

Cross-Cultural Adaptation of the Fall Risk for Older People – A Community Setting (FROP-Com) Assessment Tool - Thai Version

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ABSTRACT

Objectives: The primary aim of this study was to translate and culturally adapt the Fall Risk for Older People – Community Setting (FROP-Com) assessment tool for older Thai people and to evaluate the instrument's internal consistency and reliability. The secondary goal was to identify contributing risk factors for falls in individuals assessed with the Thai-version FROP-Com tool.

Study design: Cross-sectional descriptive study

Setting: Faculty of Medicine, Vajira Hospital, Bangkok, Thailand

Subjects: Thai community-dwelling elders aged 60 years and over

Methods: This study utilized standard guidelines for the cross-cultural adaptation process, which consisted of (a) forward translation, (b) synthesis translation, (c) backward translation, (d) expert committee review, and (e) test of the pre-final version. Internal consistency was assessed using Cronbach's alpha coefficient. This study used intraclass correlation coefficients (ICC) with 95% confidence intervals to evaluate intra-rater and inter-rater reliability.

Results: The Thai FROP-Com assessment tool was successfully adapted for the Thai language. A total of 140 Thai community-dwelling participants aged 60 and older who met the inclusion criteria completed the study. Validation showed a good internal consistency of 0.96, while the intra-rater reliability was 0.92 and the Kappa coefficient was 0.89. The inter-rater reliability was 0.91 and the Kappa coefficient was 0.86.

Conclusions: The FROP-Com assessment tool displayed positive reliability and internal consistency for assessing risk factors among Thai older people. The tool was demonstrated to be valid and is now available for use with older members of the Thai population.

Keywords: Thai version, FROP-Com assessment tool, fall risk factors, Thai older people, cross-cultural adaptation

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Introduction

Globally, falls are the leading cause of death for seniors aged 60 years and over. According to the World Health Organization (WHO), the worldwide annual prevalence rate for falls among older persons varies from 28% to 35%.¹ In Southeast Asia, the prevalence of falls among individuals over 60 ranges from 10.4% to 53.6%.² In Thailand, elderly residents of urban and suburban neighborhoods had higher fall prevalence rates, ranging from 18.7% to 19.8%.^{3,4} Among older Thai people (age ≥ 65), 11% of deaths were brought on by falls.⁵ Thus, it is essential to look into and identify the risk factors that make older Thai individuals more likely to fall.

Age, gender, general health information, housing situation, and fall history have all been recognized as potential fall risk factors, both intrinsic and extrinsic, in older persons. In 2007, the WHO recommended classifying these risk factors into four categories: biological, behavioral, environmental, and socioeconomic. Many tools for assessing fall risk factors have been developed for older people in community settings. Thai-FRAT is a community-based screening tool that takes about five minutes to complete. It can be used by non-healthcare professionals and has 97% specificity when a person ticks four out of the five questions.⁶

The Physiological Profile Assessment (PPA) developed by Stephen Lord takes 45 minutes to administer. The PPA involves a series of simple tests of vision, peripheral sensation, muscle force, reaction time, and postural sway, but omits assessments of medication, medical conditions, or home hazards. A computer program using data from the PPA can be employed to assess an individual's performance with a normative database so that deficits can be targeted for intervention.⁷ The Falls Risk for Older People in the Community (FROP-Com) assessment tool is a clinical assessment tool invented to evaluate multifactorial fall risks. It can be used in time-limited situations, requiring only 5-10 minutes to classify those at high risk of falls who require more detailed assessment and

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management. The FROP-Com assessment tool includes 26 questions with either ordinal (0-3) or dichotomous scoring that address 13 risk factors: (1) history of falls, (2) number of medications, (3) number of medical conditions, (4) sensory deficit, (5) foot problems/inappropriate footwear, (6) cognitive status, (7) bladder control problems, (8) nutritional status, (9) environment, (10) functional behavior, (11) physical function, (12) balance, and (13) gait/physical activity. A score of 0-20 indicates mild to moderate fall risk, and 21-60 suggests high fall risk. The tool has a high intraclass correlation coefficient (ICC) for intra-rater reliability of 0.93 (95% CI 0.84-0.97) and a strong inter-rater reliability of 0.81 (95% CI 0.59-0.92). In a previous study, the sensitivity and specificity of FROP-Com were determined to be 71.3% (95% CI: 64.4-78.3) and 56.1% (95% CI: 48.9-63.4), respectively.⁸ This tool is simple to use, accurate, and dependable. The entire FROP-Com tool, along with its scoring standards, additional assessments, and interventions, are available at <https://www.nari.net.au/frop-com>. The primary aim of the present study was to translate the FROP-Com assessment tool developed by Russell et al.⁸ in 2009 to create a Thai version using standard guidelines for the cross-cultural adaptation process. The secondary goal was to identify contributing risk factors for falls in individuals assessed by the Thai-version FROP-Com tool.

A Thai-translated fall risk assessment version of the original tool is necessary to overcome the language barrier. The present study validated the Thai FROP-Com translation of the FROP-Com assessment instrument for thorough falls risk assessment developed by Russell et al. in 2009.⁸

Methods

Study design

This cross-sectional descriptive study consisted of two phases: cross-cultural adaptation followed by investigation of the psychometric properties of the Thai-version FROP-Com assessment tool.

The study was approved by the Faculty of Medicine Vajira Hospital, Navamindradhiraj University Institutional Review Board (COA.No.105/2018). The authors received permission to translate the FROP-Com from Dr. Frances Batchelor, Acting Director Health Promotion, MARC Program Manager, National Ageing Research Institute Ltd., PO Box 2127, Royal Melbourne Hospital, Victoria 3050, Australia via e-mail f.batchelor@nari.unimelb.edu.au. The guidelines used in the translation and the details of each step are described in Beaton et al.⁹

Participants

A total of 140 Thai community dwellers who met the following inclusion criteria were recruited: having or not having a history of falls within the past 12 months, being able to walk outdoors either with or without gait aids, and understanding Thai verbal instructions. The data were collected at the Department of Rehabilitation Medicine, Faculty of Medicine, Vajira Hospital.

The sample size was calculated using the formula for translating questionnaires.¹⁰ The minimum sample size required was 95 individuals. However, we recruited a larger sample of older people to determine the fall risk factors associated with fall status without adjusting for other factors ($p = 0.05$), a total of 140.

Intervention

In the present study, five steps of cross-cultural adaptation were conducted: (a) forward translation, (b) synthesis translation, (c) backward translation, (d) expert committee review, and (e) preliminary version testing.

Step 1. Forward translation. The FROP-Com assessment tool Russell M. et al. proposed in 2009 was translated into Thai FROP-Com. Two translators translated the original English version to Thai by matching Thai words with the same meaning to ensure the equivalence of the concept of each fall risk factor in both languages. The forward translation versions were completed by the Center for Translation and Language Services Research Institute for Languages and Cultures of Asia (RILCA), Mahidol University Salaya, Nakhon Pathom 73170, Thailand.

Step 2. Synthesis translation. The two translators and a recording observer synthesized the first and second translations, producing one common translation from the original FROP-Com assessment tool and the versions of the first and second translators. A detailed report on the process was prepared and the issues addressed and resolved in this step were documented.

Step 3. Back or reverse translation. Two bilingual translators converted every sentence from the Thai translation back to English. They chose English words that had the same meaning as the Thai version while being ignorant of the original English version.

Step 4. Expert committee. The two forward and two back translated versions were reviewed by an expert committee including four experts, a geriatric physical therapist, an orthopedic physical therapist, a family medicine doctor, and a language specialist, to create the final translated version. The committee also considered all of the suggestions made by the translators and research teams after which the Thai FROP-Com translation was finally finished.

Step 5. Preliminary version testing. This step was conducted to ascertain the level of acceptance among the intended audience and to validate the Thai-translated version. It was evaluated with the assistance of ten older adults (aged 60 to 80), both with and without a history of falls. This procedure was followed to evaluate the overall translation accuracy and the acceptance of each of the fall risk factors. The evaluation included the question, "Did you understand all the words?" and responses to "Please rate the scale of acceptable meaning in fall risk factors." Acceptability of meaning was measured on a 5-point Likert scale (range: unacceptable meaning to acceptable meaning). The final question asked the participants to rate

Step 1.	Forward translation	Two translators translated the original English version into Thai using Thai words with the same meaning. The forward translated versions were completed by the Center for Translation and Language Services Research Institute for Languages and Cultures of Asia (RILCA), Mahidol University Salaya, Nakhon Pathom 73170, Thailand.
Step 2.	Synthesis translation	The two translators and a recording observer synthesized the two translations of the first and second translators. One common translation version was produced from the original FROP-Com assessment tool and the versions of the first and second translators. Details of the process and the issues addressed and resolved in this step were documented.
Step 3.	Back translation	Two bilingual translators converted each sentence from the Thai translation back into English. They chose English words that had a similar or the same meaning as the Thai version while being totally ignorant of the original English version.
Step 4.	Expert committee	A committee of four experts (a geriatric physical therapist, an orthopedic physical therapist, a family medicine doctor, and a language specialist) reviewed the two forward and two back translation versions for the final translated version. They also considered all of the suggestions from the translators and research teams in completing the Thai FROP-Com.
Step 5.	Preliminary version testing	This step was used to ascertain the level of acceptance and to validate the Thai translation among the intended audience. The evaluation was done by ten older adults (60 to 80 years old), both with and without a history of falls. This procedure was done to evaluate the overall translation and the acceptance of each fall risk factor. The questions were "Did you understand all the words?" and "Please rate acceptability of the meaning of the fall risk factors". The five levels of acceptability of meaning (Likert scale) ranged from unacceptable to acceptable (scale 1 to 5). The final part of the questionnaire asked the participants to rate the acceptability of the translation overall.

Figure 1. The five steps in the cross-cultural adaption of the Thai FROP-Com assessment tool

the overall acceptability of the translation as a percentage.

To test the reliability and consistency of the Thai-version FROP-Com tool, two physiotherapists assessed the participants with it. They completed all the baseline evaluations and repeated the assessment with the same participants in the next two weeks.

Outcome measurements

The intra-rater and inter-rater reliability of the Thai FROP-Com assessment tool were the primary outcome measurements of this study. Two physiotherapists independently reviewed all of the baseline evaluations of each of the 10 participants for inter-rater reliability. After two weeks, they then visited the participants again and repeated all of the Thai FROP-Com assessment tool items.

Statistical methods

Demographic information was examined with descriptive statistics analysis. Content analysis was used to compile the qualitative information and comments from steps 1 through 5 of the cross-cultural adaptation.¹¹

The percentage of agreement for each item was used to evaluate the level of agreement for each translation. The level of agreement in the final Thai translation version used in the pilot study was assessed using rater agreement or Fleiss'

Kappa agreement. The Kappa values were interpreted as follows: less than 0.40 indicating fair agreement, 0.41-0.60 for moderate agreement, 0.61-0.80 for substantial agreement, and 0.81-1.00 for excellent agreement. Rater agreement and the percentage of subjects rating the meaning acceptable (scale >3) were calculated^{11,12} Rating of acceptability ranged from unacceptable to acceptable: 1 = unacceptable, 2 = slightly unacceptable, 3 = neutral, 4 = slightly acceptable, and 5 = acceptable.

Intraclass Correlation Coefficient (ICC) was used to determine the intra-rater and inter-rater reliability. The first and the second numbers represent the model and the number of the rater, respectively. ICC (3,1) was employed for two-way mixed effects, consistency, and single rater/measurement to determine the intra-rater reliability while ICC (2,1) was applied for two-way random effects, absolute agreement, and single rater/measurement to evaluate inter-rater reliability. Finally, content validity was assessed by the 10 participants in the pre-testing phase of the Thai FROP-Com assessment tool.

The sensitivity, specificity, and cutoff score of the Thai-version FROP-Com tool were also defined by measuring the area under the curve (AUC) of the receiver operating characteristic (ROC) curve.

The secondary goal of this study was to use univariate logistic regression analysis to identify the factors associated

Table 1. Demographic characteristics of the study participants

	Non-Fallers ^a (N = 77)	Fallers ^b (N = 63)	Total (N = 140)
Age group N (%)			
80-89 years	20 (25.97%)	16 (25.40%)	36 (25.72%)
70-79 years	30 (38.96%)	22 (34.92%)	52 (37.14%)
60-69 years	27 (35.07%)	25 (39.68%)	52 (37.14%)
Gender N (%)			
Female	53 (68.83%)	42 (66.67%)	95 (67.86%)
Male	24 (31.17%)	21 (33.33%)	45 (32.14%)
Thai FROP-Com Score ^c	19.51 (5.2)	25.5 (3.6)	24.19 (4.14)
BMI (kg/m ²) N (%)			
Obese (BMI ≥ 25)	11 (14.28%)	9 (14.28%)	20 (14.28%)
Overweight (23.0 ≤ BMI < 25.0)	26 (33.77%)	18 (28.57%)	44 (31.42%)
Normal (18.5 ≤ BMI < 23.0)	29 (37.67%)	22 (34.93%)	51 (36.45%)
Lean (BMI < 18.5)	11 (14.28%)	14 (22.22%)	25 (17.85%)
Living alone N (%)			
Yes	27 (35.06%)	10 (15.87%)	37 (26.43%)
No	50 (64.94%)	53 (84.13%)	103 (73.57%)

^aParticipants who had no history of falling in the past 12 months; ^bparticipants who had one or more falls in the past 12 months; ^cmean (SD)

FROP-Com, The Falls Risk for Older People in the Community; BMI, body mass index

with the occurrence of one or more falls over the previous 12 months. Fallers were participants who were rated 1-3 on previous falls within 12 months in the assessment tool without adjustment for other factors. Odds ratios of the Thai FROP-Com risk factors were used to judge the strength of association among variables (p -value < 0.05). All data were analyzed using IBM SPSS Statistics for Windows, version 19.0. (Armonk, NY, USA).

Results

The FROP-Com has been successfully translated into a Thai version. A total of 140 Thai community members who satisfied the inclusion requirements, including age at least 60 years, participated in a cross-sectional study. Participants were stratified by age into three groups, 60-69, 70-79, and 80-89 years, with the proportion of each group shown in Table 1. Most (67.86%) were female; 17.85% of the subjects had a low body mass index (BMI) of less than 18.5 kg/m², while 14.28% were considered to be obese (BMI ≥ 25 kg/m²). Only 26.43% lived alone, with most staying with family members or caregivers.

The 140 Thai FROP-Com scores were used to calculate the relationship between the sensitivity and specificity obtained from fallers ($n = 63$) and non-fallers ($n = 77$) (Table 2).

Good internal consistency (0.96) was demonstrated via validation, with ICC (3, 1) intra-rater reliability of 0.92, 95% confidence interval (95% CI) = 0.89 to 0.95, and a Kappa coefficient of 0.89. The inter-rater reliability measured by ICC (2, 1) was 0.91; 95% CI = 0.87 to 0.95 with the Kappa coefficient of 0.86. The specificity was 97.0%, and the sensitivity was 95.3%. A Thai FROP-Com cutoff score ≥ 25.0 was defined to distinguish between participants with and without a history of falling in the past 12 months.

Table 2. Sensitivity and specificity of the Thai FROP-Com scores

Thai FROP-Com score	Sensitivity	1 - Specificity	Specificity
8	0.000	0.000	1.000
9	0.007	0.000	1.000
10	0.012	0.000	1.000
11	0.031	0.000	1.000
12	0.047	0.000	1.000
13	0.055	0.000	1.000
14	0.076	0.000	1.000
15	0.105	0.000	1.000
16	0.173	0.000	1.000
17	0.408	0.000	1.000
18	0.539	0.000	1.000
19	0.765	0.000	1.000
20	0.875	0.000	1.000
21	0.910	0.000	1.000
22	0.922	0.000	1.000
23	0.945	0.020	0.980
24	0.953	0.030	0.970
25	0.953	0.030	0.970
26	0.970	0.119	0.881
27	0.978	0.189	0.811
28	1.000	0.564	0.436
29	1.000	0.758	0.242
30	1.000	1.000	0.000

FROP-Com, The Falls Risk for Older People in the Community

The mean Thai FROP-Com score for all participants was 24.19 (SD±4.14). For the subjects who completed the Thai FROP-Com assessments tool, the risk factors with the highest proportion classified as high risk (3 on the 0-3 point scale items or 1 on the 0-1 scale items) were the number of medical conditions (57.6%), vision deficit (45.4%), inappropriate footwear (43.3%), incontinence (34.3%), nocturia (43.1%), and

foot problems (30.9%). However, only 9% were rated as having severe balance problems when walking and turning, and 13% were rated at least minimally unsteady when walking and turning based on observation.

Twenty-two items from the Thai FROP-Com assessment tool which were designed to be calculated as in the original FROP-Com assessment tool were included to determine the factors most strongly associated with fall status without adjustment for other factors ($p < 0.05$). Thirty percent of the participants assessed by the Thai FROP-Com assessment tool were rated as having mild falls risk (scores ≤ 10 , $n = 42$), while 42.85% were evaluated as having moderate falls risk (scores 11-24, $n = 60$), and 27.15% were classified as having high falls risk (scores ≥ 25 , $n = 38$). Eight risk factors differentiated fallers from non-fallers: multiple falls history in the past 12 months, higher number of medical conditions, the presence of visual deficit, foot problems, inappropriate footwear, bladder control problems (either incontinence or nocturia) unsteadiness when walking and turning/risk of losing balance, and low physical activity level. Odds ratios of Thai FROP-Com risk factors are shown in Table 3.

Discussion

The translation and validation process was conducted following recommendations for cross-cultural adaptation. The assessment tool was effectively cross-culturally adapted,

and demonstrated the feasibility for senior Thai people. The translated Thai FROP-Com assessment tool has 28 key headings. The Thai FROP-Com's expert members determined that the meaning of words remained unchanged from their original form. Finally, simple and unambiguous Thai vocabulary was substituted to increase the content validity of the Thai-translation version. Items related to fall risk from the Thai FROP-Com evaluation were analyzed as shown in Table 3.

The ICC of inter-rater reliability was greater than the original version of 0.81 (95% CI 0.59-0.92). Similarly, intra-rater reliability was higher than the original FROP-Com assessment tool of 0.93 (95% CI 0.84-0.97). The psychometric features of the Thai FROP-Com assessment tool demonstrated strong internal consistency, reliability, and validity. The cutoff score of ≥ 25 was determined by measuring the area under the curve (AUC) of the receiver operating characteristic (ROC) curve.

A previous study reported that the FROP-Com cutoff score of ≥ 19 had been used to discriminate high levels of fall risk in people with Alzheimer's disease.¹³ Another study showed a significant correlation between the FROP-Com score and the Functional Gait Assessment score in stroke patients.¹⁴ A study that evaluated the ability of the FROP-Com tool to predict falls and fall injuries for community-dwelling older people presenting to the emergency department after falling suggested an optimal cutoff score of ≥ 15 to indicate

Table 3. Odds ratios of Thai FROP-Com risk factors

Falls risk factor	OR	95% CI	P-value
Number of falls in the past 12 months	2.52	1.94-3.28	<0.001*
Number of medical conditions	2.09	1.67-2.89	<0.001*
Number of sedative medications	1.62	1.05-2.37	0.678
Number of falls risk medications	1.58	0.88-1.66	0.569
Vision deficit	1.69	1.29-1.95	<0.001*
Somatosensory deficit	1.37	0.33-5.75	0.269
Foot problem	1.57	1.45-2.68	<0.001*
Inappropriate footwear	1.37	0.33-5.75	<0.001*
Cognitive impairment	1.11	0.56-2.21	0.368
Incontinence	2.16	1.12-5.01	<0.001*
Decreased food intake	0.48	0.13-1.99	0.481
Weight loss	1.26	0.59-2.72	0.552
Alcohol intake	0.46	0.29-2.72	0.268
Home environment appears unsafe	0.48	0.19-1.42	0.191
Self-awareness in ADLs performance	0.34	0.37-1.81	0.743
Impaired balance (from observation)	2.67	1.59-5.46	<0.001*
Assistance required to perform personal ADLs	2.06	0.89-2.52	0.388
Assistance required to perform domestic ADLs	1.96	0.69-2.92	0.758
Low level of physical activity	2.08	1.32-3.16	<0.001*
Inability to walk safely in the house	1.16	0.49-2.41	0.948
Inability to walk safely in the community	0.91	0.72-1.69	0.412
Injury from falls in the past 12 months	0.76	0.57-2.42	0.688

*Statistically significant ($p < 0.05$)

OR, odd ratio; CI, confidence interval; FROP-Com, The Falls Risk for Older People in the Community; ADLs activities of daily living

Details of each fall risk factor are available in the appendix

a high fall risk with a sensitivity of 70.8% to help identify individual risk factors and provide the fall prevention intervention guidance.¹⁵

Thai FROP-Com was designed to be comprehensive, i.e., able to identify all existing risk factors, with higher scores being indicative of higher falls risk. For the subjects who completed the Thai FROP-Com assessments tool, the risk factors found to indicate high risk were the following: number of medical conditions, vision deficit, inappropriate footwear, incontinence, nocturia, and foot problems. Approximately 10% of the participants were rated as having either unsteadiness or severe balance problems with level walking and turning.

The secondary goal of the study is to identify contributing risk factors for falls in individuals that need to be addressed. Our study identified eight risk factors considered to be associated with a high risk for falls as follows: a history of multiple falls in the past 12 months, a higher number of medical conditions, the presence of vision deficit, foot problems, inappropriate footwear, bladder control problems (either incontinence or nocturia), unsteadiness when walking and turning/risk of losing balance, and low physical activity level. The number of current medications was classified on a 4-point scale, i.e., 0 = no medications, 1 = 1-2 medications, 2 = 3 medications, and 4 = 4 or more medications. Additionally, certain medications that are considered to increase the risk of falls were categorized on a 4-point scale based on the number of prescription medications. Polypharmacy and fall-predisposing drug use failed to predict falls in our study. This might be explained by the fact that most of the participants took 1-3 prescription medications and only a few participants used medications that have been recognized as affecting the balance.

Since entering a private home was occasionally seen as intrusive, accessing and evaluating the home environment was frequently difficult. It was not possible to view the situation inside residences for this study. As evaluating the homes of older Thai people in community settings can be unacceptable to them, alternative approaches, include asking the participants to self-report home safety issues using pictures of potentially unsafe situations. Despite the insignificant odds ratio regarding the inability to walk safely in the community, footpath surfaces in community-dwelling settings are often uneven, and there are frequently extra risks outside the house, e.g., rough walkways and roads, which should be taken into consideration.

Although the Thai FROP-Com was advantageous to identify falls status, the primary aim of the assessment was to identify contributing risk factors for falls in individuals rather than identifying fall risk factors that need to be addressed. The variables most frequently assessed as high risk using the Thai FROP-Com in this study offer suggestions for actions that could be useful in preventing falls in older Thai people.

Limitations of this study include that the Thai FROP-Com assessment tool was not validated for other samples, e.g.,

populations with risk factor profiles for hip fractures, renal failures, and severe osteoporosis. That is a necessary next step in the development of more specific assessment tools for these particular populations. The sensitivity and specificity reported here might not be extrapolated to other groups of community-dwelling older people. Nevertheless, this study provides preliminary guidance for identifying fall risk factors which could aid decision-making regarding falls reduction efforts for older Thai people.

The information in this study could help researchers and clinicians such as physicians, nurses, physical therapists, and health care professionals¹³⁻¹⁵ utilize this new tool which is both practical and easy to use. This tool could also contribute to future research and to improvements in clinical practices by providing data which could be used in the development of fall prevention programs. The most pertinent risk variables to focus on in a fall intervention program for Thai senior citizens appear to be medication review, vision review, home safety adjustments, and exercises to increase balance, strength, and mobility. The next step is to identify and implement effective preventive measures which are both culturally suitable and acceptable to the target population.

Conclusions

The Thai-translated FROP-Com demonstrated validity, high reliability and internal consistency in assessing risk factors for falls and is available for use with older population in Thailand.

Conflict of Interest

The authors declare no competing interests.

Acknowledgments

The study data was collected from older people who lived in the Dusit District of Bangkok, Thailand. The authors would like to thank all participants in that community. We would also like to thank the National Ageing Research Institute (NARI), Melbourne, Australia, for permission to use FROP-Com for translation and data collection. The Faculty of Medicine, Vajira Hospital, Navamindradhiraj University supported this research. The funder had no role in the study's design, collection, analysis, data interpretation, or manuscript writing.

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