Cross-Cultural Adaptation and Reliability Testing of the Thai Version of the Brief Michigan Hand Outcomes Questionnaire

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Background: The brief Michigan Hand Outcomes Questionnaire (bMHQ), a 12-item questionnaire is a short and easy tool in assessing hand function. It measures hand in six domains including function, activities in daily living, work, pain, esthetics, and satisfaction. The original version is in English and has been translated into many languages. However, it has not yet been translated into the Thai language.

Objective: To translate the bMHQ to the Thai language and to assess the reliability of the Thai version of the bMHQ in patients with hand problems.

Materials and Methods: The present study translated and cross-culturally adapted the bMHQ following the Beaton's Guidelines for the Cross-Cultural Adaptation Process. The reliability testing was evaluated in 35 patients with hand problems.

Results: Twelve items of the bMHQ were translated into Thai without changing the main content of the question. The intraclass correlation coefficient of the test-retest reliability and Cronbach's alpha were 0.94 and 0.97, respectively.

Conclusion: The bMHQ was successfully translated into Thai language and had excellent reliability and internal consistency. Thus, the bMHQ-Thai version is a reliable instrument for evaluating and tracking the hand functions of Thai patients. This questionnaire is easy to use and can be complete in a short time. Thus, it is useful to measure and monitor the hand functions in Thai patients.

Keywords: Questionnaire; Translations; Hand injuries; Quality of life; Carpal tunnel syndrome

Hands are an important part of the human body, used to do various activities. Hands are used in many ways for both one-handed and two-handed tasks. One-handed tasks include picking, drawing, twisting a doorknob, and writing. Two-handed tasks include eating with a spoon and fork, buttoning a shirt or blouse, driving a car, tying shoelaces, and playing music such as drums, piano, cymbals, and guitar. Therefore, the ability to work with our hands affects our quality of life[1], especially for people with hand problems such as carpal tunnel syndrome, Dupuytren contracture, trigger finger, distal radius fractures, rheumatoid arthritis, and thumb carpometacarpal arthritis.

There is a high prevalence of hand problems, from 16.9% to 62.8%, among people including musicians[2], workers who operate machines in the steel, plastic, stone, and glass industries[3], the elderly[4], and the rice farmers[5]. Therefore, evaluating hand functions in patients with hand problems is useful for tracking the functionality of the affected hand. There are many tools for evaluating hand functions including the Arthritis Hand Function Test (AHFT), the Australian Canadian Osteoarthritis Hand Index (AUSCAN), the Cochin Hand Function Scale, the Functional Index for Hand Osteoarthritis (FIHOA), the Grip Ability Test (GAT), the Patient-rated Wrist/Hand Evaluation (PRW/HE), the Jebsen Hand Function Test (JHFT), the Hand Assessment Tool (HAT)[6], the Michigan Hand Outcomes Questionnaire (MHQ)[7,8], and the brief Michigan Hand Outcomes Questionnaire (bMHQ). In the past,

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there was only a long questionnaire to assess hand function, which had many items and was difficult to use in patients[9]. The bMHQ, a shorten version of the Michigan Hand Outcome Questionnaire, was developed to minimize responder burden and missing data, and offered broader applicability[1]. The original version of bMHQ, the English version, is proven to be an efficient hand assessment tool that preserves the psychometric properties of the original MHQ and has excellent test-retest reliability[1]. Therefore, it is an easy tool to measure hand function in a short time[1,10]. There is a high prevalence of wrists and hands symptom in Thailand including 58.3% to 62.8% in rice farmers[5], 20.6% to 46.8% in endodontists[11], and 14.5% in fishnet making workers[12]. However, there are no Thai versions of the bMHQ available. Consequently, the present study aimed to translate the bMHQ into Thai language and to assess the reliability of this tool to use in Thai patients with hand problems.

Materials and Methods

To translate the bMHQ into Thai version, which could be used to assess hand function in Thai population effectively, the present study translated and cross-culturally adapted the bMHQ following the guidelines for the Cross-Cultural Adaptation Process[13]. The present study was approved by the Human Research Ethics Committee of Walailak University, Thailand (approval number: WUEC-19-040-01).

The present study was composed of seven steps, license permission, forward translation, synthesis, backward translation, expert committee review, pre-final version testing, and testing of adapted version. The following was a description of each step.

Step 1. License permission: The present study was licensed by the University of Michigan.

Step 2. Forward translation: The bMHQ was translated by two English language experts with Thai as their native language where one was a physical therapist with hand skills and English language expertise, and the other was a general person with English language expertise.

Step 3. Synthesis: The researchers integrated the two versions of the translated bMHQ into one. In case of discrepancy in content, the researchers adjusted and asked the translators again.

Step 4. Backward translation: To translate the Thai version of the bMHQ into the English version again, the Thai version of the bMHQ was sent to two Thai language experts with English as their native language. The two experts can read and write in Thai.

To assess and ensure that the Thai version of the bMHQ has the same meaning as the original version, the two experts were never shown the original version of the bMHQ.

Step 5. Expert committee review: The experts in the present study consisted of two hand specialists including a physical therapist and an occupational therapist, four translators, and two researchers. To reach a pre-final version of the bMHQ, all the experts discussed about the meaning of words, phrases, and sentences, the function that Thai people used, and the equality of the overall questions.

Step 6. Pre-final version testing: Ten patients with hand problems were asked to rate how fully they could understand the items and how easily they could answer the questionnaire.

Step 7. Testing of adapted version: To evaluate test-retest reliability, the final version of the bMHQ was evaluated by participants with hand problems. They were invited to participate in the present study using the selective sampling method and if they met the inclusion criteria of being Thai, able to communicate using the Thai language, aged 18 years or above, and having hand problems with orthopedic conditions. Data were collected between July and December 2020 in Nakhon Si Thammarat Province, Thailand using a cross-sectional study design. They were asked to complete the final version of the bMHQ twice with an interval of at least 48 hours to avoid any changes in the participants' clinical status as numerous factors could influence test-retest reliability[14,15]. To ensure that the participants' symptoms did not change, they were asked about the nature of the symptoms prior to administering the second questionnaire as improving, same, or worsening.

The present study examined the hand function using bMHQ in 35 participants. Before answering the bMHQ, the researcher explained the steps and the impact of participating in the research. After that, participants had to sign their consent to participate in the present research project. The bMHQ is a 12-item multi-hand function assessment, each graded from 1 (poorest function) to 5 (ideal function), and eight questions (items 1-4, 8-9, and 11-12) with inverted scores from 1 to 5, 2 to 4, 4 to 2 and 5 to 1, so the raw scores of the present questionnaire were 60 total points and averaged and calculated as a full score of 100. Use the formula as follow:

bMHQ score = 100×(average score – 1)/4

Sample size calculation

The required sample size of the present study

was calculated based on the following formula[16,17]:

$$n = [\{(2k/k-1)(Z_{\alpha/2} + Z_\beta)^2\}/\ln \delta^2] + 2$$

When k represented the number of items in the bMHQ, the type I error (α) was set at 0.05, and power ($1-\beta$) was set at 90%. The $\delta = (1-CA_0)/(1-CA_1)$ where the CA_0 referred to the value of Cronbach's alpha in null hypothesis and CA_1 refers to the value of Cronbach's alpha in alternative hypothesis. The present study set the CA_0 and CA_1 at 0.5 and 0.8, respectively. Therefore, the minimum sample size for the present study was 29.27. Concerning the 20% drop out rate, the present study examined the hand function using the bMHQ in 35 participants.

Statistical analysis

The participants' characteristics and their bMHQ scores were calculated and analyzed using the IBM SPSS Statistics, version 26.0 (IBM Corp., Armonk, NY, USA). The p-value was set at 0.05. The level of reliability and internal consistency were analyzed using the intraclass correlation coefficient $(ICC)_{2,1}$[18] and Cronbach's alpha coefficient, respectively. The smallest detectable change (SDC) was calculated using the formula as follows, SDC = 1.96*√2*standard error of measurement (SEM).

Results

Of the 35 participants in the present study, 82.9% were female, 77.5% were right-handed, and 60% graduated at a level lower than a bachelor's degree. The age of the participants ranged from 20 to 72 years and the mean age was 49.3 years. The participants in the present study had hand problems including wrist and finger fracture, carpal tunnel syndrome, De Quervain's tenosynovitis, trigger finger, arthritis and undiagnosed wrist and hand symptoms (Table 1).

During the process of translating and cross-culturally adapting the bMHQ, 12 items of the questionnaire were translated into Thai without any major problems. During pre-testing, all 10 participants satisfactorily understood the questions and options. Consequently, the Thai version of the bMHQ did not require major adaptation from the original version.

The mean bMHQ scores were 70.49 and 71.37 at baseline and at 48-hour follow-up, respectively. About the psychometric properties of bMHQ-Thai version, it had excellent reliability, and the ICC of the test-retest reliability was 0.94. Cronbach's alpha was 0.97, indicating excellent internal consistency with the SDC was 6 points (Table 2). Thus, the

Table 1. Participants' characteristics of the participants (n=35)

Characteristics	
Age (year); mean±SD	51.4±12.3
Sex	
Male	6 (17.1)
Female	29 (82.9)
Educational level; n (%)	
Lower than bachelor's degree	21 (60.0)
Bachelor's degree	11 (31.4)
Higher than bachelor's degree	3 (8.6)
Dominant hand; n (%)	
Right	27 (77.1)
Left	8 (22.9)
Wrist and hand problems; n (%)	
Wrist or finger fracture	2 (5.7)
Carpal tunnel syndrome	12 (34.3)
De Quervain's tenosynovitis	4 (11.4)
Arthritis	7 (20.0)
Trigger finger	4 (11.4)
Undiagnosed wrist and hand symptom	6 (17.1)

SD=standard deviation

Table 2. Hand function score of the participants (n=35)

Score	Baseline; mean±SD	48-hour follow-up; mean±SD	$ICC_{2,1}$	Cronbach's alpha	SDC
bMHQ score	70.49±16.7	71.37±18.3	0.94	0.97	6

bMHQ=brief Michigan Hand Outcomes Questionnaire; ICC=intraclass correlation coefficient; SDC=smallest detectable change; SD=standard deviation

bMHQ was cross-culturally adapted into Thai. The bMHQ-Thai version was a reliable instrument for evaluating the self-perception of Thai people who had hand problems.

Discussion

Hand function plays a key role in daily routines and work. The decrease in hand function while having to use the hand continuously impacts the quality of life[19]. Therefore, knowing the decline of hand function quickly will help provide treatment and rehabilitation in a timely manner.

To be able to quickly assess the hand function in Thai people, the present study aimed to translate and cross-culturally adapt the bMHQ into Thai language. It was found that the Thai version of the bMHQ has excellent internal consistency and test-retest reliability. This is consistent with the previous study that used the translated version in German language in orthopedic patients with Dupuytren contracture

and reported Cronbach's alpha and ICC value of 0.88 and 0.87, respectively[20]. The excellent ICC value of 0.94 in the current study also coincided with the ICC value of 0.91 showed in patients with rheumatoid arthritis who administered the English version of the bMHQ[1]. Furthermore, a translated version in Brazilian Portuguese language also found that this questionnaire is appropriate to use in patients with low educational level, save time in response, and minimize responder burden and incomplete data[10].

Therefore, the Thai version of the bMHQ is appropriate for use with orthopedic patients who have hand problems including wrist and finger fracture, carpal tunnel syndrome, De Quervain's tenosynovitis, trigger finger, and arthritis. Although the participants graduated at a level below a bachelor's degree, they could understand all the questions in the present questionnaire. It was an indication that the present questionnaire was easy to use with patients at different educational levels and with different orthopedic conditions. The bMHQ contained only 12 questions and each question asked about the functionality of the hand. Therefore, the respondents could intentionally answer all the questions in a brief period and at a satisfactory level to provide information on the functional level of their hands, which can be used to track the hand's functionality after treatment or rehabilitation.

Limitation and suggestion

The bMHQ showed excellence reliability, with ease to assess hand function in a short time. The present study assessed hand function using bMHQ in hand problems including wrist and finger fracture, carpal tunnel syndrome, De Quervain's tenosynovitis, trigger finger, and arthritis. To use in other types of hand problems, further studies need to assess the psychometric properties before use. The current study focused on the cross-cultural adaptation of the bMHQ and its reliability. The future study should examine the validity of the translated bMHQ with other standard questionnaires for hand function where the users would have more information for choosing the appropriate questionnaire.

Conclusion

The Thai version of the bMHQ has excellent internal consistency and test-retest reliability. Thus, this questionnaire is a reliable instrument for evaluating and tracking the hand functions of Thai people with hand problems.

What is already known on this topic?

The English version of the bMHQ has good reliability and validity. It has only 12 questions, allowing a short time assessment of hand function. However, if there was a Thai version, it could be used to evaluate hand problems in Thai patients.

What this study adds?

There is a Thai version of the bMHQ with excellent internal consistency and reliability and can be used to assess Thai patients with hand problems via self-report in a short time especially during the COVID-19 pandemic.

Acknowledgement

Conflicts of interest

The authors declare no conflict of interest.

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