Original Article

Validation and Reliability of the Thai Version of the Oxford Shoulder Score

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Objective: To assess the validity and reliability of Oxford shoulder score Thai version [OSS-TH].

Materials and Methods: The cross-sectional descriptive study of patients with shoulder pain and/or disorders at Department of Rehabilitation Medicine, King Chulalongkorn Memorial Hospital, Bangkok, Thailand. Oxford shoulder score [OSS] is an internationally recognized shoulder-specific patient reported outcomes [PRO] questionnaire. OSS consists of 12 questions that explore various aspects of shoulder-related problems. The higher the OSS score, the more severe the shoulder problem. Construct validity was evaluated by visual analog scale for pain [VAS-pain], Thai version of disability of arm, shoulder, and hand [DASH-TH], and Thai version 2.0 of the medical outcomes study [MOS] short form-36 [SF36-TH]. Reliability was evaluated by internal consistency and test-retest method.

Results: One hundred native Thai speaking participants with shoulder pain and/or disorders were included between November 1, 2015 and April 30, 2016. The mean age of the patients was 56.67 years and 70 participants were female. The most common diagnoses were rotator cuff disease (46%) and adhesive capsulitis (40%). A majority of participants were able to complete the OSS-TH questionnaire within approximately 3.5 minutes. OSS-TH significantly highly correlated with DASH-TH (r = 0.82). Regarding the SF36-TH, OSS-TH significantly moderately correlated with the physical role functioning, bodily pain, social role functioning. A Cronbach's alpha of 0.92 revealed high internal consistency. All patients participated in the test-retest process, for an average time to retest of 4.57 days and an intraclass correlation coefficient of 0.92.

Conclusion: The original English language version of the OSS was meticulously translated into Thai language to create the OSS-TH. The findings of the present study demonstrated the acceptable validity and reliability of the OSS-TH. Accordingly, the OSS-TH can be reliably adopted for using as a Thai PRO that is specific to shoulder pain/disorders.

Keywords: OSS-TH, Oxford shoulder score, Patient-reported outcomes, Shoulder pain, Shoulder disorders

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For the past twenty years, painful shoulder joint has been recognized as the second most common painful joint after knee joint among the general adult population[1-3]. Restriction of shoulder motion caused by either pain or limited range of motion [ROM] can affect basic activities of daily living and sleep[1,3]. Shoulder disorders can also interfere with work-related performance[4,5]. The consequences of shoulder pain and dysfunction have a significant negative impact on quality of life, especially in geriatric patients[6].

Subjective outcome measures or patient-reported outcomes [PRO] have recently been added to objective outcome measures, and shoulder-related subjective outcome measures that have been evaluated for use in clinical trials[7,8]. Oxford Shoulder Score [OSS] was the first PRO to be used in patients that underwent shoulder surgery[9]. The OSS has since become internationally recognized as a shoulder-specific questionnaire for patients with degenerative and inflammatory change of the shoulder, in part due to its simplicity and its fast completion time[10]. The OSS consists of 12 questions that explore various aspects of shoulder-related problems, focusing primarily on pain and function. Each question has five answer options using a five-point Likert scale. The OSS total score ranges from 12 to 60 points. A higher OSS score indicates a higher level of shoulder problem severity.

The five most common shoulder PROs include

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disability of arm, shoulder, and hand [DASH], Oxford shoulder score [OSS], shoulder disability questionnaire [SDQ-UK], shoulder pain and disability index [SPADI], and the shoulder rating questionnaire [SRQ]. After DASH, OSS is the second most preferred PRO relative to clinimetric properties. The OSS has been shown to demonstrate good sensitivity, validity, and responsiveness[8,9]. The OSS has been broadly translated into several languages[10-19]. To date, DASH and SPADI are the PROs relating to the upper limbs that have been translated into Thai language[20,21]. The objective of the present study was to translate the OSS into Thai language and to assess the validity and reliability of the OSS Thai version [OSS-TH].

Materials and Methods

Development and translation process

The first author received licensed approval from the Oxford University Innovation Limited, University of Oxford, United Kingdom, the internationally recognized copyright owner of the original OSS, to translate the original OSS into Thai language. Consistent with the terms of the license agreement and to protect the integrity of the original OSS, the translation process strictly adhered to the internationally recognized translation and linguistic validation guidelines. Those guidelines include the following eight required steps:

Step 1 (forward translation): The original OSS was separately translated into Thai language by two bilingual Thai-English translators. The first translator was a rehabilitation physician (physiatrist) and the second translator was an ordinary person (naïve translator).

Step 2 (forward translation reconciliation): The two forward translations were reviewed by a physiatrist and combined into one reconciled version that accurately reflected the concepts and details embodied in the original OSS version. The reconciled version was developed in cooperation with a language expert who specializes in semantics and pragmatics.

Step 3 (back translation): The reconciled version was sent to two bilingual English-Thai translators for translation back into English. The translations were performed separately and neither translator had ever seen the original version OSS.

Step 4 (back translation review): Both back translated versions were compared against the original version by a language expert to identify discrepancies and to determine the best possible language option.

Step 5 (pilot testing): The pre-final translated version was formatted into a layout similar to that of the original OSS. This translated version was then tested on 10 native Thai speaking patients with shoulder pain and disorders. Each patient was interviewed face-to-face for purpose of obtaining and understanding their comprehension and comments. The time it took for these patients to respond to related questions were recorded.

Step 6 (pilot testing review): The pre-final translated version and all comments were reviewed for discrepancies in meaning and terminology.

Step 7 (proofreading): The pre-final translated version was independently reviewed by one physiatrist and one physical therapist, neither of them were involved in the translation process prior to their participation in this step.

Step 8 (review and linguistic validation): Cultural relevance and comments were reviewed by the first author with guidance from a language expert who specializes in semantics and pragmatics.

A flow chart of the eight step translation process is shown in Figure 1.

The OSS Thai version

Cultural adaptation: The OSS-TH uses spoon instead of knife for the item regarding eating utensils. Thai people normally use spoon and fork as part of

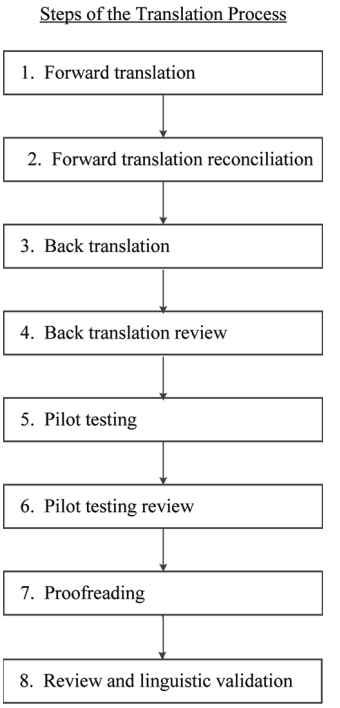

Figure 1. Steps of the translation process.

their daily eating habits. This cultural adaptation is minimally performed. Major linguistic discrepancies were not presented during the translation process.

Questionnaire format and scoring: The OSS-TH has the exact same questionnaire format and scoring system as the original OSS.

The final OSS-TH was presented as the supplement material.

Study design, setting, and ethical considerations

This cross-sectional descriptive study was conducted at the Department of Rehabilitation Medicine, King Chulalongkorn Memorial Hospital, Bangkok, Thailand. The protocol for the present study was approved by the Institutional Review Board [IRB] of the Faculty of Medicine, Chulalongkorn University (IRB. No 273/58). The present study was registered in the Thai Clinical Trials Registry (TCTR20151111001).

Participants

One hundred individuals with shoulder pain and/or shoulder disorders were enrolled in the present study. Participants were 18 years or older, all were native Thai speakers, and each had the ability to read and write Thai. The number of participants (100) was regarded as statistically acceptable for the analysis of internal consistency, reliability, and construct validity[22]. All participants received musculoskeletal ultrasound screening of both shoulders by an experienced physiatrist for diagnosis of common soft tissue problems of the shoulder, including rotator cuff disease, bicipital tenosynovitis, and shoulder impingement syndrome. All participants were asked to give their opinion regarding the simplicity of using and answering the OSS-TH questionnaire.

Statistical analysis

Data were analyzed using SPSS Statistics version 22.0 (SPSS Inc., Chicago, IL, USA). The maximum allowable percentage of missing data was 5%. Fifteen percent was the maximum allowable percentage for both floor and ceiling thresholds[22]. An absolute z-value for skewness and kurtosis of lower than 3.29 was considered a symmetrically distributed normal score[23].

Validity

Construct validity was evaluated by 100 mm visual analog scale for pain [VAS-pain], DASH-TH, and Thai version 2.0 of the medical outcomes study [MOS] short form-36 [SF36-TH]. DASH-TH and SF36-TH were studied and proven for their validity and reliability[21,24]. DASH-TH consists of 30 items and has two optional modules, work [DASHW-TH] and sport & art [DASHSA-TH]. The DASH-TH scoring system is similar to that of the OSS-TH. The higher the DASH-TH score, the greater the severity of the problem[21]. The SF36-TH consists of 36 items categorized into two domains, physical composite score [PCS] and mental composite score [MCS]. The SF36-TH has eight subscales categorized into the PCS and MCS domains, as follows, PCS subscales such as physical functioning [PF], physical role functioning [RP], bodily pain [BP], and general health perceptions [GH] and, MCS subscales such as vitality [VE], social role functioning [SF], emotional role functioning [RE], and mental health [MH]. A higher SF36-TH score indicates a higher level of overall patient health[24].

Evaluation of construct validity between measures was performed using Pearson's correlation coefficient. Degree of correlation (r) was interpreted, as follows: 0.90 to 1.00 (-0.90 to -1.00) = very high positive (negative) correlation; 0.70 to 0.90 (-0.70 to -0.90) = high positive (negative) correlation; 0.50 to 0.70 (-0.50 to -0.70) = moderate positive (negative) correlation; 0.30 to 0.50 (-0.30 to -0.50) = low positive (negative) correlation; and 0.00 to 0.30 (0.00 to -0.30) = negligible correlation[25].

Reliability

Evaluation of reliability was performed using internal consistency and test-retest method. Cronbach's alpha with a minimum value of 0.70 was considered acceptable for internal consistency[26]. Intraclass correlation coefficient [ICC] was determined by test-retest method and an ICC above 0.70 was considered to be acceptable[27,28]. All study participants were retested within a test-retest interval of one to seven days. The maximum test-retest interval was pre-specified as seven days to circumvent the development of clinically significant change. All participants were asked to maintain the same treatment and activity schedule and regimen during the test-retest period.

Results

One hundred native Thai speaking participants with shoulder pain and/or disorders were enrolled between November 1, 2015 and April 30, 2016. None of the originally included participants were subsequently excluded. Mean age of patients was 56.67±10.81 years and 70% were female. More than half of participants had an education level of at least bachelor's degree. Eighty-six participants reported unilateral shoulder

pain and/or disorders. Shoulder pain/disorder diagnoses were, rotator cuff disease (n = 46), adhesive capsulitis (n = 40), shoulder impingement syndrome (n = 8), and bicipital tenosynovitis (n = 6). Seventy-six participants reported that their work-related responsibilities required the use of their upper extremities. Patient demographic and clinical data is shown in Table 1. Pain severity was categorized by VAS-pain scale into four groups as no pain (VAS 0 to 4 mm; n = 3), mild pain (VAS 5 to 44 mm; n = 40), moderate pain (VAS 45 to 74 mm; n = 40), and severe pain (VAS >75 mm; n = 17)[29].

There were no missing or incomplete data from any OSS-TH questionnaire. There were no items distributed outside the z-values for skewness and kurtosis. The average time taken to complete OSS-TH was 1.76±0.87 minutes (range 0.51 to 5.16). Ninety-four participants were able to complete the OSS-TH without additional assistance. The absolute value of each PRO score is shown in Table 2. Construct validity revealed OSS-TH to be significantly highly correlated with DASH-TH (r = 0.82). Moreover, OSS-TH was found to be significantly moderately correlated with DASHW-TH (r = 0.63). Regarding association with SF36-TH, OSS-TH was found to be significantly moderately correlated with the RP and BP subscales of the PCS domain. There was significantly low correlation between the OSS-TH and the MCS domain; however, a significantly moderate correlation between the OSS-TH and the SF subscale was demonstrated. The OSS-TH had a significantly low correlation with VAS-pain (r = 0.49). A Cronbach's alpha of 0.92 revealed high internal consistency. All participants were retested, with an average time to retest of 4.57 ±1.57 days. The ICC for test-retest reliability was 0.92. Details relating to construct validity and reliability of the OSS-TH were given in Table 3. Details relating to each question of the OSS-TH, including internal consistency and floor and ceiling effects, were presented in Table 4.

Table 1. Patient demographic and clinical data

Subjects, n	100
Average age, mean ± SD	56.67±10.81
Gender (female), n	70
Education, n	
Less than primary	2
Primary	9
Secondary	19
Bachelor or above	70
BMI, mean ± SD	23.1±3.49
Side, n	
Unilateral	86
Bilateral	14
Diagnosis, n	
Rotator cuff disease	46
Adhesive capsulitis	40
Shoulder impingement syndrome	8
Bicipital tenosynovitis	6
Onset (month), median (IQR range)	6 (3 to 12)
Daily time of shoulder use (hour), median (IQR range)	28 (10 to 12)

Table 2. Absolute value of each PRO score and VAS-pain

Scores	Mean ± SD	Range
OSS-TH (n = 100)	43.57±8.36	16 to 60
VAS-pain (n = 100)	48.41±24.51	0 to 100
DASH-TH (n = 100)	36.79±18.05	2.5 to 91.38
DASHW-TH (n = 83)	30.95±21.34	0 to 75
DASHSA-TH (n = 20)	39.06±24.74	0 to 87.50

PRO = patient-reported outcomes; OSS-TH = Oxford shoulder score Thai version; VAS-pain = visual analog scale for pain; DASH-TH = Thai version of disability of arm, shoulder, and hand; DASHW-TH = DASH-TH work module; DASHSA-TH = DASH-TH sport & art module

Discussion

The original OSS is internationally recognized as a PRO specific to patients with shoulder pain/or disorders and has been broadly translated into different languages with cultural adaptation[10-19,30,31]. The translation processes were referred to internationally recommended standards[32]. After translation in the present study, cultural adaptation was performed for items relating to eating utensils similar to previous

Table 3. Construct validity and reliability of OSS-TH

Construct validity	
VAS-pain	-0.49*
DASH-TH	-0.82*
DASHW-TH	-0.63*
DASHSA-TH	-0.23*
SF36-TH	
• Physical component summary score [PCS]	0.55*
• Physical function [PF]	0.41*
• Role-physical [RP]	0.51*
• Bodily pain [BP]	0.67*
• General health [GH]	0.33*
• Mental component summary score [MCS]	0.38*
• Vitality [VT]	0.35*
• Social functioning [SF]	0.54*
• Role-emotional [RE]	0.44*
• Mental health [MH]	0.36*
Reliability	
Cronbach's alpha	0.92*
Intraclass correlation coefficient (95% CI)	0.92* (0.89 to 0.94)

OSS-TH = Oxford shoulder score Thai version; VAS-pain = visual analog scale for pain; DASH-TH = Thai version of disability of arm, shoulder, and hand; DASHW-TH = DASH-TH work module; DASHSA-TH = DASH-TH sport & art module; SF36-TH = Thai version of the medical outcomes study short form-36

* $p<0.001$

Table 4. Mean Score, Internal consistency and floor and ceiling effects relating to each question of the OSS-TH

Question	Mean score	SD	Floor effect	Ceiling effect	Item-total correlation	Alpha if item deleted
1	2.87	0.86	5%	3%	0.52	0.92
2	3.36	0.98	3%	14%	0.74	0.91
3	3.81	0.99	1%	30%	0.71	0.91
4	4.54	0.77	2%	69%	0.65	0.91
5	4.34	0.83	4%	53%	0.67	0.91
6	4.31	0.93	2%	55%	0.74	0.91
7	3.99	1.11	3%	40%	0.75	0.91
8	2.77	1.09	10%	6%	0.61	0.91
9	3.54	1.04	3%	17%	0.69	0.91
10	3.72	0.90	1%	22%	0.63	0.91
11	3.44	0.87	16%	9%	0.78	0.91
12	2.88	1.11	12%	13%	0.51	0.92

OSS-TH = Oxford shoulder score Thai version

studies in Asian countries. Adaptation was minimal in our study, as compared to adaptation required in other Asian studies[11,14]. The questionnaire layout, format, and scoring system for the OSS-TH are the same as the original OSS, because the authors aimed to preserve the integrity of the original questionnaire in all possible dimensions.

A majority of participants were able to complete the OSS-TH questionnaire within approximately 3.5 minutes. The time required to complete the questionnaire was similar to the completion time reported in a Korean study[14]. Most participants were able to complete the questionnaire without any difficulty or need for additional assistance. Construct validity revealed a strong correlation between the OSS-TH and DASH-TH and low correlation between the OSS-TH and VAS-pain. The same finding was found in a Korean study[14]. This finding might be explained by two reasons. First, almost half of the participants in our study were diagnosed with adhesive capsulitis. These patients were either without pain or had only mild pain, but they mainly reported difficulty with shoulder function. Second, the OSS-TH has a scoring system that is similar to that of DASH-TH. The same scoring system could influence participants to respond similarly on both PRO questionnaires.

Except for VAS-pain and DASH sports/art, Pearson's correlation coefficient values for OSS-TH compared to the other measures reveal indifferent value when they were compared with previous studies[10-12,15,17]. Only 20 participants responded the DASH sports/art section, hence the low Pearson's correlation coefficient value for the OSS-TH may have resulted from the low number of participants (Table 2). Very high Cronbach's alpha and ICC were demonstrated from our reliability study. These findings are similar to those reported in previous studies[10-12,14,15,17].

The strength of the present study is demonstrated in three points. First, all enrolled subjects participated in the test-retest protocol. Second, the average time taken to complete the OSS-TH (1.76±0.87 minutes) is considered acceptable for use in the routine evaluation of disease severity and outcomes of provided treatments. Third, 94% of participants were able to complete the OSS-TH by themselves and without any additional assistance.

The present study had some mentionable limitations. First, almost half of participants were diagnosed with adhesive capsulitis and had no pain or only mild pain, which resulted in a low correlation with VAS-pain. Second, 70% of participants were women and 70% of subjects had at least a bachelor's degree. The question then arose regarding generalizability issue. Based on the findings of the present study, the authors recommend more supervised use of the OSS-TH among male patients and in patients with an education level below bachelor's degree. Third, the average test-retest interval in the present study was 4.57±1.57 days, which was less than the recommended one week[22]. A fixed retest time is preferable for best results; however, a fixed retest time was not achievable in this study. The authors made the decision to sacrifice fixed retest time to optimize retest participation. By doing so, we were able to achieve 100% test-retest among our 100 participants.

Conclusion

The original English language version of the OSS was meticulously translated into Thai language to create the OSS-TH. The translation process was designed to produce a translation of the highest quality that maintained the integrity of the original version. The findings of the present study demonstrate the validity and reliability of the OSS-TH. Accordingly, the OSS-TH can be reliably adopted for using as a Thai PRO that is specific to shoulder pain/disorders.

What is already known on this topic?

The OSS is an internationally recognized shoulder-specific PRO questionnaire. The OSS consists of 12 questions that explore various aspects of shoulder-related problems. The higher the OSS score is the more

severe the shoulder problem. Patients can complete this questionnaire in approximately 5 to 10 minutes.

What this study adds?

The original English language version of the OSS was meticulously translated into Thai language to create the OSS-TH. The findings of this study demonstrate the acceptable validity and reliability of OSS-TH. Accordingly, the OSS-TH can be reliably adopted for use as a Thai PRO that is specific to shoulder pain/disorders.

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Potential conflicts of interest

The authors declare no conflict of interest.

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