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Reliability of the Malay Version of the KOOS Patellofemoral Pain and Subscale (KOOS-PF)

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Abstract

Introduction: The Knee Orthopaedic Outcome Score- Patellofemoral (KOOS-PF) has been established as a reliable and valid instrument for evaluating individuals suffering from patellofemoral discomfort. However, a Malay version of KOOS-PF is unavailable. **Significant:** To assess the reliability of the KOOS-PF Malay version. **Methods:** The English KOOS-PF was translated into Malay utilising a forward and backward translation technique. **Findings:** The Cronbach's alpha value is 0.917, indicating highly reliable tools for Malaysians with PFPS. **Conclusion:** The KOOS-PF Malay questionnaire was reliable, dependable, and simple for assessing stiffness, pain, and quality of life in Malaysia.

Keywords: Knee Orthopedic Outcome Score- Patellofemoral; Patellofemoral pain; Patient-reported outcome measures; Reliability test of Malay version

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1.0 Introduction

Clinical outcome research evaluates the benefits and cost-effectiveness of new knee diagnostic, surgical, and rehabilitation methods. Orthopedic patients' clinical outcomes are assessed using performance-based and self-reported metrics (Pantaleon, 2019). Before being used in different language groups and countries, patient-oriented measures (self-administered questionnaires) must be translated, adapted to other cultures, and validated using standard psychometric methods.

Patient-reported outcome questionnaires are crucial to injury evaluation and must be extensively evaluated and standardised (Calvert et al., 2022). Additionally, they save researchers a lot of time. Crossley et al. (2018) developed, published, and validated the patellofemoral pain and osteoarthritis subscale KOOS-PF. Is an assessment tools for Osteoarthritis and patellofemoral discomfort which measures pain, rigidity, and quality of life (Willy et al., 2019).

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The Knee Orthopaedic Outcome Score- Patellofemoral (KOOS-PF) is valid for evaluating patients and measuring the efficacy of treatment interventions (Crossley et al., 2018). Nonetheless, a Malay variant of KOOS-PF is currently unavailable. This study opted for reliability tools based on cultural translation and adaptation to use this instrument with Malay-speaking patients in Malaysia.

This study aimed to investigate the KOOS-psychometric patellofemoral qualities (construct reliability) using Cronbach's alpha and to translate and culturally transform the KOOS-PF into Malay for patellofemoral pain patients in Malaysia.

2.0 Literature Review

KOOS-PF

Ewa M. Roos and colleagues from Lund University, Sweden, and the University of Vermont, USA, founded the KOOS in 1995. Thus, the American-English and Swedish translations were simultaneous. It has been administered to males and females aged 14–79.

11 elements make up the KOOS-PF, developed with patients and physicians. It is suggested for clinical and research use when assessing patellofemoral pain and osteoarthritis (Hoglund et al., 2023; Crossley et al., 2018). The content validity of patient-reported outcome measures for patellofemoral discomfort pain and function needs improvement. Hoglund et al. (2022) found the KOOS-PF to have the highest content validity across all measures. Hoglund et al. (2022) recommend utilising the KOOS-PF to assess pain and functional limitations in adult and adolescent patellofemoral pain (PFP) patients in research and therapy. The Knee injury and Osteoarthritis Outcome Score-Physical Function Short Form (KOOS-PF) included just two Spanish and Arabic translations.

The KOOS-PF was translated into Spanish, and sixty patellofemoral pain and osteoarthritis patients completed it. One week later, 58 patients answered the questions again for test-retest reliability validation, and 55 did so one month later for response assessment. The Spanish version was dependable (intraclass correlation coefficient: 0.82) and consistent (Cronbach's alpha: 0.93) across tests. The reaction was confirmed, and the GROC score correlated with responsiveness ($r = 0.64$). The last alteration was 11.1, and the least essential was 17.2. No floor or ceiling affected the score (Martinez-Cano et al., 2021).

The Arabic knee injury and osteoarthritis outcome score physical function brief form are accurate and reliable for measuring knee osteoarthritis patients' physical function. Cronbach's alpha equals 0.848 (0.789, 0.896), and all Spearman's correlations between test and retest results were positive (Almalki et al., 2021).

3.0 Methodology

During May and June of 2023, a survey with a cross-sectional design was carried out among students from a public university in Malaysia who could read in Malay. The Malay-language KOOS-PF questionnaire was distributed to the students so that they could fill it out. The public university Ethics Committee approved the research (REF: REC/03/2023 (PG/MR/86)).

3.1 Inclusion and exclusion criteria

Males and females between 18 and 40, public university students who could read and speak the native Malay language and were willing to participate in the study, and participants who could comprehend and complete self-report questionnaires met the inclusion criteria. Participants excluded from the study had limb length discrepancy, musculoskeletal deformity, severe inflammatory arthritis, and participants with a history of intraarticular use of corticosteroids and could not understand the Malay language.

3.2 Adaptation of KOOS-PF

The recommendations Lee et al. (2018) provided were considered when carrying out the translation work. The English version was the foundation for the forward translations into Malay. A translator unfamiliar with the original English version worked backward to generate the English version.

3.3 Translation and cross-cultural adaptation

Stage 1: Initial translation

The process of adaptation started with the forward translation as the first step. The original language of the instrument has been translated into the target audience's language (Malay). This forward translation was conducted to discover inconsistencies, which may have resulted from confusing terminology in the original language or variances in how the text was interpreted. The selected translators come from diverse backgrounds or possess distinctive talents, allowing them to produce the highest possible quality translation.

i) Step 2: Synthesis of these translations

The translator worked on the original questionnaire, and they then translated it. A written report was finished with a thorough description of the synthesis process, each topic discussed, and the potential solutions to those problems.

ii) Step 3: Back-translation

After that, the questionnaire was translated back into its initial language, and the people working on it were utterly oblivious that the previous version existed. This back translation served as a method for ensuring that the translated edition faithfully conveys the item information of the original version. Back translation often has the effect of emphasising ambiguity in the original translation. As was the case with forward translations, back translations were treated as though they were the standard. These translations were created by a

multilingual person whose first language is the source language, which in this case is English. The interpreters were unaware of the topics being discussed or briefed about them.

Moreover, the interpreters preferably did not have any medical background. After that, the questionnaire was translated back into its initial language, and the people working on it were utterly oblivious that the previous version existed. The results of this back-translated questionnaire demonstrated that the translated edition faithfully conveys the item information found in the original version. Back translation often has the effect of emphasising ambiguity in the original translation. As was the case with forward translations, back translations were treated as though they were the standard. These translations were created by a multilingual person whose first language is the source language, which in this case is English. The interpreters needed to be made aware of the topics being discussed or briefed about them. Moreover, the interpreters preferably did not have any medical background.

iii) Step 4: Harmonisation

The goal of this stage is to ensure that the versions in the source language and the target language, as well as all translations, are conceptually equivalent. It is a different stage in the quality control process that guarantees reliable data aggregation from worldwide trials. We completed this task by assembling a project team to look into the back translation review.

iv) Step 5: Proofreading

A final check of the finished translation is required at this stage, which is sometimes skipped over. This check is performed to guarantee that there are no leftover minor or typographical errors. A member of our project team is fluent in Malay and English and was responsible for completing the translations. In addition, we commissioned two further independent professional forward translations from paid specialists, which we then compared to the versions we finalised.

v) Step 6: A test of the pre-final version

The final step of the adaptation procedure was a pre-test. This field evaluation of the new questionnaire utilises a pre-final version of the questionnaire administered to participants from the target environment. In this study, the questionnaire was filled out by 10 participants for pilot testing. Each subject completes the questionnaire and is questioned to explore their thoughts and answers. It discussed the significance of the things and the answers to which the modified variant of an applied scenario still preserves its equivalence. The results of this phase were compiled and sent to the UiTM along with the other documents for approval.

v) Step 7: submission of documentation to the UiTM Ethical Committee for appraisal

The final stage in the adaptation process was submitting all findings and formats to the UiTM Ethical Committee. The committee has affirmed and implemented the recommended steps, and the results accurately reflect this procedure.

Stage II: psychometric testing

The total sample size was 55, calculated by G power 3.1, out of which 40 were male participants and 15 were female. The data was gathered after ethical approval from The University Institute of Technology Mara (UiTM). All procedures were conducted following applicable rules and regulations. Before the commencement of data collection, all participants were required to provide written informed assent.

3.2 Evaluation of measurement properties

The measurement properties include responsiveness and interpretability (smallest detectable change (SDC), minimal important change (MIC), and minimal important difference (MID), as well as floor and ceiling effects). Reliability refers to internal consistency, test-retest reliability, and measurement error. The number of participants in the study was determined to be 55, with a power of 90 percent to detect an intraclass correlation coefficient of as low as 0.5.

3.2.1 Internal consistency

Using KOOS-PF baseline data, we estimated Cronbach's alpha, with values between 0.70 and 0.95 being acceptable. A lower value indicates a weak correlation between subscale items and restricts the interpretability of the final total score. An extremely high value indicates item obsolescence.

3.2.2 Test-retest reliability

This study tested reliability and utilised the intraclass correlation coefficient (ICC). For this calculation, individuals were invited to retake the exam 7 days following the initial measurement, and the inter-test reliability was determined.

3.2.3 Convergent validity

The researcher evaluated the correlation between the KOOS-PF Malay version and the Malay version of the OAKHQOL. The Malay version of OAKHQOL, consisting of assessed through 31 items, was valid, reliable, and acceptable for measuring the quality of life in the Malaysian population with knee OA.

4.0 Findings

4.1 Cross-cultural adaptation process

During the phases of translation and adaptation, the prefinal versions of the Malay KOOS-PF were well received by test participants in preliminary testing. All participants completed the questionnaires without omitting any questions and thoroughly understood the scale items. There were no significant conceptual or cultural differences between the Malay and the English-speaking populations. Therefore, the pre-final versions of Malay KOOS-PF were not modified further and were considered final.

4.2 Demographic data

Table 1 displays the demographic characteristics and summarises the results of a cross-tabulation between students' demographics and health histories. Between May and June 2023, 55 public university students responded to the survey. The average age of the participants was 24.09 years. Most respondents were female (n=40, 72.7%), compared to males (n=15, 27.3%). It displays the descriptive results of their race, status, language, and level of education.

Table 1: The demographic data of the participants (N=55)

Demographic	Mean ±SD	Total n (%)	Significant
Gender			X ² =11.364, p=<0.001
Lelaki (Male)		15 (27.3)	
Wanita (Female)		40 (72.7)	
Umur (Age)	23.82 ±3.549		t=11.364, p=<0.001
21		3 (5.5)	
22		15 (27.3)	
23		25 (45.5)	
24		25 (9.2)	
25		2 (3.6)	
31		1 (1.8)	
33		1 (1.8)	
35		2 (3.6)	
38		1 (1.8)	
Ketinggian (Height)	159.91±8.245		t=29.218, p=0.173
140cm-150cm		4 (7)	
151cm-160cm		32 (58)	
161cm-170cm		11 (20)	
171cm-180cm		8 (15)	
BMI			t=12.418, p=0.006
Underweight (<18.5)	22.7485±4.6	10 (18.2)	
Normal Weight (18.5-22.9)		25 (45.5)	
Overweight (23-26.9)		11 (20)	
Obese (>27)		9 (16.4)	
Bangsa (Race)			
Malay		55 (100)	
Status (Status)			t= <47.291, p= <0.001
Single (Bujang)	1.04±0.189	53 (96.4)	
Married (Kahwin)		2 (3.6)	
Bahasa (Language)			
Malay		55 (100)	
Sila nyatakan tahap Pendidikan (Level of education)			
University		55 (100)	

4.3 Sociodemographic data

Table 2 displays the time spent engaging in physical activities, type of stay, smoking propensity, number of cigarettes smoked, need to climb stairs, type of toilet, health status, do they have trouble walking, do they have medical conditions, and do they take medication.

Table 2: The sociodemographic data of the participants (N=55)

Sociodemographic	Total n (%)
Aktiviti fizikal? (physical activity?)	
Dua hingga tiga kali seminggu (Two to three times a week)	19(34.5)
Sebulan sekali (Once a month)	9(16.4)
Seminggu sekali (Once a week)	16(29.1)
Setiap hari (Everyday)	9(16.4)
Tidak (No)	2(3.6)
Tempat tinggal (Type of residence)	

Kondominium (Condominium)	5 (9.1)
Dua tingkat (Two stories)	19 (34.5)
Flat (Flat)	13 (23.6)
Merokok? (Smoking?)	
Ya (Yes)	3 (5.5)
Tidak (No)	52 (94.5)
Berapa putung sehari (How much a day?)	
0	52 (94.5)
1	2 (3.6)
3	1 (1.8)
Memanjat tangga (Climb stairs)	47 (85.5)
Ya (Yes)	
Tidak (No)	8 (14.5)
Jenis tandas (Type of toilet)	7 (12.7)
Cangkung (Squatting)	
Duduk (Sitting)	48 (87.3)
Status kesihatan (Health status?)	
Bagus (Good)	34 (60)
Sangat bagus (Very good)	18 (34.5)
Sederhana (Moderate)	3 (5.5)
Masalah berjalan (Problem in walking)	
Bagus (Good)	12 (21.8)
Lemah (Weak)	3 (5.5)
Sangat bagus (Very good)	35 (63.6)
Sederhana (Moderate)	3 (9.1)
Penyakit (Illness)	
Tiada (No)	100
Kencing manis (Diabetes)	0
Angin Ahmar (Stroke)	0
Darah tinggi (High blood pressure)	0
Penyakit jantung (Cardiovascular disease)	0
Perubatan? (Medicine)	
Ya (Yes)	6 (10.9)
Tidak (No)	49 (89.1)
Pembedahan (Surgery)	
Ya (Yes)	11 (20)
Tidak (No)	44 (80)
Kawasan sakit (Area of pain)	
Leher (Neck)	6 (10.9)
Bahu (Shoulder)	4 (7.3)
Lutut (Knee)	4 (7.3)
Pergelangan kaki (Ankle)	2 (3.6)
Pinggul (Hip)	2 (3.6)
Belakang (Back)	0
Tiada (No)	37 (67.3)

Table 3 displays the characteristics and summarises the results KOOS-PF Malay version.

Table 3: Results of test 1 and test 2 of Malay KOOS PF Malay version

KOOS PF Malay	Test 1			Test 2		
	Mean ±SD	Total n (%)	P value	Mean ±SD	Total n (%)	P value
Sejauh manakah kekakuan lutut anda selepas bersenam?	0.47±0.690		X ² =24.473, p<0.001	0.40±0.710		X ² =38.436, p<0.001
Tidak sakit		35 (63.6)		40 (72.7)		
Sakit sedikit		14 (25.5)		8 (14.5)		
Sederhana		6 (10.9)		7 (12.7)		
Teruk		0		0		
Sangat sakit		0		0		
Berapa kerap anda mengalami sakit lutut selepas berhenti melakukan aktiviti?	0.42±1.397		X ² =49.127, p<0.001	0.24±0.816		X ² =120.626, p<0.001
Tidak pernah		42 (76.4)				
Setiap bulan		12 (21.8)				
Setiap minggu		1 (1.8)				
Setiap hari		0				
selalu		0				

Berapa kerap kesakitan menghadkan aktiviti anda?	0.13±0.336	X ² =30.564, p=<0.001	0.20±0.650	X ² =120.636, p=<0.001
Tidak pernah	48 (87.3)		49 (89.1)	
Setiap bulan	7 (12.7)		3 (5.5)	
Setiap minggu	0		1 (1.8)	
Setiap hari	0		2 (3.6)	
selalu	0		0	
Bangun daripada duduk (termasuk keluar daripada kereta)	0.07±0.262	X ² =40.164, p=<0.001	0.16±0.420	X ² =68.218, p=<0.001
Tidak sakit	51 (92.7)		47 (85.5)	
Sakit sedikit	4 (7.3)		7 (12.7)	
Sederhana	0		1 (1.8)	
Teruk	0		0	
Sangat sakit	0		0	
Berlutut	0.18±0.434	X ² =63.964, p=<0.001	0.29±0.533	X ² =44.764, p=<0.001
Tidak sakit	46 (83.6)		41 (74.5)	
Sakit sedikit	8 (14.5)		12 (21.8)	
Sederhana	1 (1.8)		2 (3.6)	
Teruk	0		0	
Sangat sakit	0		0	
Bertinggang	0.16±0.373	X ² =24.891, p=<0.001	0.33±0.668	X ² =79.909, p=<0.001
Tidak sakit	46 (83.6)		42 (76.4)	
Sakit sedikit	8 (14.5)		9 (16.4)	
Sederhana	1 (1.8)		3 (5.5)	
Teruk	0		1 (1.8)	
Sangat sakit	0		0	
Aktiviti berat di rumah (termasuk membawa dan mengangkat barang)	0.13±0.336	X ² =30.564, p=<0.001	0.31±0.717	X ² =95.327, p=<0.001
Tidak sakit	48 (87.3)		45 (81.8)	
Sakit sedikit	7 (12.7)		4 (7.3)	
Sederhana	0		5 (9.1)	
Teruk	0		1 (1.8)	
Sangat sakit	0		0	
Meloncat/melompat	0.24±0.637	X ² =59.927, p=<0.001	0.33±0.721	X ² =84.709, p=<0.001
Tidak sakit	45 (81.8)		43 (78.2)	
Sakit sedikit	9 (16.4)		8 (14.5)	
Sederhana	0		2 (3.6)	
Teruk	0		2 (3.6)	
Sangat sakit	1 (1.8)		0	
Berlari/joging	0.22±0.459	X ² =56.109, p=<0.001	0.45±0.765	X ² =57.800, p=<0.001
Tidak sakit	44 (80)		37 (67.3)	
Sakit sedikit	10 (18.2)		13 (23.6)	
Sederhana	1 (1.8)		3 (5.5)	
Teruk	0		2 (3.6)	
Sangat sakit	0		0	
Selepas aktiviti sukan dan rekreasi	0.20±0.404	X ² =19.800, p=<0.001	0.35±0.751	X ² =83.983, p=<0.001
Tidak sakit	44 (80)		43 (78.2)	
Sakit sedikit	11 (20)		7 (12.7)	
Sederhana	0		3 (5.5)	
Teruk	0		2 (3.6)	
Sangat sakit	0		0	
Adakah anda sudah mengubah suai aktiviti sukan dan rekreasi anda akibat kesakitan lutut anda?	0.25±0.726	X ² =67.345, p=<0.001	0.35±0.717	X ² =89.945, p=<0.001
Tidak sama sekali	47 (85.5)		44 (80)	
sedikit	5 (9.1)		7 (12.7)	
Sederhana	0		2 (3.6)	
Banyak	3 (5.5)		2 (3.6)	
semua	0		0	

4.4 Test-retest reliability and internal consistency of each item in the KOOS-PF Questionnaire

Table 4 shows the KOOS-PF Malay version's Test-Retest Reliability and Internal consistency (Cronbach's alpha). The model consists of three constructs: stiffness (one item), pain (nine items), and QOL (one item). The reliability analysis showed that Cronbach's alpha coefficient value for each construct was greater than 0.07 with p-values <0.001, which shows that the results are reliable and significant.

Table 4 Test-retest reliability and internal consistency of each item in the KOOS-PF Questionnaire

Questionnaire	Test 1 (mean+sd)	Test 2 (mean+sd)	Internal Consistency
Stiffness (Q1)	0.47± 0.690	0.40± 0.710	0.467
Pain (P1)	0.42±1.397	0.24±0.816	0.193
Pain (P2)	0.13± 0.336	0.20±0.650	0.540
Pain (P3)	0.07±0.262	0.16±0.420	0.324
Pain (P4)	0.18±0.434	0.29±0.533	0.499
Pain (P5)	0.16±0.373	0.33±0.668	0.698
Pain (P6)	0.13±0.336	0.31±0.717	0.084
Pain (P7)	0.24±0.637	0.33±0.721	0.634
Pain (P8)	0.22±0.459	0.45±0.765	0.519
Pain (P9)	0.20±.404	0.35±0.751	0.623
QOL (Q1)	0.25±0.726	0.31±0.717	0.460

5.0 Discussion

Like the primary KOOS questionnaire, respondents evaluate the severity of their symptoms and limitations, and the scores evaluate the impact of patellofemoral-related issues. The KOOS-PF is especially beneficial in cases where patellofemoral joint problems are the primary concern, as it provides valuable information for treatment planning, monitoring progress over time, and determining the most appropriate management strategies.

The present study successfully translated the Malay version of the KOOS-PF questionnaire, which is reliable. It was determined that the English version and its Malay translation are both identical to one another. The results of this study indicate that the Malay version is suitable for use with patients suffering from patellofemoral pain in Malaysia. Translating from English to Malay did not provide us with any significant difficulties.

Each step specified in the Method was carried out. Similarly, the first two forward and reverse translations were straightforward and quick. The back translation process rapidly revealed that the original English version of KOOS-PF required no modifications. The researcher intended to create translations that were easily accessible to local participants. The translation and back-translation of KOOS-PF proved to be a wise choice, and the back-translation and review process was concluded.

According to the findings, the Malay version of the KOOS-PF is a reliable evaluation tool for patellofemoral knee conditions in Malaysia and displayed an adequate degree of goodness of fit overall.

5.1 Limitations

Several limitations were identified in this investigation. The participants self-reporting, recall bias and other data collection limitations can lead to inaccuracies in sociodemographic data. In addition, certain groups may need to be represented or included in data collection, resulting in knowledge deficits regarding populations.

This study was conducted in a single-centered institution where most participants were public university students. In addition, most of them were pursuing health education, including physiotherapy. These students had notions or experiences regarding managing their pain to carry out their daily activities and minimise their level of disability.

On the other hand, PFPS affects young age groups, mostly adolescents. The participants were of comparable age and were youthful and physically active. Thus, younger people are more likely to recover from an injury than older adults. Consequently, the level of disability is not significantly affected compared to groups of middle-aged and older adults.

5.2 Clinical Implications and Future Recommendations

The KOOS-PF Malay version helps healthcare professionals assess how knee injuries and osteoarthritis affect patients' everyday lives and quality of life. It gives valuable knee pain, functional restriction, and patient perception information.

A practical and clear self-reported measure for patellofemoral pain patients with good psychometric qualities, this questionnaire is suggested for future clinical trials and therapeutic use. Healthcare providers can measure knee impairment severity and develop treatment programmes using KOOS-PF Malay.

Continuous usage and adaption of the KOOS-PF questionnaire can improve knee injury and osteoarthritis understanding and patient care and therapy.

5.3 Future research

- i) Differential item functioning (DIF) analysis: Conduct DIF analysis to identify possible item bias in the translated versions. DIF occurs when distinct language or cultural groups respond differently to particular items, indicating the need for adjustments at the item level.
- ii) Longitudinal studies: Conduct longitudinal studies using the translated versions to evaluate the stability of the measurements over time and the impact of knee injuries or osteoarthritis on physical function over the long term (Wetzel & Böhnke, 2020).

6.0 Conclusion

The KOOS-PF is a patient-reported outcome measure that provides a deeper understanding of how knee problems impact individuals' daily lives and activities. Researchers and clinicians can use the KOOS to evaluate the efficacy of various knee injuries and osteoarthritis treatments and interventions. By comparing KOOS scores before and after treatment, it is possible to determine the effect of multiple treatments on patients' symptoms and quality of life. The KOOS-PF contributes significantly to our understanding of knee injuries, osteoarthritis, and patellofemoral joint disorders. Its ability to provide quantitative and patient-centered data makes it an indispensable tool for researchers, clinicians, and patients attempting to enhance knee health and quality of life.

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Paper Contribution to Related Field of Study

Incorporating patient-reported outcomes such as the KOOS-PF Malay version provides a valuable perspective on the patient experience and ensures that research outcomes reflect patients' actual experiences in Malaysia.

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