participants were assessed at baseline and after 2 to 3 days assessed with the Arabic AKPS only. The measurements tested were reliability, validity, and feasibility.

Results: The Arabic AKPS showed high reliability for both temporal stability, internal consistency (Cronbach’s alpha was 0.81 for the first assessment and 0.75 for the second), excellent test-retest reliability (Intraclass Correlation Coefficients ICC=0.96; 95% confidence interval (CI): 0.93, 0.98) and good agreement (standard error of measurement SEM=1.8%). The Arabic AKPS was significantly correlated with physical components of the RAND 36-Item Health Survey (Spearman’s rho=0.69; p<0.001). No ceiling or floor effects were observed.

Conclusions: The Arabic AKPS is a valid and reliable tool and is comparable to the original English version and other translated versions.

MeSH Keywords: Anterior Knee Pain • Arabic Version • Patellofemoral Pain Syndrome • Outcome Measures • RAND 36-Item Health Survey • Scoring of Patellofemoral Disorders

Full-text PDF: http://www.medscimonit.com/abstract/index/idArt/901264
Background

Patellofemoral pain syndrome (PFPS) is one of the most frequently occurring overuse injuries affecting the lower limbs [1] and is especially prevalent in people who are physically active [2,3]. The syndrome is manifested by either retropatellar or peripatellar pain, or both, as a result of activities that involve loading of the lower extremity when an individual walks, runs, jumps, climbs stairs and sits or kneels for a prolonged period [4]. The major symptom of PFPS is pain [5] and it is usually progresses to impairment of function. Based on the fundamental theoretical framework and existing research, number of factors such as weakness of the muscles, structural as well as biochemical alterations of the lower limbs, the way an individual moves and cognitive factors contribute to the development of PFPS [6,7].

There are numerous etiologies responsible for either PFPS, with different patients displaying different underlying pathology [8]. Some individuals can have poor patella tracking due to underlying biomechanical etiology. On the other hand, some individuals can have a normal profile of the femoral or tibial bone and manifest with tibiofemoral-patellofemoral joint anatomical features. Anterior knee pain is linked with patella tracking that occurs laterally in the femoral trochlea [9].

Numerous functional and patient self-reported outcome (PRO) measures had been applied in the assessment of clinical outcomes following patellar dislocation or anterior knee pain [10]. Most of those measurements were initially designed for people with joint disorders that are non-patellofemoral. The Kujala Patellofemoral Disorder Score, also known as AKPS was particularly designed and developed for the assessment of patients having anterior knee pain as well as patellofemoral conditions [11]. This outcome measurement was subsequently demonstrated to be reliable, valid and responsive to patients with anterior knee pain and patellar instability [10,12,13]. Since, direct translation of a questionnaire from one language to another, may not be scientifically sound for clinical and research purposes, the standard AKPS written in English must be validated and adapted for use in an Arabic speaking population. This can be achieved by translating the Patient Report Outcome (PRO) measures in Arabic, then correlating the psychometric properties of the new version against the original version [14]. The standard AKPS is widely used globally, and has shown strong representation of psychometric and normative data patterns seen in English speaking populations [11]. It has been translated to different cultural settings and into many languages, including Turkish [15], Persian [16], Chinese [17], Dutch [18], and Brazilian-Portuguese [19]. Data compiled from questionnaires targeting different cultures are useful in establishing a better understanding of the instrument’s strengths and limitations. The aim of this study was to translate, develop a cross-cultural adaptation, and perform psychometric properties testing of the Arabic version of the Anterior Knee Pain Scale (AKPS) in patients with PFPS.

Material and Methods

Cross-cultural adaptation

The cross-cultural adaptation was conducted in two major stages: translation and cross-cultural adaptation and assessment of psychometric properties. The first stage was performed according to the guidelines published for the translation and cross-cultural adaptations of health-related questionnaires [20,21] and adopted by the American Orthopedic Surgeons Association (AOSA). The second stage employed the use of quality criteria for assessing properties of the questionnaire [22]; this included: (1) translation, (2) synthesis, (3) back-translation, (4) expert committee review, (5) pretesting, and (6) validation.

The initial translation

The initial stage in the process was forward translation of the AKPS. Two independent Arabic speakers who were native and also spoke fluent English translated the AKPS, which was in English, into Arabic. One translator was aware of the questionnaire concept, while the other was not. That strategy utilized version T1 which was the conceptual translation of the outcome being measured and version T2, that was a reflection of the linguistic practice which was not only standard but also without a scholarly influence [20].

The synthesis

The authors of this study and the two translators compared and synthesized versions T1 and T2 of the instrument and then produced Arabic versions of each measurement: the initial draft of the Arabic language version, developed as T12 [20].

Back translation

Two professional translators who spoke both Arabic and English and did not know what the instrument measured translated version T12, the initial translation of the instrument into Arabic, back into English. These back-translations were titled versions B1 and B2, and compared with the initial English versions [20].

Expert committee review

A committee of three rehabilitation specialists who were bilingual in Arabic and English was established. The translators (described previously) assisted the committee members whenever the need arose. Each of the committee members

This work is licensed under Creative Common Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0)
independently evaluated the semantic, idiomatic, experien-
tial and conceptual equivalence of each item on the question-
naire. During that analysis process, the members were given
the original English version of the AKPS scale, the Arabic ver-
sion that was forward translated and the English version that
was back translated. When a nonequivalent item was identi-
fied, the committee reviewed it until a conclusion was made
and the final version of the instrument was adapted for use
in Arabic culture [20].

The pretesting

The adapted Arabic version of the instrument was tested for
cultural equivalence. In that stage, an option labeled “not ap-
pplicable” was included in every item of the Arabic version of
the scale in order to recognize questions that Arabs would not
understand or activities they would not perform often [23]. The
“not applicable” option was used in pretesting and was re-
moved from the final version of the instrument. After the sur-
vey was finalized, 15 patients diagnosed with PFPS who were
receiving physical therapy treatment in Prince Sultan Medical
City completed the questionnaire.

Later, the patients were asked about any difficulties they en-
countered while completing the questionnaire, and patients par-
ticipated in a discussion about items that were “not applicable”
or questions the patients did not answer. To develop the final
Arabic version of AKPS, a 15% upper limit was set for the num-
ber of unanswered questions and “not applicable” items [20].

Validation

The assessment of psychometric properties was based on
the quality criteria used to assess properties of the question-
naire [22]. The details and results of the validation study of the
Arabic version of the AKPS are provided in the next sections.

Patients

Forty volunteers native Arabic speakers with PFPS were recruit-
ed from the Prince Sultan Military Medical City in Riyadh and
the Prince Faisal Bin Fahad Hospital in Riyadh. They completed
both Arabic versions of the AKPS and the RAND 36-Item Health
Survey at baseline and the Arabic AKPS only 48 to 72 hours
later. The mean ±SD age of the participants was 34.7±9.31
years. The majority of participants were males (65%, n=26),
and 67.5% (n=27) reported pain in the right knee (Table 1).

All patients were diagnosed by either general practitioners or
an orthopedist. Inclusion criteria were as follows: age between
18 and 45 years old with untreated PFPS and symptoms for
longer than two months. A range of ages was chosen to avoid
difficulties in differentiating between PFPS, late symptoms of

Table 1. Summary characteristics of the participants.

| Study sample N=40 |
|-------------------|
| Gender*           |
| Male              | 26 (65%)          |
| Female            | 14 (35%)          |
| Age (Years)       | 34.7±9.3          |
| Knee**            |
| Right             | 27 (67.5%)        |
| Left              | 13 (32.5%)        |
| Duration (Months) | 7.9±6.1           |

* Values represented as n (%).  * Bilateral affected sides we ask the patient to complete the questionnaires for more symptomatic side.

apophyseis (Osgood-Schlatter’s disease) and early symptoms
of osteoarthritis. Patients included in the study were experi-
encing anterior or retropatellar pain from at least two of the
following activities: prolonged sitting, stair climbing, squat-
ting, running, kneeling and hopping/jumping, with symptom
onset unrelated to a traumatic incident and experienced pain
on palpation of the patellar facets or a positive physical symp-
toms on Waldron’s test [4,24,25]. We excluded patients with
other knee injuries or pathology, such as knee osteoarthritis/
arthritis, previous knee injury or knee operation, patellar ten-
dinopathy and Osgood-Schlatter’s disease.

Instruments

The AKPS, which is sometimes known as the Kujala Scale [11],
is a self-report questionnaire with 13 items that are knee-specif-
ic. It documents patients’ responses about six activities such as
walking, running, jumping, climbing stairs, squatting, and sitting
for a long period. The AKPS also documents symptoms such as
limping, inability to bear weight in the affected extremity, swell-
ing, abnormal movement of the patellar, muscle atrophy, and
limited flexion of the knees. Based on the patient’s answers, a
score between zero and 100 is given, with the lowest score in-
dicating severe pain or disability. The scoring of the scale is hi-
erarchical, using categories such as “absence of difficulty – not
able” or “absence of pain – presence of severe pain.” Some sec-
tions included scoring the distance that the patient can either
walk or run without pain. The AKPS is easy to understand and
administer and can be completed quickly [26]; the test-retest
reliability is good [11,27]. The authors of the AKPS scale have
demonstrated its validity [11,27] and its sensitivity has been
examined by numerous authors [12,26,28] (Appendixes 1, 2.)

Another scale used in this study was the Arabic RAND 36-Item
Health Survey. The instrument, a multipurpose short survey
with 36 questions, has eight subscales for assessing a person’s physical and mental health. The physical component (PCS) includes: physical functioning, physical role functioning, bodily pain, and general health. The mental component (MCS) includes: vitality, social functioning, emotional role, and mental health. The score of this scale ranges from 0 to 100 (higher scores indicating better health status). It has been validated in Arabic [29] (Appendixes 3, 4).

Procedures

Patients participating in this study signed the consent form and were briefed about the study procedures at every stage. The study was approved by the Institutional Review Board (IRB) of Loma Linda University and the Ethical Committee of the Prince Sultan Military Medical City in Riyadh, Saudi Arabia. The first session involved completing the Arabic version of both the AKPS and the RAND 36-Item Health Survey. In the event that a patient had PFPS on both limbs, the patient completed the questionnaires for the more symptomatic side [12,26]. The Arabic AKPS was given again 48 to 72 hours after the initial session to assess for test-retest reliability [12,30]. This time interval was chosen because it is not long enough for participant’s health status to be altered but long enough for participants to have forgotten the earlier responses of the initial session [12,26]. For convergent validity we hypothesized a strong and moderate correlation between both the Arabic AKPS and the physical components of the RAND 36-Item survey (physical functioning, role-physical, bodily pain, and general health) [22]. To assess divergent validity we hypothesized a weak correlation between both the Arabic AKPS and the mental components of the RAND survey (vitality, social functioning, role-emotion, and mental health) because those measure different constructs. Finally, to assess feasibility, ceiling and floor effects were measured [22]. The questionnaires were considered to have ceiling and floor effects if 15% of participants had the theoretical maximum or minimum total scores [31].

Statistical analyses

Data analysis was conducted using the Statistical Package for the Social Sciences (SPSS). A sample size of 40 patients was required for a power of 80% and an alpha of 0.5 to carry out this study. The two scales used in the study were examined for internal consistency, test-retest reliability, construct validity, and feasibility. Using the Cronbach’s alpha index, we were able to assess the internal consistency of the Arabic AKPS with values of 0.70 to 0.90 considered adequate [22]. For test-retest reliability, interclass correlational coefficient (ICCs) and corresponding 95% confidence intervals (CIs) were calculated. ICCs that were less than 0.40 were considered poor, 0.4 to 0.7 were considered moderate, and 0.7 to 0.9 was considered substantial, while values above 0.9 were regarded as excellent [22].

Agreement was obtained by computing the standard error of measurement (SEM) from baseline assessment data and the assessment taken 48 to 72 hours later and expressed in similar units as the instrument used [12,30]. The SEM as a percentage of the total score provides a relatively good measure of agreement and is considered very good if it is ≤5%; good if it is between >5% and ≤10%, doubtful if it between >10% and ≤20% or negative if >20% [32]. Taking the standard deviation of differences between the scores from the two testing sessions and dividing by the square root of two yielded the SEM [33]. To obtain construct validity, the level of association was calculated using the Spearman’s rho correlation between both the Arabic AKPS and the RAND 36-Item subscales at baseline. Correlation coefficients of ≥0.7 are recommended for same-construct instruments, while moderate correlations of ≥0.4 to ≤0.70 are acceptable [22]. We examined the ceiling and floor effects by calculating the percentage of participants who reached the highest or lowest possible scores in any instrument [22]. Ceiling and floor effects were confirmed to have occurred when more than 15% of all respondents obtained the lowest or highest possible score [22]. The level of significance was set at p≤0.05.

Results

Translations and cross-cultural adaptation

In the process of translating the AKPS into Arabic, we did not find any linguistic, semantic, or cultural differences and any inconsistencies were well illustrated and resolved amicably by the expert committee. During pretests all questions and options on cultural equivalence were well understood and answered satisfactorily by all 15 participants.
Measurements properties testing

All participants completed Arabic versions of both AKPS and the RAND 36-Item Health Survey at baseline and the Arabic AKPS only 48 to 72 hours later. The mean ±SD of total scores on the instruments at baseline and 48 to 72 hours later are provided in Table 2.

Internal consistency

Results showed that the internal consistency of the Arabic version of AKPS, with a Cronbach’s α of 0.81 at baseline and 0.75 after 48 to 72 hours later. Deleting an item from the construct did not significantly change the alpha level. Values ranged from 0.75 to 0.83 when an item was deleted at baseline (Table 3).

Reliability

From test-retest reliability analysis, the Arabic AKPS showed excellent reliability (ICC=0.96; 95% CI: 0.93, 0.98). Also, analysis of individual ICC values ranged between 0.59 and 0.97. The percentage of the SEM to the total score was classified as very good (Table 4).

Construct validity

The Arabic AKPS was significantly correlated with physical components of the RAND 36-Item Health Survey (ρ=0.69, p<0.001) and RAND 36-Item subscales: physical functioning (ρ=0.63), role-physical (ρ=0.57) and bodily pain (ρ=0.49); only the general health subscale was weak (ρ=0.24). For divergent validity, the correlation with mental components of the RAND-36 was not significant (ρ=0.31, p=0.055), showing a non-significant correlation with social functioning subscales (ρ=0.22), role-emotional (ρ=0.34) and mental health (ρ=0.42), and a strong correlation with vitality subscales (ρ=0.53) (Table 5).

Ceiling and floor effects

For this analysis, responses from participants at baseline and at 42 and 72 hours after baseline were used. None of the participants obtained the highest or lowest possible score on the Arabic AKPS; therefore, no ceiling or floor effects were observed at any of the assessment times. Regarding the RAND 36-Item, we observed a ceiling and floor effect in role-physical, while a floor effect only in vitality and role-emotional (Table 6).

Discussion

The purpose of this study was to translate, modify, and adapt the Anterior Knee Pain Scale (AKPS) to suit the Arab population culturally.

Translation process

The study was conducted using a sample of Arab-speaking patients with anterior knee pain. Results of this study showed that the Arabic version of the AKPS exhibited tolerable levels for reliability, validity, and feasibility and could be used as a...
subjective and functional assessment tool for Arab-speaking individuals presenting with AKP or PFPS.

The literature suggests that if possible it is preferable to use a scale developed in another language which had its reliability previously tested than to create a new instrument; in this way, the results can be compared with other studies [20]. Therefore, we chose to perform the cultural adaptation and validation of the Arabic AKPS in patients with patellofemoral pain syndrome (PFPS) in Saudi Arabia instead of creating a new questionnaire. There is consensus in the literature that a direct translation of a questionnaire into another language is not appropriate; for this reason we chose a translation protocol for maximum attainment of semantic, idiomatic, experiential, and conceptual correspondence between the original and the translated questionnaire.

The process of translating and customizing a questionnaire to a different cultural group is not an easy one. It requires time, knowledge, skill and experience [34]. Certain conversational terms, idiomatic expressions, and emotional expressive terms may be challenging to translate. Whereas, reviews of literature and expert opinions are needed while formulating such tools, the importance of focus groups and patient involvement in the process of cultural adaptation of PRO cannot be underestimated [35]. In this study, we followed the guidelines of cross-cultural adaptations reported by Beaton et al. [20], and psychometric properties testing reported by Terwee et al. [22].

### Table 4. Test-Retest of Arabic version of the Anterior Knee Pain Scale (n=40).

| Question | ICC  | Lower 95% CI | Upper 95% CI |
|----------|------|--------------|--------------|
| Q1       | 0.96 | 0.93         | 0.98         |
| Q2       | 0.95 | 0.91         | 0.97         |
| Q3       | 0.60 | 0.36         | 0.77         |
| Q4       | 0.71 | 0.51         | 0.83         |
| Q5       | 0.79 | 0.64         | 0.88         |
| Q6       | 0.86 | 0.75         | 0.92         |
| Q7       | 0.92 | 0.86         | 0.95         |
| Q8       | 0.78 | 0.62         | 0.88         |
| Q9       | 0.62 | 0.39         | 0.78         |
| Q10      | 0.97 | 0.95         | 0.99         |
| Q11      | 0.74 | 0.57         | 0.86         |
| Q12      | 0.85 | 0.73         | 0.92         |
| Q13      | 0.59 | 0.35         | 0.76         |
| Overall AKPS | 0.96 | 0.93 | 0.98 |

AKPS – Anterior Knee Pain Scale; Q – Question; ICC – Intra Class Correlation.

### Table 5. Spearman correlations between the Arabic version of the anterior knee pain scale and the RAND 36-Item subscales (n=40).

| AKPS | RAND 36-Item PCS | RAND 36-Item MCS |
|------|------------------|------------------|
| Physical functioning | 0.63 | 0.83 | 0.36* |
| Role-physical | 0.57 | 0.77 |  |
| Bodily pain | 0.49 | 0.66 | 0.41 |
| General health | 0.24* | 0.53 | 0.27* |
| Vitality | 0.53 | 0.42 | 0.57 |
| Social functioning | 0.22* | 0.57 | 0.52 |
| Role-emotional | 0.34* | 0.45 | 0.54 |
| Mental health | 0.01* | 0.26* | 0.78 |

AKPS – Anterior Knee Pain Scale; RAND 36-Item – RAND 36-Item Health Survey; PCS – Physical Components (physical functioning, role-physical, bodily pain, and general health); MCS – Mental Components (vitality, social functioning, role-emotional, and mental health). * Not significant at an alpha of 0.01 level of significance.
and cross-cultural adaptation of the AKPS was performed in five stages: translation, synthesis, back translation, expert committee review, and pretesting. The role of the expert committee was crucial in the review of all translations, making critical decisions, reaching a consensus on any discrepancy, and putting together the different versions of the questionnaire. The new tool was reviewed and modified at each point by the investigators and subjected to an additional review by the committee members to guarantee the quality of the final translation. The Arabic version did not need major or specific modifications and changes because the signs, symptoms, and activities evaluated by the scale are common in both English and Arabic populations. Even so, it remains challenging to align literal terms with dialectic ones. We observed that in the questions on “Abnormal painful kneecap (patellar) movements, Stairs, and Squatting” were not clear to all participants, so we placed an Arabic slang term (rather than a classical Arabic term) between parentheses to be clearer to participants. After the cross-cultural adaptation phase had been completed, the questionnaire still was not yet ready for use. Further tests should be conducted on the psychometric properties of the adapted questionnaire.

The most important findings of our study was that the Arabic AKPS demonstrated an excellent internal consistency, reliability, and acceptable construct validity; in addition, no ceiling

| Study | Language version | Cronbach’s Alpha Index | Test-retest reliability | Time interval |
|-------|------------------|------------------------|-------------------------|---------------|
| Present study | Arabic | 0.81 | 0.96* | 2–3 days |
| Kujala et al., 1993 | Original Kujala | Not tested | – | – |
| Kuru et al., 2010 | Turkish | 0.84 | 0.94* | 2 weeks |
| Negahban et al., 2012 | Persian | 0.81 | 0.96* | 2–3 days |
| Cheung et al., 2012 | Chinese | 0.81 | 0.96* | 7 days |
| Kievit et al., 2013 | Dutch | 0.81 | Not tested | – |
| da Cunha et al., 2013 | Brazilian-Portuguese | 0.75 | 0.95* | 2–3 days |

* Intraclass Correlation Coefficient (ICC); * Spearman’s correlation (rho).

Table 6. Ceiling and flooring effects of Arabic version of the anterior knee pain scale and rand 36-item subscales (n=40).

| AKPS | Ceiling effect (%) | Flooring effect (%) |
|------|---------------------|---------------------|
| RAND 36-item summary | | |
| Physical | 0 | 0 |
| Mental | 0 | 0 |
| RAND 36-item subscales | | |
| Physical functioning | 0 | 0 |
| Role-physical | 22.5* | 37.5* |
| Bodily pain | 2.5 | 0 |
| General health | 0 | 0 |
| Vitality | 2.5 | 2.5* |
| Social functioning | 25 | 0 |
| Role-emotional | 70 | 10* |
| Mental health | 5 | 0 |

AKPS – Anterior Knee Pain Scale; RAND 36-Item – RAND 36-Item Health Survey. * Ceiling and flooring effects by more than 15% of the participants.
Table 8. Overview of different Spearman rank correlation coefficients of the total score of the AKPS scale and the RAND 36-Item that have been reported in the different language versions of the AKPS.

|                          | This study | Persian (Negahban, et al. 2012) | Chinese (Cheung, et al. 2012) | Dutch (Kievit, et al. 2013) |
|--------------------------|------------|---------------------------------|------------------------------|----------------------------|
| Physical functioning     | 0.63       | 0.51                            | 0.49                         | 0.59                       |
| Role-physical            | 0.57       | 0.44                            | 0.41                         | 0.54                       |
| Bodily pain              | 0.49       | 0.47                            | 0.14                         | 0.22                       |
| General health           | 0.24*      | 0.34                            | 0.44                         | 0.37                       |
| Vitality                 | 0.53       | 0.33                            | 0.29                         | 0.27                       |
| Social functioning       | 0.22*      | 0.37                            | 0.22                         | 0.46                       |
| Role-emotional           | 0.34*      | 0.25                            | 0.13                         | 0.57                       |
| Mental health            | 0.01*      | 0.35                            | 0.16                         | 0.33                       |

AKPS – Anterior Knee Pain Scale; RAND 36-Item – RAND 36-Item Health Survey. * Non-significant at an alpha of 0.05.

or floor effects were observed in patients with anterior knee pain. Furthermore, this is the first study to translate the AKPS to Arabic and validate it for use in patients with anterior knee pain.

Reliability

Similar to other versions, the Arabic AKPS had good internal consistency (α=0.81) [15–19]. Reliability testing is one of the most important of psychometric properties of an outcome measurement [12]. When we examined reliability, we used 48 to 72 hour intervals between the baseline session and the second session to give patients time to forget their initial responses and for symptoms not to vary substantially [12,30]. The Arabic version of the AKPS showed excellent reliability and very good agreement (ICC=0.96, 95% CI=0.93–0.98). These findings are in line with those obtained by studies of other versions of the instrument, Turkish [15], Persian [16], Chinese [17], Brazilian-Portuguese [19] and those conducted by Bennell et al. (ICC=0.96) [26], Crossley et al. [28], and Watson et al. (ICC=0.95) [12]. The original Kujala scale and Dutch version did not examine test-retest reliability. The variation in reliability observed among different studies may be due to length of time intervals, population differences, and the type of statistical approach used. The agreement assessed by the percentage of the SEM in relation to the total score range was rated as very good and was in agreement with findings from previous studies that used the AKPS [19,26,28] (Table 7).

Validity

To verify the validity of the AKPS, we studied the content and construct validity: construct validity was examined by convergent and divergent validity, and content validity by ceiling and floor effects. We found a good correlation between Arabic AKPS and PCS of the RAND-36 Item subscales: physical functioning, role-physical, and bodily pain. A poor correlation was found with the general health subscale. Divergent validity was expected and observed with the MCS of the RAND-36. These findings support our hypothesis that the AKPS and the PCS measure the same construct, while the AKPS and the MCS measure a different construct [22]. In this study, the correlation between the Arabic AKPS and the RAND-36 subscales of physical functioning, role-physical, and bodily pain were higher than that of the Persian [16], Chinese [17], and Dutch [18] versions. The correlation between the AKPS and the mental components of the RAND-36 were similar to the results found in other translated versions [16] (Table 8).

Feasibility

In this study, no ceiling and floor effect was seen for the Arabic version of the AKPS; therefore, the Arabic AKPS has the ability to distinguish between different patients based on their signs and symptoms. This parameter supports the reliability and responsiveness of the scale [22] and is comparable to other translated versions [15,17–19].

Findings from this study provide clinicians and researchers with evidence backing the use of an AKPS tool on Arabic speaking patients with PFPS by Arabic researchers in everyday clinical settings [36]. Having reliable and standardized instruments can improve the quality of research findings and enhance the value of scientific evidence since findings can be reported in a more unified way. This allows standardized comparison of findings through systematic reviews and meta-analysis [37]. In addition, this standardized instrument enhances the quality of pooled data from various parts of the world with dissimilar cultures. Our study was concluded with recommendations for future study. Due to time restraints we did not conduct an analysis of the responsiveness of the AKPS, which is defined as the ability of an instrument to detect important clinical changes through time [38]. Therefore, we feel that the measurement properties of the AKPS...
are similar to the original version and the majority of the different versions available in the literature. We understand that evaluating a cross-culturally adapted instrument is an ongoing procedure, and believe that the present study laid the cornerstone for that process. Based on this assumption, we suggest further studies on the AKPS with the purpose of increasing its coverage and evaluating measurement properties yet unknown.

**Conclusions**

From our findings, the Arabic AKPS is sufficiently reliable, valid, and appropriate for use as a patient reported outcome measure for Arabic speaking individuals with anterior knee pain and PFPS. It is also the first validated knee outcome measure in Arabic to assess knee pathology.

**Statement**

The study protocol was approved by IRB of Loma Linda University (# 5140007), Loma Linda, California, United States and the Ethical Committee of Prince Sultan Military Medical City, Riyadh, Kingdom of Saudi Arabia.

**Acknowledgment**

The authors thank Dr. Abdulrahman Alasmari at Prince Sultan Military Medical Hospital for supporting this research.

**Appendixes**

**APPENDIX 1**

ANTEROIOR KNEE PAIN (English Version)

ANTEROIOR KNEE PAIN (Sheet code: __________________)

Name: ______________________________________ Date: __________________

Age: __________

Knee: L/R

Duration of symptoms: _____ years _____ months

For each question, circle the latest choice (letter), which corresponds to your knee symptoms.

1. **Limp**
   (a) None (5)
   (b) Slight or periodical (3)
   (c) Constant (0)

2. **Support**
   (a) Full support without pain (5)
   (b) Painful (3)
   (c) Weight bearing impossible (0)

3. **Walking**
   (a) Unlimited (5)
   (b) More than 2 km (3)
   (c) 1-2 km (2)
   (d) Unable (0)

4. **Stairs**
   (a) No difficulty (10)
   (b) Slight pain when descending (8)
   (c) Pain both when descending and ascending (5)
   (d) Unable (0)

5. **Squatting**
   (a) No difficulty (5)
   (b) Repeated squatting painful (4)
   (c) Painful each time (3)
   (d) Possible with partial weight bearing (2)
   (e) Unable (0)

6. **Running**
   (a) No difficulty (10)
   (b) Pain after more than 2 km (8)
   (c) Slight pain from start (6)
   (d) Severe pain (3)
   (e) Unable (0)

7. **Jumping**
   (a) No difficulty (10)
   (b) Slight difficulty (7)
   (c) Constant pain (2)
   (d) Unable (0)
8. Prolonged sitting with the knees flexed
(a) No difficulty (10)
(b) Pain after exercise (8)
(c) Constant pain (6)
(d) Pain forces to extend knees temporarily (4)
(e) Unable (0)

9. Pain
(a) None (10)
(b) Slight and occasional (8)
(c) Interferes with sleep (6)
(d) Occasionally severe (3)
(e) Constant and severe (0)

10. Swelling
(a) None (10)
(b) After severe exertion (8)
(c) After daily activities (6)
(d) Every evening (4)
(e) Constant (0)

11. Abnormal painful kneecap (patellar) movements (subluxations)
(a) None (10)
(b) Occasionally in sports activities (6)
(c) Occasionally in daily activities (4)
(d) At least one documented dislocation (2)
(e) More than two dislocations (0)

12. Atrophy of thigh
(a) None (5)
(b) Slight (3)
(c) Severe (0)

13. Flexion deficiency
(a) None (5)
(b) Slight (3)
(c) Severe (0)
APPENDIX 2

ANTERIOR KNEE PAIN (Arabic Version)
| رقم | محتوى |
|-----|--------|
| 11  | حركات غير طبيعية وإجهاد لرضفة الركبة (صابون) |
| 12  | ضمور للفخذ (حجم الفخذ) |
| 13  | مدة تأثر درجة القيثة في الركبة المصابة |
| 14  | تحت في وضع مريح أو مريح |
| 15  | تحت في وضع مريح أو مريح |
| 16  | تحت في وضع مريح أو مريح |
| 17  | تحت في وضع مريح أو مريح |
| 18  | تحت في وضع مريح أو مريح |
| 19  | تحت في وضع مريح أو مريح |
| 20  | تحت في وضع مريح أو مريح |
| 21  | تحت في وضع مريح أو مريح |
| 22  | تحت في وضع مريح أو مريح |
| 23  | تحت في وضع مريح أو مريح |
| 24  | تحت في وضع مريح أو مريح |
| 25  | تحت في وضع مريح أو مريح |
| 26  | تحت في وضع مريح أو مريح |
| 27  | تحت في وضع مريح أو مريح |
| 28  | تحت في وضع مريح أو مريح |
| 29  | تحت في وضع مريح أو مريح |
| 30  | تحت في وضع مريح أو مريح |
| 31  | تحت في وضع مريح أو مريح |
| 32  | تحت في وضع مريح أو مريح |
| 33  | تحت في وضع مريح أو مريح |
| 34  | تحت في وضع مريح أو مريح |
| 35  | تحت في وضع مريح أو مريح |
| 36  | تحت في وضع مريح أو مريح |
| 37  | تحت في وضع مريح أو مريح |
| 38  | تحت في وضع مريح أو مريح |
| 39  | تحت في وضع مريح أو مريح |
| 40  | تحت في وضع مريح أو مريح |
| 41  | تحت في وضع مريح أو مريح |
| 42  | تحت في وضع مريح أو مريح |
| 43  | تحت في وضع مريح أو مريح |
| 44  | تحت في وضع مريح أو مريح |
| 45  | تحت في وضع مريح أو مريح |
| 46  | تحت في وضع مريح أو مريح |
| 47  | تحت في وضع مريح أو مريح |
| 48  | تحت في وضع مريح أو مريح |
| 49  | تحت في وضع مريح أو مريح |
| 50  | تحت في وضع مريح أو مريح |
| 51  | تحت في وضع مريح أو مريح |
| 52  | تحت في وضع مريح أو مريح |
| 53  | تحت في وضع مريح أو مريح |
| 54  | تحت في وضع مريح أو مريح |
| 55  | تحت في وضع مريح أو مريح |
| 56  | تحت في وضع مريح أو مريح |
| 57  | تحت في وضع مريح أو مريح |
| 58  | تحت في وضع مريح أو مريح |
| 59  | تحت في وضع مريح أو مريح |
| 60  | تحت في وضع مريح أو مريح |
| 61  | تحت في وضع مريح أو مريح |
| 62  | تحت في وضع مريح أو مريح |
| 63  | تحت في وضع مريح أو مريح |
| 64  | تحت في وضع مريح أو مريح |
| 65  | تحت في وضع مريح أو مريح |
| 66  | تحت في وضع مريح أو مريح |
| 67  | تحت في وضع مريح أو مريح |
| 68  | تحت في وضع مريح أو مريح |
| 69  | تحت في وضع مريح أو مريح |
| 70  | تحت في وضع مريح أو مريح |
| 71  | تحت في وضع مريح أو مريح |
| 72  | تحت في وضع مريح أو مريح |
| 73  | تحت في وضع مريح أو مريح |
| 74  | تحت في وضع مريح أو مريح |
| 75  | تحت في وضع مريح أو مريح |
| 76  | تحت في وضع مريح أو مريح |
| 77  | تحت في وضع مريح أو مريح |
| 78  | تحت في وضع مريح أو مريح |
| 79  | تحت في وضع مريح أو مريح |
| 80  | تحت في وضع مريح أو مريح |
| 81  | تحت في وضع مريح أو مريح |
| 82  | تحت في وضع مريح أو مريح |
| 83  | تحت في وضع مريح أو مريح |
| 84  | تحت في وضع مريح أو مريح |
| 85  | تحت في وضع مريح أو مريح |
| 86  | تحت في وضع مريح أو مريح |
| 87  | تحت في وضع مريح أو مريح |
| 88  | تحت في وضع مريح أو مريح |
| 89  | تحت في وضع مريح أو مريح |
| 90  | تحت في وضع مريح أو مريح |
| 91  | تحت في وضع مريح أو مريح |
| 92  | تحت في وضع مريح أو مريح |
| 93  | تحت في وضع مريح أو مريح |
| 94  | تحت في وضع مريح أو مريح |
| 95  | تحت في وضع مريح أو مريح |
| 96  | تحت في وضع مريح أو مريح |
| 97  | تحت في وضع مريح أو مريح |
| 98  | تحت في وضع مريح أو مريح |
| 99  | تحت في وضع مريح أو مريح |
| 100 | تحت في وضع مريح أو مريح |

المراجعات:

1. Alshehri A.S. et al. "Cross-cultural adaptation and psychometric properties testing…\" © Med Sci Monit, 2017; 23: 1559-1582

الحالة: CLINICAL RESEARCH

الرقم: 1570

ال版权声明: This work is licensed under Creative Common Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0)
APPENDIX 3

RAND 36-Item Health Survey (English Version)

Instructions for completing the questionnaire: Please answer every question. Some questions may look like others, but each one is different. Please take the time to read and answer each question carefully by filling in the bubble that best represents your response.

Patient Name: ___________________________________________________________

Date: _______________________________________

1. In general, would you say your health is:
   o Excellent
   o Very good
   o Good
   o Fair
   o Poor

2. Compared to one year ago, how would you rate your health in general now?
   o Much better now than a year ago
   o Somewhat better now than a year ago
   o About the same as one year ago
   o Somewhat worse now than one year ago
   o Much worse now than one year ago

3. The following items are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?
   a. Vigorous activities, such as running, lifting heavy objects, participating in strenuous sports.
      o Yes, limited a lot.
      o Yes, limited a little.
      o No, not limited at all.

   b. Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf?
      o Yes, limited a lot.
      o Yes, limited a little.
      o No, not limited at all.

   c. Lifting or carrying groceries.
      o Yes, limited a lot.
      o Yes, limited a little.
      o No, not limited at all.

   d. Climbing several flights of stairs.
      o Yes, limited a lot.
      o Yes, limited a little.

   e. Climbing one flight of stairs.
      o Yes, limited a lot.
      o Yes, limited a little.
      o No, not limited at all.

   f. Bending, kneeling or stooping.
      o Yes, limited a lot.
      o Yes, limited a little.
      o No, not limited at all.

   g. Walking more than one mile.
      o Yes, limited a lot.
      o Yes, limited a little.
      o No, not limited at all.

   h. Walking several blocks.
      o Yes, limited a lot.
      o Yes, limited a little.
      o No, not limited at all.

   i. Walking one block.
      o Yes, limited a lot.
      o Yes, limited a little.
      o No, not limited at all.

   j. Bathing or dressing yourself.
      o Yes, limited a lot.
      o Yes, limited a little.
      o No, not limited at all.
4. During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of your physical health?
   a. Cut down the amount of time you spent on work or other activities?
      o Yes
      o No
   b. Accomplished less than you would like?
      o Yes
      o No
   c. Were limited in the kind of work or other activities?
      o Yes
      o No
   d. Had difficulty performing the work or other activities (for example, it took extra time)
      o Yes
      o No

5. During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?
   a. Cut down the amount of time you spent on work or other activities?
      o Yes
      o No
   b. Accomplished less than you would like?
      o Yes
      o No
   c. Didn’t do work or other activities as carefully as usual?
      o Yes
      o No

6. During the past 4 weeks, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?
   o Not at all
   o Slightly
   o Moderately
   o Quite a bit
   o Extremely

7. How much bodily pain have you had during the past 4 weeks?
   o Not at all
   o Slightly
   o Moderately
   o Quite a bit
   o Extremely

8. During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?
   o Not at all
   o Slightly
   o Moderately
   o Quite a bit
   o Extremely

9. These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during the past 4 weeks.
   a. Did you feel full of pep?
      o All of the time
      o Most of the time
      o A good bit of the time
      o Some of the time
      o A little of the time
      o None of the time
   b. Have you been a very nervous person?
      o All of the time
      o Most of the time
      o A good bit of the time
      o Some of the time
      o A little of the time
      o None of the time
   c. Have you felt so down in the dumps nothing could cheer you up?
      o All of the time
      o Most of the time
      o A good bit of the time
      o Some of the time
      o A little of the time
      o None of the time
   d. Have you felt calm and peaceful?
      o All of the time
      o Most of the time
      o A good bit of the time
      o Some of the time
10. During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting friends, relatives, etc.)?
- All of the time
- Most of the time
- Some of the time
- A little of the time
- None of the time

11. How TRUE or FALSE is each of the following statements for you?

a. I seem to get sick a little easier than other people
- Definitely true
- Mostly true
- Don’t know
- Mostly false
- Definitely false

b. I am as healthy as anybody I know
- Definitely true
- Mostly true
- Don’t know
- Mostly false
- Definitely false

c. I expect my health to get worse
- Definitely true
- Mostly true
- Don’t know
- Mostly false
- Definitely false

d. My health is excellent
- Definitely true
- Mostly true
- Don’t know
- Mostly false
- Definitely false
APPENDIX 4

RAND 36-Item Health Survey (Arabic Version)

chi نايبتسا

1. What is your name?
2. Gender: Male, Female
3. Age
4. Occupation: Urban, Rural
5. Education: Literate, Illiterate
6. Income: Low, High
7. Doctor's name

From the list below, select the option closest to your condition. In case of uncertainty, please choose the option that is closest to your condition. Circle the correct answer to the question.

1) General health status, how healthy are you?
2) Overall health status (8) After the health check-up

This work is licensed under Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0)
2) مقارنة بعلامه صحيه، كيف تقدم حالةك الصحية الآن بصورة عامة؟

أفضل إجابة واحدة وضع علامة (✔) أمام الإجابة المناسبة:

- ممتازة
- جيد جداً
- جيدة
- لا بأس بها
- سلبة
| لا تعني | نعم تعني كثيراً | نعم تعني قليلاً | لا تعني |
|--------|----------------|---------------|--------|
| ☐      | ☐              | ☐             | ☐      |
| ☐      | ☐              | ☐             | ☐      |
| ☐      | ☐              | ☐             | ☐      |
| ☐      | ☐              | ☐             | ☐      |
| ☐      | ☐              | ☐             | ☐      |
| ☐      | ☐              | ☐             | ☐      |
| ☐      | ☐              | ☐             | ☐      |
| ☐      | ☐              | ☐             | ☐      |
| ☐      | ☐              | ☐             | ☐      |

الإجابة correct إجابة واحدة وضع علامة (✓) تحت الإجابة المناسبة.

- تتعلق البنود التالية بعملية يمكن أن تقوم بها خلال يومك العادي، في الوقت الحالي، إلى أي مدى تقوىك حالتك الصحية:

3) من ممارسة الأنشطة التافية مثل: الجري، حمل الأثاث، تنقية أو مزاحنة الأنشطة الرياضية المجهدة جداً؟

4) من ممارسة الأنشطة متوسطة الجهد، كجري الطاولة أو التنظيف باستخدام المكسة الكهربائية أو تنظيف حديثة المنزل والخانة بها؟

5) من حمل المتطرقات من البقالة أو السوق المركزى (السوبر ماركت)؟

6) من صعود الدرج عدة نواب؟

7) من صعود الدرج لدورة واحد فقط؟

8) من الأثاث أو الركوع أو السجد؟

9) من المشي لأكثر من كيلومتر ونصف؟

10) من المشي لمسافة ترفع كيلومتر؟

11) من المشي لمسافة متر؟

12) من الاستحمام أو أرتفاع الملابس بنفسك؟
### الصحة الجسمية

(اختُر إجابة واحدة وضع علامة (√) تحت الإجابة المناسبة)

|   |   |
|---|---|
| لا |   |
|   | √ |
|   |   |
|   |   |
|   |   |
|   |   |

13. التقليل من الوقت الذي تقضيه في العمل أو أي أنشطة أخرى؟
14. التقليل مما تؤدّي إليه من العمل أو أي أنشطة أخرى؟
15. تقليلك في أداء نوع معين من الأعمال أو أي أنشطة أخرى؟
16. أنك بصحة في كافية العامل أو أي أنشطة أخرى؟

(على سبيل المثال، احتاجت إلى جهد إضافي كافي لتحديتها.)

### الصحة النفسية

(اختُر إجابة واحدة وضع علامة (√) تحت الإجابة المناسبة)

|   |   |
|---|---|
| لا |   |
|   | √ |
|   |   |
|   |   |
|   |   |
|   |   |

17. التقليل من الوقت الذي تقضيه في العمل أو أي أنشطة أخرى؟
18. التقليل مما تؤدّي إليه من العمل أو أي أنشطة أخرى؟
19. عدم انجاز العمل أو أي أنشطة أخرى بالحرص المعتاد؟
الصحة الجسدية أو النفسية

(اختصار ووضع علاماتٍ مقابل الإجابة الصحيحة)

- لم يكن هناك تعارض إطلاقاً
- كان هناك تعارض قليلاً
- كان هناك تعارض متوسط
- كان هناك تعارض كبير
- كان هناك تعارض كبير جداً
الآلام المزمنة:

1) ما شدة الألم الجسمى الذي عانيت منه خلال الأسابيع الأربعة الماضية؟

| علامه | شدة الألم |
|-------|----------|
|       | لا         |
|       | باهظة     |
|       | خفيف جداً |
|       | شديد     |
|       | شديد جداً |

2) خلال الأسابيع الأربعة الماضية، إلى أي مدى أدى الألم الجسمى إلى التمرين مع تأثيرك لأعمالك المعقدة (سواء داخل المنزل أو خارجه):

| علامه | التمرين |
|-------|----------|
|       | لا         |
|       | باهظة     |
|       | خفيف جداً |
|       | شديد     |
|       | شديد جداً |

© Med Sci Monit, 2017; 23: 1559-1582

CLINICAL RESEARCH

This work is licensed under Creative Common Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0)
الأسئلة التالية تتعلق بكيفية تصرفك وطبيعة سير الأمور عليك خلال الأسابيع الأسبوعية الماضية، الرجاء إعطاء إجابة واحدة لكل سؤال بحيث تكون الإجابة هي الأقرب إلى الحالة التي كنت تشعر بها خلال الأسابيع الأسبوعية الماضية.

| لم أشعر في أي وقت من الأوقات | لم أشعر في أقل من بعض الأوقات | لم أشعر في بعض الأوقات | لم أشعر في أكثر من الأوقات | فكرت في كل الأوقات |
|--------------------------------|--------------------------------|--------------------------|-----------------------------|---------------------|
| 23: شعرت بقلق ملائم بالحيوية والنشاط؟ |
| 24: كنت شخصاً عصبياً جداً؟ |
| 25: شعرت بقلق في حالة اكتئاب إلى درجة لا يمكن معها إدخال السرور إلا؟ |
| 26: شعرت بالدهون والطمثنة؟ |
| 27: كانت لديك طاقة كبيرة؟ |
| 28: شعرت بالإحباط والًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًًّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّّ̀°
22) خلال الأسابيع الأربعة الماضية، ما مقدار الوقت الذي تعارضت فيه صحتك الجسمية أو مشاكلك النفسية مع نشاطك الاجتماعي (مثل زيارة الأصدقاء والأقارب وغير ذلك)?

أختار إجابة واحدة وضمن علامة (✓) تحت الإجابة المناسبة.

- كان التعرض في كل الأوقات
- كان التعرض في معظم الأوقات
- كان التعرض في بعض الأوقات
- كان التعرض في قليل من الأوقات
- لم يكن هناك تعارض في أي وقت من الأوقات

ما مدى صحة أو خطأ كل من العبارات بالنسبة إلى حالتك الصحية؟

| خطا ولا يحققه دكتور الفحص | خطا بالفعل وحققه دكتور الفحص | لا أعلم | صحيحة غاليًا | صحيحة بالإمكان
|--------------------------|-----------------------------|-------|--------------|---------------|
| ✓                        | ✓                           | ✓     | ✓            |              |

33) يبدو أن أصبع المريض فشل من الآخرين.
34) حالة الصحة مساوية لأي شخص أعرفه.
35) أتوقع أن تسوء حالةي الصحية.
36) حالةي الصحية ممتازة.
References:

1. Thijs Y, Van Tiggelen D, Roosen P et al: A prospective study on gait-related intrinsic risk factors for patellofemoral pain. Clin J Sport Med, 2007; 17(6): 437–45

2. Osteras B, Osteras H, Torsensen TA: Long-term effects of medical exercise therapy in patients with patellofemoral pain syndrome: Results from a single-blinded randomized controlled trial with 12 months follow-up. Physiotherapy, 2013; 99(4): 311–16

3. McCarthy MM, Strickland AM: Patellofemoral pain: An update on diagnosis and treatment options. Curr Rev Musculoskelet Med, 2013; 6(2): 188–94

4. Cook C, Hegedus E, Hawkins R et al: Diagnostic accuracy and association to disability of clinical test findings associated with patellofemoral pain syndrome. Physiother Can, 2010; 62(1): 17–24

5. Farrokhi S, Kekai JH, Powers CM: Individuals with patellofemoral pain exhibit greater patellofemoral joint stress: A finite element analysis study. Osteoarthritis Cartilage, 2011; 19(3): 287–94

6. McConnell J: The physical therapist's approach to patellofemoral disorders. Clin Sports Med, 2002; 21(3): 363–87

7. Dutton RA, Khadavi MJ, Fredericson M: Patellofemoral pain. Phys Med Rehabil Clin N Am, 2016; 27(1): 31–52

8. Smith TO, McMamara I, Donell ST: The contemporary management of anterior knee pain and patellofemoral instability. Knee, 2013; 20: 53–15

9. Harman M, Dogan A, Arslan H et al: Evaluation of the patellofemoral joint with kinematic MR fluoroscopy. Clin Imaging, 2002; 26(2): 136–39

10. Wang D, Jones MH, Khair MM, Miniaci A: Patient-reported outcome measures for the knee. J Knee Surg, 2010; 23(3): 137–51

11. Kujala UM, Jaakolah KU, Koskinnen SK et al: Scoring of patellofemoral disorders. Arthroscopy, 1993; 9(2): 159–63

12. Watson CJ, Propps M, Ratner J et al: Reliability and responsiveness of the lower extremity functional scale and the anterior knee pain scale in patients with anterior knee pain. J Orthop Sports Phys Ther, 2005; 35(3): 136–46

13. Paxton EW, Fisher DC, Stone MS, Silva P: The reliability and validity of knee-specific and general health instruments in assessing acute patellar dislocation outcomes. Am J Sports Med, 2003; 31(4): 487–92

14. Celik D, Coskunsu D, Kilicoglu O et al: Translation and cross-cultural adaptation of the international knee documentation committee subjective knee outcome in Turkish. J Orthoped Sports Phys Ther, 2014; 44(11): 899–909

15. Kuro T, Dereli EE, Yaliman A: Validity of the Turkish version of the Kujala patellofemoral score in patellofemoral pain syndrome. Acta Orthop Traumatol Turc, 2010; 44(2): 152–56

16. Negahban H, Pourteaza M, Yazdi MJ et al: Persian translation and validation of the Kujala Patellofemoral Scale in patients with patellofemoral pain syndrome. Disabil Rehabil, 2012; 34(26): 2259–63

17. Cheung RT, Ngai SP, Lam PL et al: Chinese translation and validation of the Kujala scale for patients with patellofemoral pain. Disabil Rehabil, 2012; 34(6): 510–13

18. Kievet AJ, Breugem SI, Siererellt IN et al: Dutch translation of the Kujala Anterior Knee Pain Scale and validation in patients after knee arthroplasty. Knee Surg Sports Traumatol Arthrosc, 2013; 21(11): 2647–53

19. da Cunha RA, Costa LO, Hespanhol Junior LC et al: Translation, cross-cultural adaptation, and clinimetric testing of instruments used to assess patients with patellofemoral pain syndrome in the Brazilian population. J Orthop Sports Phys Ther, 2013; 43(5): 332–39

20. Beaton DE, Bombardier C, Guillemin F, Bosch Ferraz M: Guidelines for the Process of Cross-Cultural Adaptation of Self-Report Measures. 2000

21. Guillemin F, Bombardier C, Beaton D: Cross-cultural adaptation of health-related quality of life measures: literature review and proposed guidelines. J Clin Epidemiol, 1993; 46(12): 1417–22

22. Terwee CB, Bot SD, de Boer MR et al: Quality criteria were proposed for measurement properties of health status questionnaires. J Clin Epidemiol, 2007; 60(1): 34–42

23. Heintjes E, Berger MY, Bierna-Zeinha SM et al: Exercise therapy for patellofemoral pain syndrome. Cochrane Database Syst Rev, 2003; (4): CD003472

24. Nunes GS, Stapat IL, Kirsten MH et al: Clinical test for diagnosis of patellofemoral pain syndrome. Systematic review with meta-analysis. Phys Ther Sport, 2013; 14(1): 54–59

25. Cook C, Mabry L, Reiman MP, Hegedus EJ: Best tests: clinical findings for screening and diagnosis of patellofemoral pain syndrome: A systematic review. Physiother Rev, 2012; 9(2): 93–100

26. Bennell K, Bartam S, Crossley K, Green S: Outcomes measures in patellofemoral pain syndrome: Test-retest reliability and inter-relationship. Phys Ther Sport, 2000; 1: 32–43

27. Timm KE: Randomized controlled trial of Prototnics on patellar pain, position, and function. Med Sci Sports Exerc, 1998; 30(5): 665–70

28. Crossley KM, Bennell KL, Cowan SM, Green S: Analysis of outcome measures for persons with patellofemoral pain: Which are reliable and valid? Arch Phys Med Rehabil, 2004; 85(5): 815–22

29. Al Abdulmohsen SA, Draugals JLR, Hays RD: Translation of the RAND 36-ITEM Health Survey 1.0 (Aka SF-36) into Arabic. 1997

30. Binkley JM, Stratford PW, Lott SA, Riddle DL: The Lower Extremity Functional Scale (LEFS): Scale development, measurement properties, and clinical application. North American Orthopaedic Rehabilitation Research Network. Phys Ther, 1999; 79(4): 371–83

31. Denegar CR, Vela LJ, Evans TA: Evidence-based sports medicine: outcomes instruments for active populations. Clin Sports Med, 2008; 27(3): 339–51, vii

32. Ostelo RW, de Vet HC, Knol DL, van den Brandt PA: 24-item Roland-Morris Disability Questionnaire was preferred out of six functional status questionnaires for post-lumbar disc surgery. J Clin Epidemiol, 2004; 57(3): 268–76

33. de Vet HC, Terwee CB, Knol DL, Bouter LM: When to use agreement versus reliability measures. J Clin Epidemiol, 2006; 59(10): 1033–39

34. Brilson R LW, Thomdike R: Questionnaire wording and translation. In: Cross-cultural research methods. New York: Wiley, 1973

35. Breugelmans R: Dangers in using translated medical questionnaires: the importance of conceptual equivalence across languages and cultures in patient-reported outcome measures. Chest, 2009; 136(4): 1175–77

36. Bent NP, Wright CC, Rushton AB, Batt ME: Selecting outcome measures in sports medicine: A guide for practitioners using the example of anterior cruciate ligament rehabilitation. Br J Sports Med, 2009; 43(13): 1006–12

37. Reider B: Toward a common language. Am J Sports Med, 2008; 36(7): 1261–62

38. Mokkink LB, Terwee CB, Patrick DL et al: The COSMIN study reached international consensus on taxonomy, terminology, and definitions of measurement properties for health-related patient-reported outcomes. J Clin Epidemiol, 2010; 63(7): 737–45

Indexed in: [Current Contents/Clinical Medicine] [SCI Expanded] [ISI Alerting System] [ISI Journals Master List] [Index Medicus/MEDLINE] [EMBASE/Excerpta Medica] [Chemical Abstracts/CAS] [Index Copernicus] © Med Sci Monit, 2017; 23: 1559-1582