

Translation and validation of the Simplified Chinese version of Western Ontario Osteoarthritis of the Shoulder Index (WOOS)

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Abstract

To produce a cross-cultural adaptation and translation of the English version of the Western Ontario Osteoarthritis of the Shoulder index (WOOS) into Simplified Chinese and to validate its reliability, validity, and responsiveness.

A total of 52 consecutive patients were included. The inclusion criteria were as follows: diagnosed to have primary shoulder osteoarthritis (OA) and referred to undergo conservative treatment, able to speak Chinese, and able to read Simplified Chinese. WOOS, the Oxford Shoulder Score (OSS), and Short Form 36 (SF-36) were filled at the first visit, and WOOS alone was filled at the second visit with an interval of 3 to 7 days after the first visit. Four months after appropriate treatments, the WOOS was again sent to patients by e-mail for the evaluation of responsiveness.

The intraclass correlation coefficient ranged from 0.90 to 0.98, which showed good test–retest reliability. As we had hypothesized, construct validity was high according to a significant correlation among WOOS, SF-36 (3 subscales, namely physical functioning, bodily pain, and role—physical), and OSS. High responsiveness was documented by the evaluation of standard response mean (from 1.09 to 1.33) and effect size (from 0.80 to 0.97).

The Simplified Chinese version of WOOS (SC-WOOS) was shown to be a reliable, valid instrument for evaluating the quality of life of patients suffering from shoulder OA in China.

Abbreviations: AAOS = the American Academy of Orthopedic Surgeons Outcome Committee, ASES = the American Shoulder and Elbow Surgeons, BMI = body mass index, BP = bodily pain, DASH = the Disability of the Arm, Shoulder and Hand Questionnaire, ES = the effect size, GH = general health, ICC = intraclass correlation coefficient, MH = mental health, NSAIDs = oral nonsteroidal antiinflammatory drugs, OA = osteoarthritis, OSS = the Oxford Shoulder Score, PF = physical functioning, QoL = quality of life, RE = role—emotional, RP = role—physical, SC-WOOS = The Simplified Chinese version of the Western Ontario Osteoarthritis of the Shoulder index, SD = standard deviation, SF = social functioning, SF-36 = Short Form 36, SPAID = the Shoulder Pain and Disability Index, SRM = the standard response mean, SST = the simple shoulder test, VT = vitality, WOOS = the Western Ontario Osteoarthritis of the Shoulder index.

Keywords: osteoarthritis, reliability, shoulder, validity

Editor: Jenn-Huang Lai.

Z-yJ, CZ, and JC are co-first authors and contributed equally to the work.

Authors' contributions: Z-yJ, CZ, and JC designed the study, analyzed the data, and wrote the manuscript; C-cX followed up the patients and collected the information; and Z-yJ, CZ, JC, and W-DX are responsible for the WOOS translation and adaptation.

The authors have no conflicts of interest to disclose.

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Medicine (2018) 97:13(e8691)

Received: 2 March 2017 / Received in final form: 15 September 2017 /

Accepted: 23 October 2017

<http://dx.doi.org/10.1097/MD.0000000000008691>

1. Introduction

Osteoarthritis (OA) is a highly debilitating degenerative joint disease characterized by degeneration of articular cartilage and subchondral bone with narrowing of the glenohumeral joint.^[1] To specifically ascertain the patients' quality of life (QoL) and to enable patients to provide the necessary information about their physical and psychological status, health-related instruments are rapidly being developed. Several instruments have been used to evaluate conditions of the shoulder and have been proved to be valid and reliable, such as the Disability of the Arm, Shoulder and Hand Questionnaire (DASH), the Oxford Shoulder Score (OSS), and the Shoulder Pain and Disability Index (SPAID).^[2–4] Some of these instruments have already been translated into Simplified Chinese.^[5,6]

The commonly used functional rating scales for studies evaluating patients with shoulder OA include the UCLA shoulder rating scale, the simple shoulder test (SST), and the American Shoulder and Elbow Surgeons (ASES) evaluation form.^[7–9] General measurements for health status such as SF-36 and SF-12 were routinely used. The Western Ontario Osteoarthritis of the Shoulder Index (WOOS) is a disease-specific instrument as well as

a shoulder-specific instrument, which could well reflect conditions of patients with shoulder OA.^[10] However, a Simplified Chinese version of WOOS is still not available.

The purpose of our study was to produce a cross-cultural adaptation and translation of the original version of WOOS into Simplified Chinese and to validate the Simplified Chinese version. We hypothesized that the Simplified Chinese version of WOOS (SC-WOOS) would be a valid and reliable instrument to evaluate QoL of patients suffering from OA of the shoulder.

2. Methods

2.1. Cross-cultural adaptation and translation

The process of cross-cultural adaptation and translation was suggested by the American Academy of Orthopedic Surgeons Outcome Committee (AAOS).^[11] The process was conducted in 5 steps. First, the forward translation from English to Simplified Chinese was performed by 2 bilingual translators whose native language was Simplified Chinese. One was an orthopedic surgeon in our hospital and the other was a professional English teacher at a university. Second, a combined version was written after the consensus of the 2 translators. Third, the backward translation was performed by 2 native English speakers who were good at understanding Chinese and had a medical background. Fourth, the back-translation was compared with the original version, and a discussion for consensus was held among all the translators. Finally, a prefinal version of WOOS was developed and tested on individuals.

2.2. Patients

The eligibility criteria were as follows: diagnosed to have primary OA of the shoulder and referred to undergo conservative treatment and able to speak Chinese and read Simplified Chinese. All participants signed informed consent forms, and the clinical research ethics committee of our hospital approved the study.

A total of 52 consecutive patients were included in our research. They were diagnosed to have primary OA of the shoulder between March 2014 and January 2016. Demographic data, including age, gender, body mass index (BMI), and the duration of symptoms, were collected during the first visit to the clinic. All participants were required to fill SC-WOOS, OSS, and SF-36 at the first visit and fill SC-WOOS alone a second time within an interval of 3 to 7 days after the first visit. Four months after conservative treatments, including cortisone injection, oral nonsteroidal antiinflammatory drugs (NSAIDs), analgesics, acupuncture, and physical therapy, the SC-WOOS index was sent to patients again by e-mail for the evaluation of responsiveness. Of the total sample of 52 patients, 40 patients responded to us.

2.3. Questionnaires

The WOOS index is a self-administered, disease-specific instrument for the evaluation of QoL of patients who suffer from OA of the shoulder.^[10] It contains 19 questions altogether, covering 4 aspects: physical symptoms (6 questions), sports/recreation/work (5 questions), lifestyle (5 questions), and emotions (3 questions). Each question is tested on a visual analog from 0 (the best/asymptomatic) to 100 (the worst/extremely affected). The total score is from 0 to 1900.

The SF-36 is a widely used instrument for the measurement of health, including physical functioning (PF), bodily pain (BP),

general health (GH), vitality (VT), social functioning (SF), role—physical (RP), role—emotional (RE), and mental health (MH).^[12] A higher score indicates a healthier status and less function loss.

The OSS is a shoulder-specific questionnaire for the evaluation of pain perception and daily function of patients suffering from shoulder pain. According to a modified version, it contains 12 items and each item is scored from 0 to 4, with 0 representing worst outcome/most symptoms and 4 representing best outcome/least symptoms.^[6] The total score ranges from 0 (worst) to 48 (best).

2.4. Psychometric assessment and data analysis

The analyses were performed in SPSS release 22.0 for Windows (Chicago, IL). A *P*-value of less than .05 was considered statistically significant for all analyses.

2.4.1. Reliability. Test–retest reliability could reflect the reproducibility of SC-WOOS by using intraclass correlation coefficient (ICC) and the Bland–Altman plot. A positive rating for reliability was given when the value of ICC was at least 0.70 in a sample size of at least 50 patients.^[13] The Bland–Altman plot could be used to measure within-subject variation and limits of agreement.^[14]

2.4.2. Validity. Construct validity was calculated by the Pearson correlation coefficient (*r*) of the SC-WOOS with the OSS and the SF-36. Correlations were divided into 5 categories including poor (*r*=0–0.20), fair (*r*=0.21–0.40), moderate (*r*=0.41–0.60), very good (*r*=0.61–0.80), and excellent (*r*=0.8–1.0).^[15] We hypothesized that the SC-WOOS was strongly correlated with the OSS and the PF and BP subscales of the SF-36; moderate with the GH, RP, and SF subscales of SF-36; and poorly correlated with the MH-related subscales of the SF-36.

2.4.3. Responsiveness. The standard response mean (SRM) and the effect size (ES) were calculated to assess the responsiveness of SC-WOOS. SRM is calculated as the difference between the pretherapy mean score and posttherapy mean score divided by the standard deviation (SD) of the difference. ES is calculated as the difference between the pretherapy mean score and the posttherapy mean score divided by the preoperative SD. Values of SRM and ES were considered large (SRM≥0.80), moderate (SRM=0.50–0.79), and small (SRM=0.20–0.49).^[16]

2.4.4. Score distribution and acceptability. To evaluate acceptability, all participants were asked whether there were any difficulties in filling the SC-WOOS. Missing data and ceiling/floor effect were collected in the questionnaire. The time needed to complete the SC-WOOS was also measured. It was considered acceptable that the percentage of missing data was less than 5%.^[17]

3. Results

3.1. Translation

No language difficulties occurred during translation. The final version of SC-WOOS was easily accepted by all participants according to tests of the prefinal version.

3.2. Descriptive data

A total of 52 consecutive patients were enrolled in our study (38 males; 14 females) (Table 1). The mean age was 69.5±8.2 years (range 57–86) and the mean BMI was 24.7±3.8. The duration of

Table 1
Demographic and clinical characteristics of participants.

Characteristics	Number or mean ± SD
Age	69.5 ± 8.2
Range	57–86
Sex, number, %	
Female	14 (26.9%)
Male	38 (73.1%)
Osteoarthritis duration, wk	81.4 ± 61.0
Range	1–260
BMI	24.7 ± 3.8

BMI=body mass index, SD=standard deviation.

Table 2
Intraclass correlation coefficient between the test and retest groups (n = 52).

SC-WOOS (no. of items)	ICC (95% CI)
Total (19)	0.98 (0.95–0.99)
Physical symptoms (6)	0.94 (0.90–0.97)
Sports/recreation/work (5)	0.93 (0.89–0.96)
Lifestyle (5)	0.90 (0.84–0.94)
Emotions (3)	0.94 (0.90–0.97)

CI = confidence interval, ICC = intraclass correlation coefficient, no. = number, SC-WOOS = Simplified Chinese version of Western Ontario Osteoarthritis of the Shoulder Index, SD = standard deviation.

symptoms was 81.4 ± 61.0 weeks (range 1–260 weeks). All patients accepted nonoperative treatments in our research.

3.3. Test–retest reliability

All participants were required to complete the SC-WOOS alone a second time with an interval of 3 to 7 days after the first visit. The ICCs ranged from 0.90 to 0.98 for all section scores and total scores, which showed the test–retest reliability as excellent (Table 2). Bland and Altman plots of the 2 tests showed no systematic bias between test and retest, which indicated good test–retest reliability of SC-WOOS (Fig. 1).

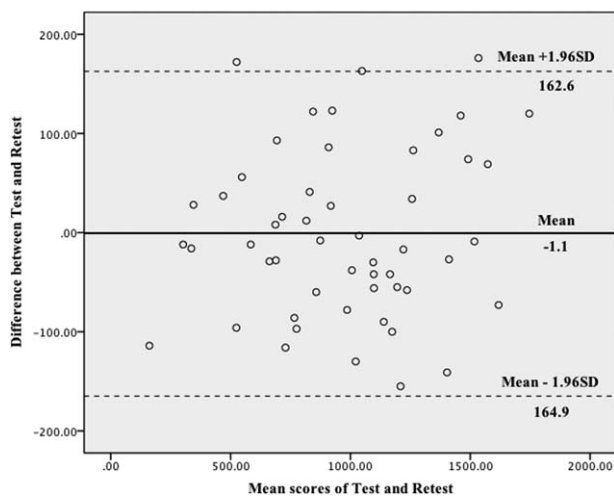


Figure 1. Bland–Altman plots of the test–retest reliability of the SC-WOOS. Each data point indicated the difference between the test and retest for the same individual participant compared with the mean score. The dashed line shows the 95% (±1.96 SD) limits of agreement. SC-WOOS = Simplified Chinese version of Western Ontario Osteoarthritis of the Shoulder Index, SD = standard deviation.

Table 3
Pearson correlations among the SC-WOOS, OSS, and SF-36 (n = 52).

Instrument	SC-WOOS	OSS
SC-WOOS		0.85*
OSS	0.85*	
SF-36		
PF	0.79*	0.72*
RP	0.76*	0.79*
BP	0.60*	0.66*
GH	0.42*	0.52*
VT	0.46*	0.37*
SF	0.36*	0.22
RE	0.25	0.07
MH	0.24	0.02

BP = bodily pain, GH = general health, MH = mental health, OSS = Oxford Shoulder Score, PF = physical functioning, RE = role—emotional, RP = role—physical, SC-WOOS = Simplified Chinese version of Western Ontario Osteoarthritis of the Shoulder Index, SF = social functioning, SF-36 = Short-Form 36, VT = vitality.

* Correlation is significant at the .01 level (2-tailed).

3.4. Validity

A correlation was performed to assess the construction validity among OSS, SF-36, and SC-WOOS (Table 3). The SC-WOOS was notably well related to OSS ($r = 0.85, P < .01$) and 3 subscales of SF-36 (PF, $r = 0.79, P < .01$; RP, $r = 0.76, P < .01$; BP, $r = 0.60, P < .01$). The OSS was the most strongly related to SC-WOOS, while the subscale (MH) of SF-36 was the most irrelevant.

3.5. Responsiveness

Both ES and SRM were greater than 0.80 (ES ranged from 0.80 to 0.97, SRM ranged from 1.09 to 1.33), indicating high responsiveness of SC-WOOS (Table 4).

3.6. Score distribution and acceptability

No floor and ceiling effect exceeded 15%, which indicates all subscale scores of SC-WOOS were well distributed. The average time needed to complete the SC-WOOS was 104.6 ± 27.2 seconds. There were no missing data in our research, which indicated good acceptability.

4. Discussion

The most important finding of this research was that the SC-WOOS instrument had good score distribution, excellent test–retest reliability, and notable construct validity. OSS and SF-36 were chosen as a golden standard for evaluating validity. The SC-WOOS and these 2 instruments were compared by

Table 4
Responsiveness of the SC-WOOS (n = 40).

SC-WOOS (no. items)	SRM	ES
Total (19)	1.28	0.87
Physical symptoms (6)	1.15	0.97
Sports/recreation/work (5)	1.09	0.82
Lifestyle (5)	1.30	0.84
Emotions (3)	1.33	0.80

ES = effect size, SC-WOOS = Simplified Chinese version of Western Ontario Osteoarthritis of the Shoulder Index, SRM = standardized response mean.

calculating Pearson correlation coefficient (r). As hypothesized, SC-WOOS was well correlated with OSS and 3 subscales of SF-36 (PF, RP, BP), which showed good convergence. Poor correlations between the SC-WOOS and VT, RE, and MH of SF-36 indicated good divergence. Good divergence and convergence proved that SC-WOOS was well correlated with items for shoulder symptoms and functions but poorly related with nonshoulder-specific items.

The ICC ranged from 0.90 to 0.98, which was similar to that reported by previous research.^[18–20] All translated versions including Chinese versions showed a good test–retest reliability for all values of ICC greater than 0.70. Bland and Altman plots (Fig. 1) of the test–retest differences showed no systematic bias between sessions, indicating good test–retest reliability.

The responsiveness was analyzed using preoperative and 4-month postoperative measurements. Different from previous research, a 3-month postoperative might be relatively short, while a 1-year postoperative might be relatively long. The SRM and ES were greater than 0.80, which showed good responsiveness; this observation is similar to findings from other research studies. However, the values of SRM and ES were relatively lower than the original version and the Danish version but close to the Italian version.^[10,18–20] The potential reason might be that most of the enrolled patients in the English and Danish version accepted operative treatments, while nonoperative treatments were considered the most acceptable in the Italian and Chinese versions.

Patients with shoulder OA often present shoulder pain, limitation of shoulder function, and disability.^[21] Other common clinical manifestations include shoulder stiffness, pain in the morning, pain with weather changes, and pain with increased activity. The WOOS could indicate all manifestations caused by shoulder OA. The process of cross-cultural adaptation and translation was followed by AAOS. There was no revision compared with the original English version. All contents could be easily understood. The missing data did not occur in our research, which showed good quality acceptability.

The present study had some limitations. The most important was that the participants could not fully represent the entirety of the Chinese-speaking people with shoulder OA. Moreover, patients with surgical treatments were excluded in our research.

5. Conclusions

SC-WOOS was demonstrated to be a reliable, valid instrument for evaluating the QoL of Chinese patients suffering from OA of the shoulder.

Acknowledgment

The corresponding author wishes to thank all the coauthors for their contributions.

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