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Original Article

Thai version of the Survey Instrument for Natural History, Aetiology and Prevalence of Patellofemoral Pain: Cross-cultural validation and test-retest reliability

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ABSTRACT

Background: /objective: The Survey Instrument for Natural History, Aetiology and Prevalence of Patellofemoral Pain (SNAPPS) is a self-report questionnaire which is a specifically designed measurement instrument to identify patellofemoral pain. It has reported high sensitivity, specificity and test-retest reliability to discriminate between people with knee pain, with or without patellofemoral pain. SNAPPS hasn't been studied in Thailand; therefore, the aim of this study was to cross-culturally adapt the questionnaire into Thai.
Method: This study was separated into two phases: cross-cultural adaptation and test-retest reliability. The Survey Instrument for Natural History, Aetiology and Prevalence of Patellofemoral Pain was translated into Thai following the guidelines for the cross cultural adaptation of self-report measures including six steps. Thirty four knee pain patients performed the test-retest reliability of the final version of this questionnaire. They were clinically diagnosed with patellofemoral pain by a physical therapist. They were asked to complete the questionnaire twice; with the 1st session and 2nd session having a 30 min break between. The intraclass correlation coefficient ($ICC_{3,1}$) method was used to determine test-retest reliability. The correlation of SNAPPS and VAS-U, VAS-W, VAS-S, VAS-J, VAS-R, and VAS-SQ were analyzed by Pearson correlation.
Results: The thirty-four participants (19 males, 15 females; with ages ranging 19–24 years) with patellofemoral pain were assessed twice with a 30 min break between the two sessions. The total scores of section 2 and 4 of the questionnaire indicated very strong test-retest reliability, ranging from 0.83 to 0.954 and the total score was ICC 0.91. Moreover, the Survey Instrument for Natural History, Aetiology and Prevalence of Patellofemoral Pain had a correlation with intensity of pain during ascending and descending stairs.
Conclusion: The Thai version of the Survey Instrument for Natural History, Aetiology and Prevalence of Patellofemoral Pain can be used to assess patellofemoral pain in young Thai patients.

Introduction

A study in young athletes reported that the lower extremities were the most commonly injured body parts, with the knee being

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the most frequent, especially in people who participate in regular physical activities.[1] Patients visiting sport medicine clinics were there with knee injuries about 25–30% of the time.[2] The classification of knee diseases or syndromes is also necessary because it may be useful for prevention and proper treatment. Patellofemoral pain (PFP) is a common cause of painful knee problems, especially in young and active people. Anterior knee pain is the most common presenting symptom without pathognomonic signs in the diagnosis. There are no standard clinical guidelines for the diagnosis of PFP, therefore PFP is a diagnosis of exclusion.[3] Previous studies have used clinical tests or medical records that incur a lot of time, cost and inconvenience to participants. A specific tool developed to assess for PFP would be beneficial. The Survey Instrument for Natural History, Aetiology and Prevalence of Patellofemoral Pain (SNAPPS) is a self-report questionnaire which is a specifically designed measurement instrument to identify people with PFP in the community by discriminating between those with and without the condition.[4] It has a reported high sensitivity, specificity (>90%) and test-retest reliability to discriminate between knee pain with and without patellofemoral pain. It was designed based on clinical features and a knee pain map. SNAPPS is already translated into ten languages and has been studied and used in Europe, China and Africa.[4–7] Other countries have different cultures and/or languages, so it is necessary to use a unique method to reach equivalence between the original and target language, and it must be adapted culturally to maintain the content validity of the instrument. SNAPPS hasn't been studied in Thailand; therefore, the purpose of this study was to cross-culturally adapt the questionnaire into Thai.

Method

This was a descriptive study. The translation process occurred from June 2020 to February 2021 and the test-retest was performed in March 2021.

Instrumentation

The Survey Instrument for Natural History, Aetiology and Prevalence of Patellofemoral Pain (SNAPPS) consists of four sections. The first section is to identify people with knee pain or problems. If participants have had knee pain, they are to complete the remaining three sections of the questionnaire. The second section includes clinical features of the knee pain and problem. The third section covers pain or difficulty during many activities related to knee problems. The last section is to identify the location of knee pain using a knee and patella map. The total scores for the questionnaire are calculating by combining the scores of section 2 and 4. Participants with knee problems and a total score of 6 or more were considered to have PFP (Table 1).

Cross cultural adaptation

The SNAPPS tool was translated into Thai following the guidelines for the cross cultural adaptation of self-report measures including six steps[8] (Fig. 1). The first step is to request permission from the original study's author. The original version is in English language.

Stage I: Initial Translation. The SNAPPS was translated into Thai individually by two bilingual translators with different backgrounds. The first translator has no clinical background (T1) and the second translator has a medical and clinical background (T2).

Stage II: Synthesis of the translations. Both Thai translations were analyzed and synthesized by the two translators together. Moreover, an additional physiotherapist with expertise in orthopedics was invited to a meeting in order to check for mistakes in the

questionnaire items, and to together agree on sentence equivalence and select the most appropriate meaning. They produced the first draft of Thai SNAPPS version (T-12).

Stage III: Back translation. The backward translation version was completed by two bilingual translators, with expertise in English language. The two translators (B1, B2) have no medical background. They translated the Thai SNAPPS version (T-12) back into English. This process can be used to validate forward translation and check that the Thai translated version reflects the original survey content.

Stage IV: Expert committee. The expert committee for this study included health and methodologist professionals, language professionals and the translators who considered all the translations and equivalence between the original and target version such that the words, phrases, and sentences or interpretability is equivalent. We have reported each version to the original developers of SNAPPS and have produced the pre-final version for pretesting with subjects.

Stage V: Testing the pre-final version. The last stage of the process is to pretest the new target language questionnaire with a group of thirty four subjects.

Test-retest reliability

Thirty-four participants with PFP performed the test-retest reliability of the final version of this questionnaire. The questionnaire included general information including age, gender, type and frequency of physical activity, side of the body with symptoms of PFP, and symptoms of PFP; visual analog scale for usual (VAS-U), worst pain (VAS-W) and pain during activities (VAS-activities) as ascending and descending stairs (VAS-S), jumping (VAS-J), running (VAS-R), and squatting (VAS-SQ). All 34 participants were university students who perform regular physical activity. They were able to read and understand Thai and had no cognitive impairments and neurological conditions. They were asked to sign an informed consent form approved by the Khon Kaen University ethics committee for human research based on the declaration of Helsinki and the ICH good clinical practice guidelines (HE 622192; No.4.2.02:30/2019). Participants were asked to complete the questionnaire on two occasions, with a 30 min break between each occasion. The participants were advised regarding injury prevention and therapeutic exercise during the break period[9] (Fig. 2).

Study population

The sample included thirty four participants ranging from 19 to 25 years old. They each participated in physical activities and sport at least three times per week. The inclusion criteria were: fluent Thai speakers, with retropatellar pain for more than three months without traumatic onset, and elevated pain during three of the following four tasks: walking up or down stairs, jumping, running or squatting. Participants were clinically diagnosed with PFP by a physiotherapist with tests including vastus medialis coordination, patellar apprehension, eccentric step and single leg squat. The diagnosis was confirmed if at least two tests were considered positive. The exclusion criteria were: knee swelling, a history of dislocation of the patella, within 3 months of a knee injection, or within 6 months of knee surgery.[10,11]

Statistical analysis

The reliability of the Thai version of SNAPPS was determined by test-retest reliability. The test-retest reliability was evaluated by the intraclass correlation coefficient ($ICC_{3, 1}$) of 95% CI. The reliability value was determined as: between 0.9 and 1.00 indicated very strong reliability, 0.7–0.9 being strong, 0.5–0.7 being

Table 1
Four sections of The Survey Instrument for Natural History, Aetiology and Prevalence of Patellofemoral Pain (SNAPPS).

Items	Scoring of section	
Section 1	**Answer**	
	Yes	**No**
Have you had pain or problems in the last year in or around the knee?	Continue to finish sections 2 and 4 submit	
Section 2: clinical feature	**Answers and scores**	
	Yes	**No**
In which knee have you had pain or problems?	1	0
Have you had surgery to your knee?	0	1
Have you ever had a knee cap that has gone out of joint (dislocated)?	0	1
Since starting with your knee problem, does your knee ever swell up?	0	1
Have you had pain and discomfort for more than one month?	1	0
Thinking about your right (left) knee, what do you consider is your main problem with your knee?	1	0
(in the presence of bilateral pain, a maximum score of 1 was given for each clinical feature)		
Thinking about your right (left) knee, did your current knee problem come on	1	0
Section 4: knee pain map	**Scores**	
The participants were asked to determine the number of area in which they experience pain (total of six areas in both knees)	One are gets a score of 1	
	In this section, the minimum score was 0, and the maximum score was 6	
Total score	The participants were shown by calculating the scores on sections 2 and 4.The participants with a total score < 6 were considered to have self-reported knee pain but not PFP. The participants with a total score ≥ 6 were considered to have PFP.	
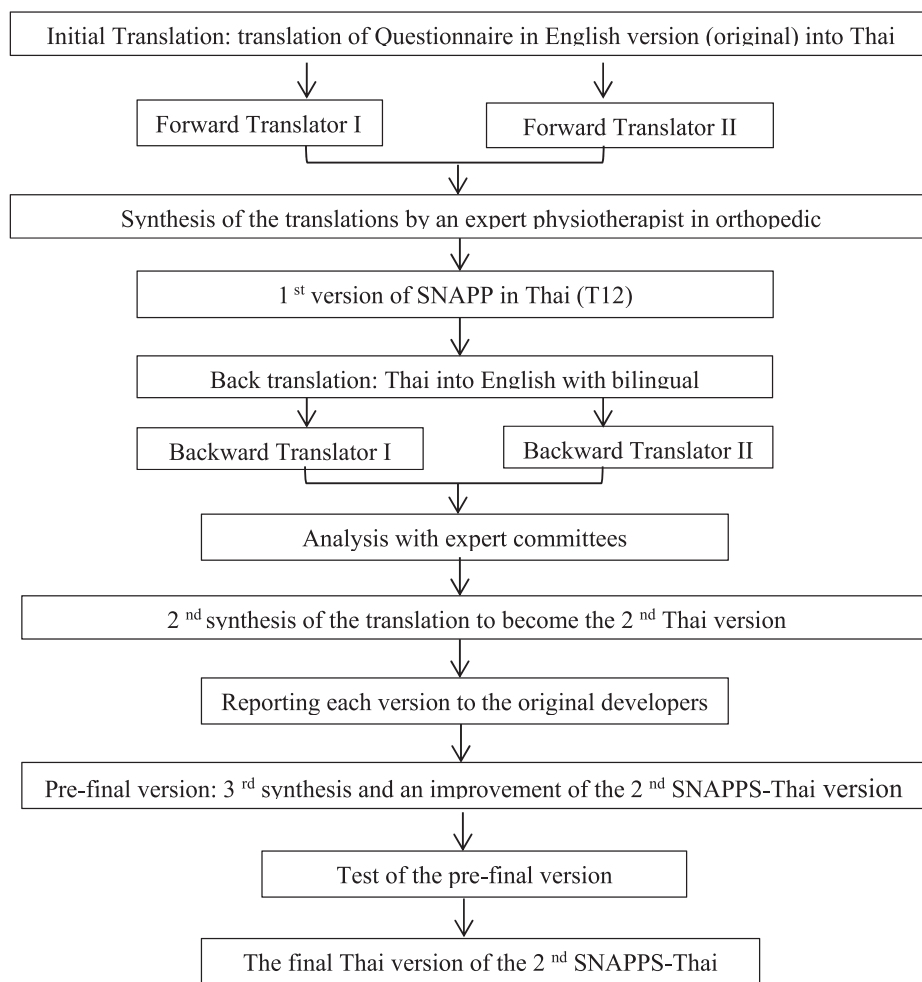
Fig. 1. Diagram representing the process of The Survey Instrument for Natural History, Aetiology and Prevalence of Patellofemoral Pain (SNAPPS) to Thai.
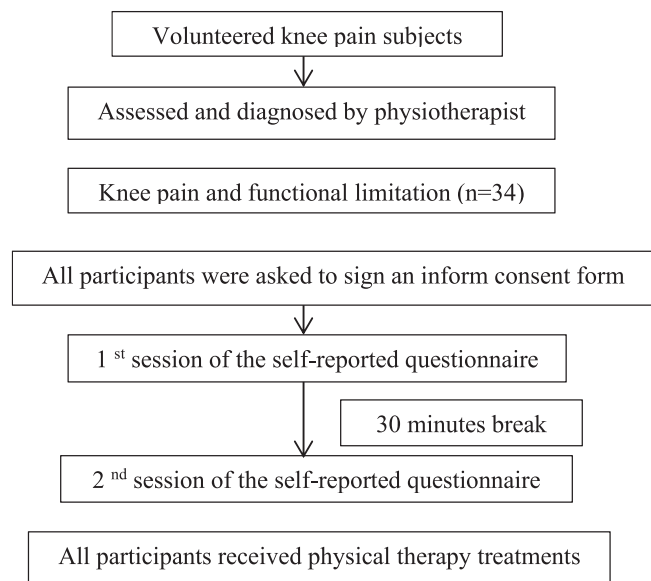
Fig. 2. Diagram representing the method for the test-retest reliability study of the Thai version of the Survey Instrument for Natural History, Aetiology and Prevalence of Patellofemoral Pain (SNAPPS).

Table 2
Demographic and clinical characteristics of participants.

Variables	Mean ± SD or Number with percentages
Gender	
Male	19 (55.9)
Female	15 (44.1)
Age (year)	21.14 (1.25)
Affected Side	
Right	13 (38.2)
Left	14 (41.2)
Both	7 (20.6)
Type of physical activity or Sport	
Volleyball	7 (20.6)
Futsal	5 (14.7)
Football	4 (11.8)
Rugby	4 (11.8)
Ballroom dance	4 (11.8)
Athletic	3 (8.8)
Basketball	2 (5.9)
Badminton	2 (5.9)
Sepak Takraw	2 (5.9)
Swimming	1 (2.9)
Symptom of pain	
VAS-U	4.58 (1.84)
VAS-W	6.90 (1.919)
VAS-S	4.18 (2.42)
VAS- J	4.82 (2.52)
VAS-R	5.10 (2.30)
VAS-SQ	5.31 (2.76)

Visual analog scale for usual (VAS-U), worst pain (VAS-W) and pain during activities (VAS-activities) as ascending and descending stairs(VAS-S), jumping (VAS- J), running (VAS- R), and squatting (VAS- SQ).

moderate and below 0.5 being considered weak reliability.[12] The correlation of SNAPPS and VAS-U, VAS-W, VAS-S, VAS- J, VAS- R, and VAS- SQ were analyzed by Pearson correlation (r) which is a number between −1 and +1 that indicates how strongly two variables correlate. Coefficient values between 0.00 and 0.29, 0.30−0.49, 0.50−0.69, 0.70−0.89 and 0.90−1.00 are indicative of negligible, low, moderate, high, and very high correlation respectively [13]

Results

The thirty-four participants who performed the test-retest reliability of the Thai version of SNAPPS included nineteen males and fifteen females. The only variables with statistically significant differences between male and females were weight and height. The mean age of the participants was 21.14 (1.25) years. There were 13 participants with right-side PFP, 14 participants with left-side PFP and 7 with bilateral PFP. There were 30 participants with chronic pain spread among 10 sports. The sports included volleyball, futsal, football, rugby, ballroom dance, athletics, basketball, badminton, sepak takraw and swimming. The results of the symptom pain-scales of anterior knee pain included VAS-U (4.58 ± 1.84), VAS-W (6.90 ± 1.91), VAS-S (4.18 ± 2.42), VAS-J (4.82 ± 2.52), VAS-R (5.10 ± 2.30) and VAS-SQ (5.31 ± 2.76) respectively (Table 2).

The first stage, forward translation with two bilingual speakers, and the second stage, synthesis, found that both translators used different words such as formal or informal but with similar or same meanings. The third stage, backward translation with two other bilinguals, found that both used different words, phrases and sentences from the original, though with similar meanings (Table 3).

Some problems of the translation that we found were grammatical difficulties such as the original question **"Have you had pain and discomfort for more than one month?"** which means "for more than one month to today" which is different to the backward translation of **"Have you _ever_ had knee pain for more than 1 month?"**. Additional examples include adjectives and adverbs with different meanings such as **"always"** and **"usually"**. Some words need to be translated specifically by a medical expert or medical terminology dictionary such as **"arthroscopy"**,

"locking" and "giving way". In English, **'have you ever'** questions can be answered with **'yes' or 'no'**, but in Thai language, **'have you ever'** questions are only answered with **'I have' or 'I have not/ never'**. So the backward translation will show a discrepancy in the case of 'have you ever' questions. Additionally, the question in English **'which knee'** can be answered with **'left knee' or 'right knee'**. In Thai, the way to write the answers **is 'the left side knee' or 'the right side knee'**. Therefore, the expert committee had to synthesize and improve the translation to become the 2 nd and 3 rd Thai versions and completed backward translation before reporting to the original developers. The original developers had four queries to clarify: the back translation including the term 'laparoscopy' did not match their original meaning of 'arthroscopy', so the term was removed; have you had knee surgery had the back translated answer of 'never' instead of 'no', because of the structure of Thai language, so it was left as is; the answer 'left knee' was back translated as 'left side' because of the structure of Thai language, so it was left as is; the back translation including the term 'deformity' did not match their original meaning of 'twist', so the term was changed in the Thai language version.

The pretest of the new target language questionnaire found that the participants could understand the questions. Some participants were confused by the knee map diagram, as they were reading it in reverse. The test-retest reliability was 0.91, by calculating the ICC, ranging from 0.83 to 0.954 (Table 4), indicating very strong test-retest reliability of the Thai version of the Survey Instrument for Natural History, Aetiology and Prevalence of Patellofemoral Pain. Additionally, this study has found that the SNAPPS only has a correlation with visual analog scale during ascending and descending stairs (VAS-S) (r = 0.403) with significance at the 0.05 level (Table 5).

Discussion

The Survey Instrument for Natural History, Aetiology and

Table 3
Comparison between the back-translation and original version.

Original English version	Back-translated English version of first translator	Back-translated English version of second translator
Are you aged over 18?	Are you over 18 years old?	Are you older than 18 years old?
Have you ever had a knee cap that has gone out of joint (dislocated)?	Have you ever had a patella slips out of the joint's normal location?	Have you experienced patella dislocation?
walking on a level surface	walking on the flat floor	walking on even surfaces
going downstairs	going down the stairs	walking down the stairs

Table 4
Mean and standard deviation of test-retest of The Survey Instrument for Natural History, Aetiology and Prevalence of Patellofemoral Pain (SNAPPS).

SNAPPS	Mean (standard deviation)		ICC	95% Confidence interval	
	Time1	Time 2		Lower Bound	Upper Bound
Total score	8.47 (1.58)	8.58 (1.86)	0.91	0.831	0.954

Table 5
Correlation coefficient matrix of SNAPPS and visual analog scale.

Variables	Correlations					
	VAS-U	VAS-W	VAS- S	VAS- J	VAS- R	VAS- SQ
SNAPPS	0.134	0.071	0.403*	0.302	0.318	0.247

*Correlation is significant at the 0.05 level.

Prevalence of Patellofemoral Pain, (SNAPPS) based on clinical features and a knee pain map had high sensitivity and specificity. In addition, the test-retest reliability suggested good agreement. This tool was a low cost and convenient self-report questionnaire which is useful to identify people with PFP.[4] Although, it has been translated into ten languages, this tool would be useful and helpful to diagnose PFP if it was translated into more languages and studied more. Therefore, the process of Cross-Cultural Adaptation of the questionnaire is important prior to use in a new country or a target language, culture, to reach equivalence between the original and new versions of the questionnaire. The expert committee had to review the source and the back-translated questionnaires for all such equivalences. They made the decision to achieve equivalence in four areas such as semantic, idiomatic, experiential and conceptual.[8,14,15] The new Thai version has achieved linguistic equivalence while considering a new cultural context and maintaining the meaning and intent of the original.

Prior to any measurement or assessment tools being used for research or clinical applications, their reliability has to be established. Therefore, the purpose of this study was to conduct a cross-cultural adaptation and determine the test-retest reliability of the first Thai version of the SNAPPS among males and females university athletes. The results of backward translation showed minorly different translations among translators. We thus had to produce a third English version with one more language expert to approve. Similarly, Selfe et al. (2019) reported the German version of the SNAPPS tool had high accuracy in translation with some minor discrepancies and some minor deviations from the original.[16] The most miscomprehended questions were related to technical terms such as "giving way" because three bilingual translators did not have the clinical or medical background (T1, B1, and B2). Therefore, it was necessary to have a bilingual translator (T2) who is an expert physiotherapist in orthopedics, with a medical and professional language background, to check and judge the final of Thai version. Moreover, this study conducted test-retest reliability intraclass correlation coefficient ($ICC_{3, 1}$) where an exceptional

value was considered as greater than 0.7. The intraclass correlation coefficient of 0.91 indicated very strong reliability.

The Thai language is a language that is always changing over time. It has a complex structure and implied meaning. Western and Thai educators agreed that the errors of translation were derived from a lack of profound understanding of three standpoints including cultures, syntax and semantics.[17]

Individual cultures have unique or specific concepts that cannot be found in other languages; culture involving meaning of words, sentence patterns, responses to questions and understanding. For example, in yes/no questions in Thai, people often prefer to answer "yes" when they do not understand or are unsure. In English, the response would more likely be "I don't understand".[18] For questions like "Have you done something/been somewhere?" in Thai, the answers are normally "never or ever", but in English, they were "yes or no".

The cultural differences happened frequently, so it was adapted using specific grammatical structures or terms. The passive voice structure was more frequent in English than in Thai, especially in academic and scientific writings.[19] Thep–Ackrapong (1997) discussed the cultural aspect of translation in terms of background knowledge of the text.[20]

Each language has its own syntax or language structures. So translators have to gain a thorough understanding in order to interpret the source text and reduce mistakes. The difference in form was the most common problem in translation. Regarding tenses, in English there was more understanding of details in the present, past and future and also how they were interrelated whereas in the Thai language they did not have any specific pattern. All English verbs were changed according to the time pattern, but the Thai verbs were not changed and Thai tenses were only marked by adverbs of time. If the translators understood the meaning of each tense, they could interpret it with less error. In addition, word order was the most frequent mistake; English modifiers came before nouns while the Thai counterparts were after nouns such as the translation word by word in Thai "pain knee" means knee pain in English. The noun classifier of the Thai language is often used when the noun is being counted such as "the left/right side knee" means left/right knee, "knee 2 sides" means both knees. The semantic problems were caused by cultural differences which impacted words and meaning.

The SNAPPS questionnaire showed a positive relationship with VAS-S, when indicating pain while walking up and down stairs. According to theory about the biomechanics of the knee joint, patellofemoral joint reaction force (PJRF) and patellofemoral joint stress (PFJS) can significantly increase during daily activities, sports and recreational activities. PJRF is the resultant compression force acting on the joint and is dependent on angle of knee and muscle tension. Studies have demonstrated that PJRF is 3.3 times body weight during stair ambulation.[21] Excessive PFJS also appears to be the cause of PFP.[22] During the controlled lowering phase of step descent, the hip, knee and ankle joints start from a rather extended position and then flex, which causes a progressive increase in the external flexion moments which, in order to prevent collapse, have

to be matched by the generation of progressively higher levels of eccentric muscle contraction. Anatomically, the stance knee starts in a relatively stable extended position and progressively moves into a more unstable position of flexion as controlled lowering takes place. This also causes a progressive demand for increased muscular control. During stair descent as knee flexion occurs, due to the proximal shift of the patella contact zone, the patella tendon lever lengthens and the quadriceps lever shortens. The effect of the moving contact zone is quite significant; at angles of less than 60° knee flexion the quadriceps lever arm works with a mechanical advantage, however, at angles of greater than 60° knee flexion the quadriceps work at a mechanical disadvantage. An interesting paradox is therefore created, as the external moment increases with progressive knee flexion the demand for higher levels of eccentric quadriceps activity increases at the same time as which the quadriceps are becoming progressively less efficient.[23] When a patient with PFP walks down stairs, it results in increasing the moment arm and pain is elevated.[24]

The study had several limitations. First, the participants of this study were 19–24 year old university students, though the instrument is designed specifically for 18–40 year olds. The characteristics of the participants were a factor which impacted on the results such as age range and level of education because they had different understanding of the questionnaire. Further studies are needed to analyze other populations, which could confirm validity and reliability for usage more widely. Second, the sample size of test-retest, 34 people, is the same size as cross-cultural adaptation, was based on Beaton et al. (2000), i.e. 30-40 participants. This was not calculated from previous cross-cultural adaptations studies because they had not shown the results of their test-retest yet. The number of participants was similar to the original paper (26 participants). Third, the researcher chose a 30 min time interval due to the potential fluctuations in pain intensity and for the convenience of participants. A previous study of cross-cultural validation and test-retest reliability of the Thai version of the kujala patellofemoral questionnaire also chose a 30 min time interval, with excellent reliability (ICC = 0.98), the same as studies in other countries even though the times intervals chosen were different.[9] The participants of this study were athletes who had a busy schedule of physical activities and sport, so this short interval helped to confirm that other confounding factors such as physical activities or treatment did not cause deviations in the clinical conditions. Further, this tool still needs to determine the correlation with other Thai version instruments which relate with anterior knee pain such as the Kujala, Short Form 36 general health outcome (SF-36) and International Knee Documentation Committee (IKDC).

Conclusion

The Thai version of the Survey Instrument for Natural History, Aetiology and Prevalence of Patellofemoral Pain was cross-culturally adapted and validated. It showed very strong reliability. The Thai version can be used to assess PFP in young Thai patients.

Funding

Authors' contribution

Wannaporn Sumranpat Brady and Nuttapong Khachornsaeng-charoen were involved in forward translation. Athawit Buahong and Pongthorn Asawaniwed were involved in backward translation. Yodchai Boonprakob and Thooptong Kwangsawad were involved in synthesis of the translation. Michael Callaghan and James Selfe were involved in equivalence between the original and backward translation. Wannaporn Sumranpat Brady involved in the collection of data. Wannaporn Sumranpat Brady and Yodchai Boonprakob involved in the analysis of the study. All authors have read and approved the final manuscript.

Declaration of competing interest

The author(s) have no conflicts of interest relevant to this article.

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References

1. Goldberg AS, Moroz L, Smith A, Ganley T. Injury surveillance in young athletes: a clinician's guide to sports injury literature. *Sports Med*. 2007;37(3):265–278. https://doi.org/10.2165/00007256-200737030-00005.
2. Halabchi F, Abolhasani M, Mirshahi M, Alizadeh Z. Patellofemoral pain in athletes: clinical perspectives. *Open Access J Sports Med*. 2017;8:189–203. https://doi.org/10.2147/OAJSM.S127359.
3. Selfe J, Janssen J, Callaghan M. *Patellofemoral Pain: An Evidence Based Clinical Guide*. Nova Science; 2017.
4. Dey P, Callaghan M, Cook N, et al. A questionnaire to identify patellofemoral pain in the community: an exploration of measurement properties. *BMC Muscoskel Disord*. 2016;17:237.
5. Xu, Yao, Wu, et al. Prevalence of patellofemoral pain and knee pain in the general population of Chinese young adults: a community-based questionnaire survey. *BMC Muscoskel Disord*. 2018;19(165):1–6. https://doi.org/10.1186/s12891-018-2083-x.
6. Akodu Ashiyat, Nkechi Nwakalor. Patellofemoral pain syndrome: prevalence and coping strategies of amateur runners in Lagos state. *Med. Sport. XIV*. January. 2018;(2):3059–3067.
7. Ibeachu C, James Selfe, Dey P. Knee problems are common in young adults and associated with physical activity and not obesity: the findings of a crosssectional survey in a university cohort. *BMC Muscoskel Disord*. 2019;20(116). https://doi.org/10.2286/s12891-091-2487-2.
8. Beaton DE, Bombardier C, Guillemin F, Ferraz MB. Guidelines for the process of Cross-cultural adaptation of self-report measures. *Spine*. 2000;25(24):3186–3191.
9. Sakunkaruna Y, Sakulsriprasert P. Thai version of the kujala patellofemoral questionnaire in knee pain patients: cross-cultural validation and test-retest reliability. *J Med Assoc Thai*. 2015;98(5):81–85.
10. Halabchi F, Abolhasani M, Mirshahi M, Alizadeh Z. Patellofemoral pain in athletes: clinical perspectives. *Open Access J Sports Med*. 2017;8:189–203. https://doi.org/10.2147/OAJSM.S127359.
11. Crossley Kay M, Callaghan Michael J, van Linschoten Robbart. Patellofemoral pain. *BMJ*. 2015;351:h3939. https://www.bmj.com/content/351/bmj.h3939.
12. Koo TK, Li MY. A guideline of selecting and reporting intraclass correlation coefficients for reliability research. *J Chiropr Med*. 2016;15:155–163.
13. Hinkle DE, William W, Stephen GJ. *Applied Statistics for the Behavior sciences*. 4th ed. New York: Houghton Mifflin; 1998.
14. Sperber AD. Translation and validation of study instruments for cross-cultural research. *Gastroenterology*. 2004;126:124–128.
15. Nantakas Vastipanich, Sujit Tiansawat. Translation of tools for cross-cultural research: techniques and issues to consider. *TJNC*. 2011;26(1):19–28.
16. Selfe J, Callaghan M, Yusuf M, Relph N, Gilchuru P, Dey P. Translation and cultural validation of self-reported health measures: an example using the SNAPPS questionnaire. In: *Paper presented at: World Confederation for Physical Therapy Congress (WCPT)*. 2019. May10-13; Geneva, Switzerland.
17. Owji Z. Translation strategies:A review and Comparison of theories. *Transl J*. 2013;17(1). https://translationjournal.net/journal/63theory.htm.
18. Wimonchalao W. *Translation Instruction Manual*. Bangkok: Chulalongkorn University; 1994:186.
19. Baker Mona. *In Other Words: A Coursebook on Translation*. New York: Routledge; 1992.
20. Thep-Ackrapong T. *Initial translation*. Bangkok: Chulalongkorn University; 1997.

21. Loudon JK. Biomechanics and pathomechanics of the patellofemoral joint. *Int. J. Sports Phys. Ther.* 2016;11(6):820–830.
22. Witvrouw E, Lysens R, Bellemans J, Cambier D, Vanderstraeten G. Intrinsic risk factors for the development of anterior knee pain in an athletic population. A two-year prospective study. *Am J Sports Med*. 2000;28(4):480–489.
23. Selfe J, Richards J, Thewlis. Chapter 12: common movement tasks in clinical assessment. *Biomechanics in Clinic and Research*. 2008:181–190 (Richards J.Elsevier Science).
24. Andrish JT. Biomechanics of the patellofemoral joint. *Operat Tech Sports Med*. 2015;23:62–67.