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Original Article

# Simplified Chinese Version of University of California at Los Angeles Activity Score for Arthroplasty and Arthroscopy: Cross-Cultural Adaptation and Validation

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ABSTRACT

*Background:* To translate and cross-culturally adapt the University of California at Los Angeles (UCLA) activity score into a simplified Chinese version (UCLA-C) and evaluate the reliability and validity of the UCLA-C for patients with both knee arthroscopy and total knee arthroplasty.
*Methods:* Cross-cultural adaptation was performed according to the internationally recognized guidelines of the American Academy of Orthopaedic Surgeons Outcome Committee. A total of 200 participants (100 arthroscopy and 100 total knee arthroplasty) were recruited in this study. An intraclass correlation coefficient (ICC) was used to determine reliability. Construct validity was analyzed by evaluating the correlations between UCLA-C and the Tegner activity score, Knee Injury and Osteoarthritis Outcome Score, and the short-form (36) health survey.
*Results:* The original version of the UCLA activity score was cross-culturally well adapted and translated into simplified Chinese. UCLA-C was found to have excellent reliability in both arthroscopy (ICC = 0.984, 95% confidence interval 0.976-0.989) and arthroplasty (ICC = 0.946, 95% confidence interval 0.920-0.964). Absolute reliability as evaluated by minimal detectable change was 0.789 and 0.837 for both arthroscopy and arthroplasty groups. Moderate to high correlations between UCLA-C and Tegner activity score (0.799, $P < .001$); Knee Injury and Osteoarthritis Outcome Score (0.449-0.715, $P < .001$); and Physical Functioning, Pain, General Health, and Social Functioning (0.549-0.746, $P < .001$) subdomains of short-form (36) health survey were observed.
*Conclusion:* UCLA-C was demonstrated to have excellent acceptability, reliability, and validity in both arthroscopy and arthroplasty, and could be recommended for patients in mainland China.


Knee disorders, including degenerative osteoarthritis, meniscal tear, and cartilage defects develop many symptoms, clinical findings, and tissue abnormalities and have profound impact on health-related quality of life (HRQoL) [1–3]. Recent epidemiologic studies found that symptomatic knee osteoarthritis affects 24% of the general population and caused major public health problems and heavy economic burden [4]. Since it began in the early 1970s, total joint arthroplasty has proven to be a successful and effective treatment for end-stage arthritis and other knee disorders and improved HRQoL in these diseases [5–7]. Arthroscopic surgery is an effective treatment for many non–end-stage joint diseases, and more than 900,000 knee arthroscopic surgeries were performed in the United States in 2009, over half of which involved meniscal tears and articular cartilage defects [8,9]. However, an important issue remains for surgeons: how to evaluate and quantify patients' condition in an appropriate way.

From the 1980s, a large body of research has been devoted to developing HRQoL questionnaires [10]. HRQoL questionnaires are patient-based and contribute to a better understanding of the severity of the patient's disorder and most appropriate therapeutic approach [11]. Many scoring systems have been used to evaluate patients' conditions in different countries and cultural background,

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but this need has become more essential with the growing number of multicenter studies among different countries and cultures [10] and can provide more statistical power from evidence-based trials [12]. When one reliable, valid, questionnaire is used in populations from different cultures, it is necessary to test the psychometric properties of the questionnaire, rather than simply translating the content, to avoid bias originating from cultural variety [13–15].

The University of California at Los Angeles (UCLA) activity score, published in 1998 [16], is a simple instrument ranging from 1-10 [16,17]. The original English UCLA activity score and its Italian version were distinguished by brief expression, good reliability, and validity [17,18], and has been used widely to assess conditions of activity for patients with joint diseases, especially for patients who have undergone total joint arthroplasty [19–23]. Chinese is the language spoken by the largest population in the world, and China has one of the largest populations of patients on whom total joint arthroplasty and arthroscopy has been performed. However, there is no UCLA activity score in the Chinese version for this population so far and, despite that the UCLA activity score was listed as an important evaluation index in studies concerning knee arthroscopic surgery [24–26], no study has proven to be a reliable and valid assessment of the UCLA activity score for arthroscopic surgery.

The purpose of this study was to translate and adapt the UCLA activity score cross-culturally into a simplified Chinese version (UCLA-C) and evaluate the reliability and validity of UCLA-C for native Chinese-speaking patients who underwent total knee arthroplasty (TKA) and arthroscopic knee surgery.

## Methods

### *Translation and Cross-Cultural Adaptation*

The steps of translation and cross-cultural adaptation followed previous guidelines in 5 steps [10,27].

Step 1—Forward translation. Two bilingual translators independently translated the metric from English to simplified Chinese. One of the translators was an orthopedic surgeon in the author's hospital; the other one was a professional translator without medical background.

Step 2—Synthesis of the translation. Two translators and other researchers unified contradictions in language expression and cultural difference after a consensus meeting and obtained the first UCLA-C.

Step 3—Backward translation. Two native English speakers fluent in English, with medical background and blind to the previous original English version of the UCLA activity score, independently translated the first UCLA-C back into English.

Step 4—Summarization of pre-final UCLA-C. A consensus meeting with all researchers, including 4 forward and backward translators, was held to resolve all discrepancies, ambiguities, or other verbal issues to reach a pre-final UCLA-C.

Step 5—Determination of final UCLA-C. Researchers invited 20 patients who had undergone TKA to test the pre-final version preliminarily and collect feedback from them.

Eventually, all researchers involved in this study discussed issues from the previous test and developed the final UCLA-C.

### *Patients and Data Collection*

From August 2015 to June 2016, 200 participants were recruited from patients suffering from degenerative knee osteoarthritis, cartilage defect, or meniscal tear, all of whom underwent knee arthroscopic surgery (100 patients) or TKA (100 patients) after two rounds of evaluation. The inclusion criteria were as follows: age >15 years and literate native Chinese speakers. Participants were excluded for similar symptoms for contralateral limb or knee operation history; history of spine surgery; or any surgery in the past month; other diseases that limited the patient's sport or movement ability; and other uncontrolled systematic disorders, such as diabetes mellitus, malignant tumor, or hepatitis. Participants who met the inclusion criteria and presented no exclusion criteria were recruited for this study. The number of patients also needed to meet the standard proposed by Terwee et al [28], that the study should include at least 50 patients for floor or ceiling effects, reliability, and validity analysis. All included participants were required to sign informed consent, and the study was approved by the clinical research Ethics Committee of our hospital (CZEC [2015]-31).

Patients provided demographic data regarding gender, year of age, side of affected joint, and diagnosis on the first day of being approved to participate in the study, and then finished the UCLA-C, Tegner activity score, Knee Injury and Osteoarthritis Outcome Score (KOOS), and the short-form (36) health survey (SF-36). All participants completed the UCLA-C a second time to assess its test-retest reliability 2-5 days later, before surgery.

### *Instruments*

The UCLA activity score is a simple scale ranging from 1-10, in which a higher score indicates better lower-limb function. An activity level of 1 was defined as “dependent on others,” and 10 was defined as “regular participation in impact sports” [16].

The Tegner score, developed by Tegner and Lysholm in 1985 [29], evaluates motor function for patients scoring from 0-10, in which 0 demonstrates a sick leave or disability pension, and 10 corresponds to participation in national or international competitive sports. KOOS, a well-known knee function score first published in 1998, mainly evaluates function and 5 knee-related clinical symptoms, including pain (9 items), symptoms (7 items), daily living (17 items), sport and recreational activities (7 items), and knee-related quality of life (4 items). The higher scores for KOOS refer to better function [30]. SF-36 is a questionnaire assessing general quality of life. It is composed of 36 items in 8 subscales to evaluate the patient's general condition. Scores for each subscale range from 0 (poor) to 100 (good) [31]. All the preceding scales have been translated into Chinese and been proven reliable and valid [32–34].

### *Psychometric Assessments and Statistical Analysis*

To assess the acceptability of UCLA-C, patients were asked about the difficulties they encountered, and mean completion time was obtained from all participants.

Statistical analysis for score distribution was performed. A floor effect and ceiling effect of <20% were considered acceptable.

Reliability was examined in terms of test-retest reliability and absolute reliability. Test-retest reliability was tested by comparing outcomes when the same patient without changes in health answered the UCLA-C in two situations. It was evaluated by the intraclass correlation coefficient (ICC), which derived from a 2-way analysis of variance in a random effect model. ICC >0.8 and >0.9 were considered good and excellent reliability, respectively [35]. Bland-Altman plots were produced to estimate systematic bias between the two measures [36]. In addition, we calculated the standard error of measurement and the minimum detectable change (MDC) to assess absolute reliability [37].

Validity tests for UCLA-C included content validity and construct validity. To assess content validity, 1 rehabilitation therapist and 3 orthopedists were invited to analyze the correlation between content in each item and state of disease. Good construct validity meant that the questionnaire correlated well with measures of the same construct (convergent validity) and correlated poorly with