Thai Version of the Functional Rating Index for Patients with Back and Neck Pain: Part 1 Cross-Cultural Adaptation, Reliability and Validity

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Objective: *To conduct the cross-cultural adaptation of the Functional Rating Index (FRI) and to test the reliability and validity of the Thai version of FRI (Thai FRI).*

Material and Method: *The cross-cultural adaptation process was used to develop the Thai FRI. The two groups of patients comprised low back pain (LBP) and neck pain (NP). Each patient was asked to complete the questionnaires twice: at the first and second visits. The patients with LBP completed the Thai FRI, Roland-Morris Disability, modified Oswestry Low Back Pain Disability and multi-level Roland-Morris Disability, while the patients with NP completed the Thai FRI and Thai Neck Disability Index. Each patient was also asked to rate a Global Perceived Effect Scale at the second visit. Reliability and cross-sectional construct validity of the Thai FRI were evaluated. Minimal detectable change ($MDC_{95\%}$) was calculated.*

Results: *The FRI was cross-culturally adapted to Thai and the adapted version was validated. In total, 161 patients with LBP and 84 patients with NP completed the questionnaires. Cronbach's alpha for the Thai FRI equaled 0.86 for LBP and 0.83 for NP, $ICC_{2,1}$ equaled 0.82 for LBP and 0.89 for NP, correlations between the Thai FRI and other questionnaires ranged from 0.68 to 0.78 for both groups. The $MDC_{95\%}$ equaled 2.5 for LBP and 2.3 for NP.*

Conclusion: *The Thai FRI was developed and validated. Its measurement properties demonstrated acceptable internal consistency, good test-retest reliability and moderate to high cross-sectional construct validity.*

Keywords: *Functional rating index, Low back pain, Neck pain, Reliability and validity, MDC*

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A number of functional disability questionnaires have been developed to assess patients' perception in terms of their disability associated with back or neck problems. Each patient often presents concurrent complaints of back and neck problems in one visit. As a result, these patients are required to complete two questionnaires to assess their disability regarding back and neck problems. It would be practicable and less time-consuming if only one questionnaire could be administered and its scores reflect similar meaningful results as the scores obtained from two separate questionnaires.

The Functional Rating Index (FRI)[1] is a self-reported measure containing 10 items. Eight items focus on activities affected by back and/or neck problems and two items focus on intensity and frequency of pain. Each item has a 5-point scale (0 = "no pain or full ability to perform function", 4 = "worst possible pain or unable to perform function"). The FRI scores ranged between 0% (no disability) and 100% (severe disability). The FRI was reported to take approximately 68-78 seconds to complete[1,2].

The FRI has been previously demonstrated acceptable reliability, validity, responsiveness and feasibility in a number of studies[1-8]. The FRI was originally developed in English. To be useful in Thailand, this questionnaire needs cross-cultural adaptation and validation. Therefore, the present study aimed to conduct the cross-cultural adaptation of the FRI to Thai (Thai FRI) and to test measurement properties, e.g., reliability and cross-sectional validity, of the Thai FRI.

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Material and Method

The present study comprised two stages: 1) cross-culturally adapting the FRI and 2) testing measurement properties of the Thai FRI. The researcher informed the developers of the original FRI regarding

the development of the Thai FRI. The present study was approved by the Institutional Review Board, Mahidol University (MU-IRB COA. No. 2009/041.0704).

Cross-cultural adaptation

The FRI was cross-culturally adapted to Thai following the guidelines for the process of cross-cultural adaptation of self-report measure[9]. The following steps were completed as described below.

Forward translation and synthesis

Two translators, whose mother tongue was Thai, independently translated the original FRI from English into Thai. One translator was aware of the concepts of functional disability questionnaire, while the other was unaware of such concepts and had no medical background. Both translated versions were compared and merged into one consensus Thai version of the FRI.

Backward translation and synthesis

Two different translators whose mother tongue was English independently translated the consensus Thai version back to English. Both of them were unaware of the original FRI and had no medical background. The semantic, experiential and conceptual equivalence of the original and translated versions were discussed and the pre-final version of Thai FRI was developed.

Pretest

The pre-final version was administered to 40 patients with back pain. Each patient was asked for their understanding of the meaning of questionnaire items and response options. The final version was called "the Thai FRI". The Thai FRI was then used to test its measurement properties.

Testing measurement properties

This stage was conducted by recruiting the participants from the physical therapy department in nine hospitals in Thailand. The participants were eligible if they were: 1) aged 18 years or older, 2) seeking physical therapy treatment for complaints of back and/or neck pain and 3) able to understand, read, speak and write Thai.

The eligible participants, willing to take part in the study, were invited to complete informed consent forms. Each participant was asked to complete their characteristic data including age, weight, height, site and duration of their symptoms. Then the participants were asked to complete the questionnaires administered twice: at the first and the second visits.

At the first visit, the participants with back pain were asked to complete the Thai FRI, Thai Roland-Morris Disability (Thai RM)[10], Thai modified Oswestry Low Back Pain Disability (Thai modified ODQ)[11] and Thai multi-level Roland-Morris Disability (Thai multi-level RM)[4]. The patients with neck pain were asked to complete the Thai FRI and Thai NDI. At the second visit, all participants were asked to complete the Thai FRI and a 7-point global perceived effect scale (GPES; 3 = completely recovered, 2 = much improved, 1 = slightly improved, 0 = no change, -1 = slightly worsened, -2 = much worsened, and -3 = vastly worsened). The reliability and validity of the Thai FRI were analyzed.

Data analysis

The mean and standard deviation (SD) were calculated for the Thai FRI, Thai RM, Thai modified ODQ, Thai multi-level RM and Thai NDI. The questionnaire scores from the first visit were used to evaluate the internal consistency, frequency of endorsement, and cross-sectional construct validity. The questionnaire scores from both visits were used to evaluate the test-retest reliability. As the FRI was designed to be used in back and/or neck problems, the scores obtained from the participants were analyzed separately.

Internal consistency, cross-sectional construct validity, test-retest

Internal consistency was evaluated by calculating Cronbach's alpha, inter-item correlations and item-total correlations. For acceptable internal consistency, Cronbach's alpha is between 0.70 and 0.90. Values less than 0.70 indicated irrelevant questionnaire items, whereas values greater than 0.90 indicated redundancy of the questionnaire items[12]. For acceptable inter-item correlation, each item should correlate with other items to indicate how well each individual item fits in with the overall items. The item, which has consistently low correlations with all other items, indicated that the item differs from the other items and should not be included in the questionnaire. However, this correlation value should be less than 0.75. A value greater than 0.75 indicated potential redundancy between each item of the questionnaire[13]. For an acceptable item-total correlation (or correlations between each item and total score when that item was deleted), values should be greater than 0.40. Values less than 0.40 indicated that the deleted item is less

relevant to the rest of the items[13].

The ceiling or floor effects were evaluated by calculating the frequency of endorsement of each response option for each item of the Thai FRI. The questionnaire exhibits the ceiling effect if more than 80% of respondents rate the 'no' response for the yes/no response option, whereas the questionnaire exhibits the floor effect if more than 80% of respondents rate the 'yes' response[12].

The cross-sectional construct validity was evaluated by calculating the correlations between the Thai FRI and other questionnaires commonly used for back and/or neck disability. Two priori hypotheses were set as follows. The validity of the Thai FRI would be supported if a high correlation ($|r|>0.70$) would exist between the Thai FRI and Thai RM, Thai modified ODQ and Thai multi-level RM. Moreover, the validity of the Thai FRI would be supported if a moderate correlation ($0.40\leq |r| \leq 0.70$) were to exist between the Thai FRI and Thai NDI.

In addition, the questionnaire scores from the first and second visits for the participants who reported that their symptoms had not changed (GPES = 0) were analyzed to calculate the test-retest reliability coefficient ($ICC_{2,1}$). For good reliability, the ICC value is greater than 0.75[14]. Standard error of measurement (SEM) was also calculated. The $SEM_{test\text{-}retest}$ was calculated by the square root of an error variance with the $ICC_{2,1}$ [4]. Minimal detectable change at 95% confidence ($MDC_{95\%}$) was calculated using the following formula: $MDC_{95\%}$ = Square root of 2 x $SEM_{test\text{-}retest}$ x 1.96[15,16]. All analyses were performed using SPSS 18.0.

Results

Cross-cultural adaptation

For the pre-final version of Thai FRI, two issues were adapted. First, item 6 of the original FRI used the word 'recreation'. Several participants taking part in testing the pre-final version asked the author about the meaning of this word. Hence, an additional explanation was given to this item for clarification. Second, the response option of item 9 (walking) of the original FRI contained the unit of distance 'mile' which was unfamiliar to Thais. Hence, the word 'meter' was used to replace the mile unit.

Testing measurement properties

Sample 1 (internal consistency, frequency of endorsement and cross-sectional construct validity). In total, 163 patients with back pain and 84 patients with neck pain returned the Thai FRI. In all, 161 patients with back pain completed all items of the Thai FRI and Thai multi-level RM on the same day. Of these, 111 patients with back pain also completed the Thai RM and Thai modified ODQ on the same day. Eighty-four patients with neck pain completed all items of the Thai FRI. Therefore, the fully completed Thai FRI scores were used to analyze the internal consistency and frequency of endorsement. In total, 111 patients with back pain and 84 patients with neck pain were used to analyze cross-sectional construct validity.

Sample 2 (test-retest reliability). In sum, 23 patients with back pain and 8 patients with neck pain, who rated their symptoms unchanged in the second visit, were analyzed to calculate the test-retest reliability coefficient ($ICC_{2,1}$). The mean duration between the first and initial visits was 7.15 days (range = 1-28 days) for the back pain group, and 2.83 days (range = 1-5 days) for the neck pain group. The results are given in Table 2.

Discussion

The present study aimed to conduct the cross-cultural adaptation of the original English version of the FRI to Thai according to the recommended guidelines[9]. The measurement properties test of the Thai FRI was also evaluated. The results showed that one item and one response option required adaptation to ensure the proper understanding of word meanings. The Thai FRI had acceptable internal consistency, moderate to high cross-sectional construct validity, minimal ceiling and floor effects, and good test-retest reliability.

For the cross-cultural adaptation process, a few modifications were made at items 6 and 9. For the internal consistency analysis, Cronbach's alpha values for both back and neck pain groups were within the acceptable range indicating that the items of the Thai FRI were homogenous and not redundant. Cronbach's alpha values in the present study were slightly lower than previous studies ranging from 0.89-0.96[1-3,6-8].

The low inter-item correlation values of the two item-pairs indicated that these items should not be part of the questionnaire as shown in Table 2. However, such correlation values were within the acceptable range (less than 0.75) indicating no potential redundancy between each item of the Thai FRI. Moreover, all item-total correlations for the back pain group were greater than 0.40 and all Cronbach's alpha values were similar when each item was deleted (0.83-0.85). These findings ascertained the homogeneity of the items of the Thai FRI. For the neck pain group;

Table 1. Participant characteristics of Sample 1 (internal consistency, frequency of endorsement, and cross-sectional construct validity) and Sample 2 (test-retest reliability)

Characteristics	Sample 1		Sample 2	
	Back (n = 161)	Neck (n = 84)	Back (n = 23)	Neck (n = 8)
Age (year), mean ± SD	49.8±13.1 range 18-85	49.0±11.5 range 24-80	56.4±9.3 range 38-78	53.4±10.8 range 41-76
Height (cm), mean ± SD	161.1±8.9 range 41-117	160.3±7.5 range 145-175	157.0±7.4 range 146-172	162.1±8.0 range 150-172
Weight (kg), mean ± SD	62.0±12.7 range 41-117	60.1±11.5 42-85	63.1±12.2 range 41-85	64.4±9.9 range 52-85
Sex: female, n (%)	104 (64.6)	64 (76.2)	18 (78.3)	5 (62.5)
Duration of symptoms[a], n (%):				
<7 days	23 (14.3)	8 (9.5)	2 (8.7)	1 (12.5)
1 week-1 month	40 (24.8)	19 (22.6)	3 (13.0)	1 (12.5)
>3 months	98 (60.9)	54 (64.3)	18 (78.3)	6 (75.0)

[a] Missing values; n = 3 (3.6%)

Table 2. Summary of measurement properties testing of the Thai FRI

Measurement properties/values	Back pain group	Neck pain group
Cronbach's alpha	0.86	0.83
Mean FRI score$_{day\ 1}$ ±SD	18.5±7.4	16.9±6.9
Inter-item correlation (range)	0.16-0.66	0.09-0.72
Item-total correlation (range)	0.46-0.66	0.32-0.67
Ceiling effect	23.6% for item 2 21.7% for item 3 28% for item 6	20.2% for item 3 20.2% for item 6 35.7% for item 9 28.6% for item 10
Floor effect	25.5% for item 10	-
Construct validity	Thai FRI vs. Thai RM; r = 0.68, Thai FRI vs. Thai modified ODQ; r = 0.78, Thai FRI vs. Thai multi-level RM; r = 0.77	Thai FRI vs. Thai NDI = 0.75
$ICC_{[2,1]}$ (95% CI)	0.82 (0.70-0.91)	0.89 (0.75-0.97)
$SEM_{test\text{-}retest}$	0.90	0.80
$MDC_{95\%}$	2.50	2.30

Thai FRI = Thai Functional Rating Index; SEM = standard error of measurement; ICC = intraclass correlation coefficient; MDC = minimal detectable change; Thai RM = Thai Roland-Morris Disability; Thai modified ODQ = Thai modified Oswestry Low Back Pain Disability; Thai multi-level RM = Thai multi-level Roland-Morris Disability; Thai NDI = Thai Neck Disability Index

however, one item-total correlation value for item 2 was less than 0.40. This finding implied that this item should reflect a different dimension of function than the rest of items.

The results of the ceiling and floor effects analysis showed that more than 20% of the participants in the back pain group rated some minimum and maximum values of the Thai FRI. These results indicate that some ceiling and floor effects existed. However, there was no floor effect for the neck pain group. For the cross-sectional construct validity, high correlation values between the Thai FRI and other functional disability questionnaires were found. These findings indicate that these questionnaires had the same construct. The correlation values in the present study were in agreement with those in previous studies

ranging from 0.58-0.75 for both patients with lower back pain[2,3,5-8], and neck pain[17].

For the test-retest reliability analysis, level of agreement for the Thai FRI for both back and neck pain groups showed good reliability. The $ICC_{(2,1)}$ values obtained from the present study were also in agreement with those in previous studies[5] ranging from 0.63-0.99[1-5,7,8].

Conclusion

The FRI was cross-culturally adapted to Thai and the reliability and validity of the Thai FRI was examined. Two items were adapted for greater understanding. The results showed acceptable internal consistency, good test-retest reliability and moderate to high cross-sectional construct validity. However, some ceiling and floor effects were reported.

What is already known on this topic?

The FRI is one of several self-reported questionnaires for patients with back and/or neck problems. The FRI has been cross-culturally adapted to many languages, but not Thai.

What this study adds?

The Thai FRI was developed. Its internal consistency, test-retest reliability, and cross-sectional construct validity were acceptable.

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Potential conflicts of interest

None.

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Appendix.

ตัวชี้วัดระดับความสามารถในการทำงานใช้สำหรับผู้ที่มีปัญหาคอ และ/หรือหลังเท่านั้น

เพื่อประเมินสภาวะอาการของท่านได้อย่างถูกต้อง ผู้ประเมินต้องเข้าใจว่าปัญหาคอ และ/หรือหลังของคุณ ส่งผลต่อความสามารถในการทำกิจกรรมในแต่ละวันมากน้อยเพียงใด

สำหรับแต่ละรายการข้างล่างนี้, กรุณาวงกลมล้อมรอบหมายเลข 0-4 ที่อธิบายภาวะของคุณในขณะนี้ได้ใกล้เคียงมากที่สุด

1. ระดับอาการเจ็บปวด

0	*1*	*2*	*3*	*4*
ไม่ปวด	*ปวดเล็กน้อย*	*ปวดปานกลาง*	*ปวดมาก*	*ปวดมากที่สุด*

2. การนอนหลับ

0	*1*	*2*	*3*	*4*
หลับได้ดี	*รบกวนการนอน เล็กน้อย*	*รบกวนการนอน ปานกลาง*	*รบกวน การนอนมาก*	*รบกวนการนอน มากที่สุด*

3. การดูแลตนเอง (ชำระล้างร่างกาย, การแต่งตัว, อื่นๆ)

0	*1*	*2*	*3*	*4*
ไม่ปวด; ไม่จำกัด การทำกิจกรรม	*ปวดเล็กน้อย; ไม่จำกัด การทำกิจกรรม*	*ปวดปานกลาง; ทำกิจกรรมได้เอง อย่างช้าๆ*	*ปวดปานกลาง; ต้องการความช่วยเหลือ ในการทำกิจกรรมเป็นบางครั้ง*	*ปวดมาก; ต้องการความช่วยเหลือ ในการทำกิจกรรม 100%*

4. การเดินทาง (ขับรถยนต์, อื่นๆ)

0	*1*	*2*	*3*	*4*
ไม่ปวด เมื่อเดินทาง ระยะไกล	*ปวดเล็กน้อย เมื่อเดินทาง ระยะไกล*	*ปวดปานกลาง เมื่อเดินทาง ระยะไกล*	*ปวดปานกลาง เมื่อเดินทาง ระยะใกล้*	*ปวดมาก เมื่อเดินทาง ระยะใกล้*

5. การทำงาน

0	*1*	*2*	*3*	*4*
ทำงานได้ตามปกติ รวมทั้งทำงานอื่นได้	*ทำงานได้ตามปกติ แต่ไม่สามารถทำงานอื่นๆ ที่นอกเหนืองานปกติได้*	*ทำงานได้ 50% ของงานปกติ*	*ทำงานได้ 25% ของงานปกติ*	*ไม่สามารถ ทำงานได้*

Appendix. *cont.*

6. กิจกรรมนันทนาการ (กิจกรรมยามว่าง)				
0	*1*	*2*	*3*	*4*
ทำได้	*ทำกิจกรรมได้*	*ทำกิจกรรมได้*	*ทำกิจกรรมได้*	*ไม่สามารถ*
ทุกกิจกรรม	*เป็นส่วนใหญ่*	*บางส่วน*	*เล็กน้อย*	*ทำกิจกรรมได้*
7. ความถี่ของความรู้สึกปวด				
0	*1*	*2*	*3*	*4*
ไม่ปวด	*ปวดเป็นบางครั้ง;*	*ปวดเป็นระยะ;*	*ปวดบ่อย ๆ;*	*ปวดตลอดเวลา;*
	25% ต่อวัน	*50% ต่อวัน*	*75% ต่อวัน*	*100% ต่อวัน*
8. การยกของ				
0	*1*	*2*	*3*	*4*
ไม่ปวด	*ปวดเพิ่มขึ้น*	*ปวดเพิ่มขึ้น*	*ปวดเพิ่มขึ้น*	*ปวดเพิ่มขึ้นเมื่อยกของ*
เมื่อยกของหนัก	*เมื่อยกของหนัก*	*เมื่อยกของหนักปานกลาง*	*เมื่อยกของเบา*	*ใด ๆ ก็ตาม*
9. การเดิน				
0	*1*	*2*	*3*	*4*
เดินได้ดีโดย	*ปวดเพิ่มขึ้น*	*ปวดเพิ่มขึ้น*	*ปวดเพิ่มขึ้น*	*ปวดเพิ่มขึ้น*
ไม่มีอาการปวด	*หลังจากเดินได้*	*หลังจากเดินได้*	*หลังจากเดินได้*	*เมื่อเริ่มเดิน*
ตลอดการเดิน	*1,600 เมตร*	*800 เมตร*	*400 เมตร*	
10. การยืน				
0	*1*	*2*	*3*	*4*
ไม่มีอาการปวด	*ปวดเพิ่มขึ้น*	*ปวดเพิ่มขึ้น*	*ปวดเพิ่มขึ้น*	*ปวดเพิ่มขึ้น*
หลังจากยืนเป็นเวลา	*หลังจากยืนเป็นเวลา*	*หลังจากยืนเป็นเวลา*	*หลังจากยืนเป็นเวลา*	*เมื่อยืน*
หลายชั่วโมง	*หลายชั่วโมง*	*1 ชั่วโมง*	*30 นาที*	

Functional Rating Index ฉบับภาษาไทยสำหรับผู้ป่วยปวดหลังและคอ ตอนที่ 1: การปรับข้ามวัฒนธรรม ความเชื่อถือได้ และความตรง

วรรณเพ็ญ จันทร์ศิรินุเคราะห์

วัตถุประสงค์: *เพื่อปรับข้ามวัฒนธรรมของแบบสอบถาม Functional Rating Index (FRI) และทดสอบความเชื่อถือได้และความตรงของแบบสอบถาม FRI ฉบับภาษาไทย*

วัสดุและวิธีการ: *ใช้กระบวนการปรับข้ามวัฒนธรรมเพื่อพัฒนาแบบสอบถาม FRI ฉบับภาษาไทย มีผู้ป่วยสองกลุ่ม คือปวดหลังส่วนล่างและปวดคอ ผู้ป่วยแต่ละรายตอบแบบสอบถาม 2 ครั้ง คือวันที่รักษาทางกายภาพบำบัดครั้งที่ 1 และ 2 ผู้ป่วยปวดหลังตอบแบบสอบถาม FRI, โรแลนด์-มอริส, โมดิฟายด์ออสเวสทรี และโรแลนด์-มอริสแบบหลายระดับฉบับภาษาไทย ผู้ป่วยปวดคอตอบแบบสอบถาม FRI และ Neck Disability Index ฉบับภาษาไทย ผู้ป่วยแต่ละรายให้คะแนน Global Perceived Effect Scale ในครั้งที่ 2 แล้วประเมินความเชื่อถือได้และความตรงของแบบสอบถามและคำนวณค่า Minimal detectable change ที่ความเชื่อมั่น 95% ($MDC_{95\%}$)*

ผลการศึกษา: *ผู้ป่วยปวดหลัง 161 คนและปวดคอ 84 คนตอบแบบสอบถาม Cronbach's alpha 0.86 สำหรับกลุ่มปวดหลังและ 0.83 สำหรับกลุ่มปวดคอ, $ICC_{2,1}$ 0.82 สำหรับกลุ่มปวดหลังและ 0.89 สำหรับกลุ่มปวดคอ, ความสัมพันธ์กับแบบสอบถามอื่น 0.68-0.78 ทั้งสองกลุ่ม และ $MDC_{95\%}$ 2.5 สำหรับกลุ่มปวดหลังและ 2.3 สำหรับกลุ่มปวดคอ*

สรุป: *แบบสอบถามฉบับภาษาไทยถูกพัฒนาและทดสอบผลคุณสมบัติการวัดแสดงว่าแบบสอบถามฉบับนี้มีความเชื่อถือได้ในเกณฑ์ดีมี ceiling และ floor effects บางหัวข้อ และค่าความตรงเชิงโครงสร้างปานกลางถึงสูง*