Validity of the Malay adaptation of the KOOS Patellofemoral Pain and Subscale (KOOS-PF)

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Abstract

Introduction: The Malay version of Knee Orthopaedic Outcome Score-Patellofemoral (KOOS-PF) is unavailable. **Aims:** This study culturally used the (KOOS-PF) questionnaire for Malaysian Malay-speaking students. **Methods:** Forward-backwards translation was used to translate the KOOS-PF questionnaire from English to Malay. Malay version psychometric patellofemoral characteristics (construct reliability) were examined using Cronbach's alpha to assess reliability and internal consistency with fifty-five UiTM physiotherapy students. **Results:** The reliability analysis found that each construct's Cronbach's alpha coefficient was more significant than 0.07, and the p-values were less than 0.001. **Conclusion:** A reliable and straightforward technique for assessing quality of life among Malaysian physiotherapy students.

Knee orthopaedic outcome score: patellofemoral pain; Patient-reported outcome measure; Reliability test of Malay version

1.0 Introduction

Patellofemoral pain and patellofemoral osteoarthritis are the conditions evaluated by the Knee injury and Osteoarthritis Outcome Score (KOOS) questionnaire. The KOOS-PF is a modified version of the KOOS questionnaire made expressly to evaluate symptoms and functional limitations associated with these conditions. Clinicians and researchers can analyse the influence that patellofemoral diseases have on patients' quality of life with this tool. The KOOS-PF investigates the clinical outcomes to assess the benefits and cost-effectiveness of novel approaches in diagnosing, intervening, and rehabilitating knee diseases. When evaluating clinical outcomes in orthopaedic patients, it is essential to subject self-administered questionnaires to rigorous psychometric processes (Dabbagh & MacDermid, 2020; Pantaleon, 2019). This is because performance-based measures and self-reported criteria must be utilised to guarantee the reliability and validity of patient-oriented interventions. The validation process must be completed before the product may be used across various linguistic communities and territories. The processes of translation, cultural adaptation, and approval are all included in the methods described above.

The evaluation of injuries requires a comprehensive investigation and the standardisation of patient-reported outcome questionnaires (Melanie et al., 2022). Additionally, they help researchers save a significant amount of time, which is a considerable assistance. Willy et al. (2019) were responsible for developing, publishing, and validating the Patellofemoral Pain and Osteoarthritis Subscale (KOOS-PF). To evaluate osteoarthritis and patellofemoral discomfort, the evaluation instrument that was described by Willy et al. (2019) is designed to measure pain, stiffness, and quality of life.

The KOOS-PF demonstrates that it is suitable for use as a tool for assessing patients and as a method for determining the effectiveness of treatment measures. The KOOS-PF evaluation tool has no Malay version available, which should be noted. The researchers who conducted this study concluded that using dependability tools based on cultural translation and adaptation would be the best way to guarantee that this instrument will be used effectively among patients in Malaysia who speak Malay.

Using Cronbach's alpha, this study aimed to evaluate the psychometric features of the KOOS-PF questionnaire, namely its construct reliability. In addition, the study aimed to translate and culturally modify the KOOS-PF into Malay, which would be used to evaluate patients in Malaysia experiencing patellofemoral pain.

2.0 Literature Review

In 1995, Ewa M. Roos and her colleagues from Lund University in Sweden and the University of Vermont in the United States established the KOOS. Both of these universities are located in Sweden. Because of this, the translation from Swedish to American English and American English to Swedish took place simultaneously. Individuals of both male and female genders, spanning a vast age range from 14 to 79 years, have been subjected to the intervention's administration.

Eleven components comprise the knee injury and osteoarthritis outcome score-physical function short-form (KOOS-PF), established through a collaborative effort between patients and physicians. To evaluate patellofemoral pain and osteoarthritis, Willy et al. (2019) and Crossley et al. (2018) have proposed the simultaneous utilisation of this methodology in clinical and research settings. The content validity of patient-reported outcome measures regarding patellofemoral discomfort, pain, and function needs to be improved by implementing these enhancements. In the context of conducting research or providing therapy for patients suffering from patellofemoral pain (PFP), Willy et al. (2019) discovered that the KOOS-PF exhibited the best level of content validity when compared to other measures. Davis and Powers (2010) suggest that the Knee KOOS-PF be used as an evaluation instrument to determine the level of discomfort experienced by these patients and the functional limitations they are confronted with. It is now only possible to obtain the KOOS-PF in two different translations: Spanish and Arabic.

Patients with osteoarthritis and patellofemoral discomfort were administered the Spanish version of the KOOS-PF questionnaire. There were sixty patients in all. To validate the test-retest reliability, 58 patients were reevaluated after one week, during which they were asked to respond to the questions once more. Following a period of one month, a total of fifty-five individuals underwent identical treatment to assess their various reactions. The dependability of the Spanish version was demonstrated by several tests, which resulted in an intraclass correlation coefficient of 0.82 and a Cronbach's alpha score of 0.93. The validity of the reaction was validated, and a statistically significant positive correlation ($r = 0.64$) was found to exist between the GROC score and responsiveness. In terms of significance, the least considerable change was 17.2, while the most recent change that was noticed was 11.1. According to the research findings by Luque-Suarez and colleagues in 2020, neither the floor nor the ceiling significantly influenced the overall score.

When evaluating the functional capabilities of people with knee osteoarthritis, the Arabic Knee Injury and Osteoarthritis Outcome Score Physical Function Form (Fuhad et al., 2023) has produced accurate and trustworthy results. According to the research findings by Saleh and colleagues (2015), Cronbach's alpha coefficient displayed a range of values between 0.789 and 0.896. Furthermore, it was discovered that every Spearman's correlation observed between the test results and the retest was positive.

3.0 Methodology

A survey was carried out online in May and June of 2023 among students who spoke Malay at a public institution in Malaysia. The poll was designed using a cross-sectional methodology. The KOOS-PF Malay questionnaire was given to the students so they could fill it out independently. As evidenced by the reference number REC/03/2023 (PG/MR/86), the research investigation was allowed to proceed after receiving approval from the Ethics Committee of the public university.

3.1 Inclusion and exclusion criteria

Participants in this study were required to have the following characteristics: the ability to read and speak Malay fluently; the age range of 18 to 40 years old; enrolment as students at public universities; the desire to take part in the study; and the capacity to interpret and finish self-report questionnaires. Furthermore, there was a requirement that the participants be able to read and speak the genuine Malay language. This was a criterion for participation. Individuals who were unable to speak the Malay language, limb length disparities, musculoskeletal abnormalities, severe inflammatory arthritis, and a history of intraarticular corticosteroid use were not included in the study. Another group of participants was eliminated from the study.

3.2 Adaptation of KOOS PF

Stage 1: Initial translation

A forward translation, which served as the beginning point for this stage, was the defining characteristic of the first phase of the adaptation process. The initial version of the instrument has been translated from its original language into Malay, which is the language that is going to be used by the audience. The purpose of this forward translation was to discover any inconsistencies that may have arisen due to unclear terminology in the source language or discrepancies in the interpretation of the text by various individuals among the target audience. It is possible to produce translations of the highest possible quality thanks to the fact that the translators chosen for this assignment come from various backgrounds and possess various skills.

i) Step 2: Synthesis of these translations

The translator was the one who initially conceived the questionnaire, and they were also the ones who translated it. A comprehensive analysis of the numerous issues that have been brought up and the potential solutions to the problems that have been encountered is included in the published report. It also provides a comprehensive explanation of the synthesis process.

ii) Step 3: Back-translation

The questionnaire was then retranslated into its original language, and the individuals who worked on it must be made aware that there had ever been an earlier version. To provide a system for assuring the accuracy of the translated edition and relaying the item information from the original version accurately, the purpose of conducting a back translation was to create a mechanism. During the reverse translation process, any ambiguities that may have been present in the initial translation are frequently brought to light. Similar to how forward translations were given equal weight, back translations were also given the same level of importance as if they were the definitive version of the text. These translations were painstakingly crafted by a person proficient in several languages, one of which is English, which served as the core language for these translations. In

addition, the interpreters were not briefed on the concerns that were discussed, nor were they informed about the themes that would be addressed.

Additionally, it was judged preferable for the translators to have no prior knowledge or competence in medicine or medical terminology. Subsequently, the questionnaire was subjected to retranslation into its native language. The personnel involved in this activity were unaware of any earlier questionnaire versions. The findings acquired from the back-translation of the questionnaire demonstrate that the translated version successfully captures the information included in the original edition. During the reverse translation process, any ambiguities that may have been present in the initial translation are frequently brought to light.

In the same way, forward translations were given equal weight, and reverse translations were given the same level of importance as if they were the definitive version of the text. These translations were painstakingly crafted by a person proficient in several languages, one of which is English, which served as the core language for these translations. The interpreters were required to receive a detailed briefing on the addressed topics or an update as soon as possible. In addition, it was concluded that it would be beneficial for the translators to have no prior medical experience or competence.

iii) Step 4: Harmonisation

At this juncture, the conceptual equivalent is verified between the source and target languages versions, in addition to all translations. A distinct phase within the quality control procedure ensures the aggregation of dependable data from trials conducted across the globe. In order to accomplish this objective, we formed a project team to examine the back translation review.

iv) Step 5: Proofreading

At the moment, there is a requirement for the final verification of the translation that has been finished, which is a stage that is occasionally skipped over. Verification is done to ascertain whether typographical or minor errors have been left behind. A project team member proficient in Malay and English finished the translations. The individual concluded that they were responsible for completing the translations. To add insult to injury, we acquired two additional excellent forward translations from independent translators who were compensated for their work. After that, we investigated the differences between these translations and the versions that were ultimately selected.

v) Step 6: An evaluation of the final phase

The pre-test was the final phase of the adaptation approach, designed to ease the evaluation of the newly constructed questionnaire in a real-world context. A prepared version of the questionnaire was given to participants who were located inside the particular study environment that was being researched. A questionnaire was given to ten individuals to conduct the pilot testing for this study. Each individual who participates in the research project is given a questionnaire to fill out, and then they are questioned about their ideas

and responses. This essay aims to investigate the significance of objects and the reactions to which the modified version of a practical scenario maintains its comparability. Following the completion of this stage, the collated results were delivered to the UiTM for examination and endorsement, together with the paperwork that accompanied them.

v) Step 7: submission to the UiTM Ethical Committee for appraisal
The findings and formats were handed over to the UiTM Ethical Committee as part of the last phase of the adaptation process. The outcomes successfully illustrate that this procedure was adhered to, and the committee has officially endorsed and carried out the advised measures.

Stage II: psychometric testing
According to the G power 3.1 study results, 55 individuals participated in the research. A total of 45 individuals took part in the activity, with 40 males and 15 females participating. It was only when the University Institute of Technology Mara (UITM) gave its approval on an ethical level that the procedure of data collection was carried out. By the laws and regulations that were in force at the time, every procedure was carried out in a manner compacting those restrictions. Before we could collect the data from the participants, we required each to give their written consent after receiving information about the study.

3.2 Evaluation of measurement properties
Responsiveness and interpretability are included in the features of the measurements. These qualities include floor and ceiling effects, as well as the minor detectable change (SDC), the least significant change (MIC), and the minimal important difference (MID). The concepts of internal consistency, test-retest reliability, and measurement inaccuracy are all included in the overarching idea of reliability. To achieve a power level of 90% and detect an intraclass correlation coefficient as low as 0.5, the research required the participation of 55 persons.

3.2.1 Internal consistency
Cronbach's alpha was calculated with the baseline data obtained from the KOOS-PF Malay instrument. Values that were within the range of 0.70 to 0.95 were considered to be satisfactory. A reduction in value implies a decreased correlation level among the constituent components of the subscale, which in turn restricts the overall aggregate score's ability to be understood. The characteristics of an object with an extraordinarily high value indicate its obsolescence.

3.2.2 Test-rest reliability
The intraclass correlation coefficient (ICC) was utilised in this study to conduct the computation, and the participants were allowed to retake the examination one week following the original evaluation. The reliability of the instrument was evaluated using this method. Afterwards, the inter-test reliability was determined using computation.

3.2.3 Convergent validity

The researcher investigated the possible connections between the KOOS-PF Malay and OAKHQOL. The application of the Malay version of the OAKHQOL, which is a 31-item instrument, was used to evaluate the quality of life of individuals in Malaysia who suffer from knee osteoarthritis. This application demonstrated the validity, reliability, and acceptance of the instrument.

4.0 Findings

4.1 Cross-cultural adaptation process

The test participants generally received the pre-versions of the KOOS-PF Malay well throughout the early testing phase, and this sentiment persisted throughout the translation and adaptation stages. One hundred per cent of the participants filled out the questionnaires, ensuring no questions were left out. In addition to that, they displayed an in-depth comprehension of the elements on the scale. There were no significant conceptual or cultural differences between the English and Malay communities. Consequently, the pre-final iterations of the Malay KOOS-PF were not subjected to any additional revisions and were considered to be in their final state.

4.2 Demographic data

Table I contains an overview of the findings of a cross-tabulation that compared the students' demographics and health histories. Additionally, the demographic features of the students are presented in the table. Between May and June of 2023, fifty-five students enrolled in public universities took part in the survey and submitted their feedback. At the time of their participation in the study, the average age of the participants was 24.09 years. With a smaller proportion of male respondents (n=15, 27.3%), the sample was primarily comprised of female respondents (n=40, 72.7%), with the majority being female. This study presents descriptive findings regarding the participants' racial background, socioeconomic situation, language competency, and educational achievement.

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		
21		3 (5.5)	
22		15 (27.3)	
23		25 (45.5)	
24		25 (9.2)	t=11.364, p=<0.001
25		2 (3.6)	
31		1 (1.8)	
33		1 (1.8)	

35		2 (3.6)	
38		1 (1.8)	
Ketinggian (Height) 140cm-150cm	159.91±8.245	4 (7)	t=29.218, p=0.173
151cm-160cm		32 (58)	
161cm-170cm		11 (20)	
171cm-180cm		8 (15)	
BMI Underweight (<18.5)	22.7485±4.6	10 (18.2)	t=12.418, p=0.006
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) Single (Bujang)	1.04±0.189	53 (96.4)	t= <47.291, p= <0.001
Married (Kahwin)		2 (3.6)	
Bahasa (Language) Malay		55 (100)	
Sila nyatakan tahap Pendidikan (Level of education) University		55 (100)	

4.2.1 Participant sociodemographic data
Data are shown in Table 2 about the length of time spent participating in physical activities, the kind of accommodations, the propensity to smoke, the amount of cigarettes consumed, the necessity of mounting stairs, the type of toilet, and the individual's health status. Several factors, including the existence of medical conditions, the use of medication, and difficulties walking, are included in the health status determination. A summary of the results of the KOOS-PF Malay is provided in Table 3, which also includes a presentation of the relevant characteristics.

Table 2: Sociodemographic data on the participants (N=55)

Sociodemographic data	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: Results of test 1 and test 2 of Malay KOOS PF Malay version

KOOS PF Malay	Pre Test			Post Test		
	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 mengehadkan 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	
Bertinggung	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 The KOOS-PF Questionnaire's internal consistency and test-retest reliability for each item

Regarding the Malay version of the KOOS-PF, Table 4 displays the findings of the test-retest reliability and internal consistency (Cronbach's alpha). The model comprises three distinct constructs, namely stiffness, pain (comprising nine sub-constructs), and quality of life. Based on the findings of the reliability study, it was observed that Cronbach's alpha coefficient value for each construct exceeded 0.07, while the p-values were below 0.001. These results suggest that the findings possess both reliability and statistical significance.

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

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

5.0 Discussion

Similar to the methodology employed for the primary KOOS questionnaire, participants assess the magnitude of their symptoms and limitations, with the resulting scores serving

as an indicator of the impact of patellofemoral-related challenges. The KOOS-PF is particularly advantageous when issues related to the patellofemoral joint are the predominant focus of concern, which is due to the provision of substantial information that may be utilised for treatment planning, monitoring progress over a while, and selecting the most suitable management strategies.

The present study successfully facilitated the translation of the KOOS-PF questionnaire into the Malay language. The credibility of this iteration of the KOOS-PF questionnaire is evident. The equivalence between the English version and the Malay translation has been verified in all aspects. Based on the findings of this study, it is possible to conclude that the Malay version of the evaluation instrument is appropriate for use with Malaysian patients who are suffering from patellofemoral pain. The translation process from English to Malay did not provide any significant obstacles.

All the steps specified in the Method section were executed. Similarly, the initial two sentences were translated effortlessly and swiftly in both the forward and reverse directions. Upon doing the back translation procedure, it was evident without delay that the original English version of the KOOS-PF did not require any modifications. The researcher aimed to generate translations that were easily comprehensible for the individuals belonging to the local community. The decision to undertake the translation and subsequent assessment of the KOOS-PF instrument has shown to be a prudent choice, resulting in a successful outcome. The process of back-translation and subsequent review has now been completed.

According to the findings, as an instrument for assessing patellofemoral knee issues in Malaysia, the Malay adaptation of the KOOS-PF demonstrates a high degree of dependability. Furthermore, the instrument exhibited a commendable degree of overall congruence. Likewise, this finding was documented across the complete sample.

5.1 Limitations

A few flaws were discovered throughout this investigation. The presence of inaccuracies in sociodemographic data can be attributed to various sources, including participant self-reporting, recall bias, and constraints inherent in the data collection process. Furthermore, it is imperative to consider including certain groups in the data collection process since this may result in knowledge gaps about specific populations.

The study was conducted at a singular site, comprising a solitary institution, whereby the predominant sample consisted of students enrolled in public universities. Moreover, many individuals were enrolled in educational institutions specialising in health-related disciplines, such as physiotherapy. The students had thoughts and personal experiences about pain management strategies, enabling them to effectively engage in their daily routines with minimal impairment.

Conversely, individuals in their early stages of life, specifically throughout adolescence, experience the impact of PFPS. All the volunteers exhibited a similar age range, with their mental and physical capacities at their peak. Hence, younger individuals are more likely to attain complete recuperation following an accident than their adult counterparts within the

same age bracket. Consequently, there is no substantial rise in disability rates when comparing this group to middle-aged and older individuals.

5.2 Clinical Implications and Future Recommendations

The KOOS-PF Malay is a significant instrument for healthcare providers to evaluate the impact of knee injuries and osteoarthritis on individuals' daily activities and general health that provides valuable insights into the patient's knee pain, restrictions in function, and subjective assessment of their condition.

The present study proposes the utilisation of a self-reported assessment questionnaire that demonstrates practicality, clarity, and favourable psychometric qualities for patients afflicted with patellofemoral pain. This instrument is recommended for prospective clinical studies and its implementation in therapeutic environments. Utilising the KOOS-PF Malay instrument enables healthcare practitioners to assess the extent of knee impairment and develop appropriate treatment protocols for their patients.

The additional implementation and refinement of the KOOS-PF questionnaire can enhance knowledge regarding knee injuries and osteoarthritis and provide patient care and therapy.

5.3 Future research

i) Conducting Differential Item Functioning (DIF) analysis: Perform DIF analysis to ascertain the presence or absence of potential bias in the translated versions. Differential item functioning (DIF) arises when distinct language or cultural groups exhibit disparate responses to certain items, suggesting that item-level adjustments are necessary.

ii) Longitudinal research should be conducted to assess the durability of the measurements over time and to examine the impact of knee injuries or osteoarthritis on physical function across an individual's lifespan (Wetzel & Bohnke, 2020).

6.0 Conclusion

Researchers and clinicians can use the KOOS-PF to evaluate the effectiveness of various interventions and therapies in the context of knee osteoarthritis and knee injuries. It provides insightful information about how knee problems affect patients' ability to function daily and their participation in activities.

The impact of various therapies on patients' symptoms and quality of life can be assessed by comparing their KOOS scores before and after the therapy. KOOS-PF has significantly advanced our comprehension of knee injuries, osteoarthritis, and pathologies impacting the patellofemoral joint. Due to its ability to provide both quantitative data and patient-centred information, this tool holds significant importance for researchers, physicians, and patients alike as they endeavour to enhance knee health and overall quality of life.

Supervised exercises conducted by a physiotherapist have both short-term and long-term advantages in pain reduction and improved function for patients suffering from patellofemoral pain(Selfe, 2010).

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