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Translation and Validation of the Korean Version of the International Knee Documentation Committee Subjective Knee Form

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Purpose: To perform a cross-cultural adaptation and to test the measurement properties of the Korean version of International Knee Documentation Committee (K-IKDC) Subjective Knee Form.
Materials and Methods: According to the guidelines for cross-cultural adaptation, translation and backward translation of the English version of the IKDC Subjective Knee Form were performed. After translation into the Korean version, 150 patients who had knee-related problems were asked to complete the K-IKDC, Lysholm score, and Short Form-36 (SF-36). Of these patients, 126 were retested 2 weeks later to evaluate test–retest reliability, and 104 were recruited 3 months later to evaluate responsiveness. Construct validity was analyzed by investigating the correlation with Lysholm score and SF-36; content validity was also evaluated. Standardized mean response was calculated for evaluating responsiveness.
Results: The test–retest reliability proved excellent with a high value for the intraclass correlation coefficient (r=0.94). The internal consistency was strong (Cronbach's α=0.91). Good content validity with absence of floor not ceiling effects and good convergent and divergent validity were observed. Moderate responsiveness was shown (standardized mean response=0.689).
Conclusions: The K-IKDC demonstrated good measurement properties. We suggest that this instrument is an excellent evaluation instrument that can be used for Korean patients with knee-related injuries.

Keywords: Knee, Outcome measures, International Knee Documentation Committee, Cross-cultural adaptation, Korean version

Introduction

Outcome measurement is fundamental to every aspect of the operative management of the patient. Development, evolution, modification, and even abolition of the treatment concept and procedure are based primarily upon outcome evaluation[1]. Since

the mid-1950s, multitudes of knee joint evaluation instruments have been suggested[2-4] and more than 54 different outcome measures exist for the anterior cruciate ligament deficient knee[5]. Although each rating system has its own concepts and rationales, comparing outcomes from different surgical techniques or treatments is impossible without standard evaluation system[2,3].

There has been a growing need for another dimension to clinical outcome evaluation[6], namely, health-related quality of life. Traditional outcome measurement tools in orthopedic surgery are either disease-specific or knee-specific and cannot avoid the pitfall that they represent a functional status from the patient's perspective. Health-related quality of life measures encompass specific or general aspects of functional status relevant to patient perception.

The International Knee Documentation Committee (IKDC) Subjective Knee Form was designed in 2001 by the joint committee of the American Orthopaedic Society for Sports Medicine

(AOSSM) and the European Society of Sports Traumatology, Knee Surgery and Arthroscopy to represent a knee-specific subjective outcome measurement of general health status. It measures symptoms and limitations in function and sports activities due to knee impairment for every knee-related problem encompassing not only ligament injury but also arthritis[3,4]. The survey form is composed of three categories (symptoms, sports activities, and function) including ten questions: one sports activities question on the affect of the knee joint on daily activity and nine specific performances. The summed score of individual questions was transformed to a final IKDC score ranging from 0 to 100[3]. It was developed and represents a knee-specific general measure of health status assessed from a patient's perspective. To evaluate this form, a comprehensive validation process of measurement properties such as reliability and validity was conducted[3,4].

Recently the original English version of IKDC Subjective Knee Form had come into wide use in Brazilian-Portuguese, Dutch, and Italian. Although informal versions of the IKDC Subjective Knee Form in have been sporadically utilized in several clinics in Korea, formal validation procedures have not been undertaken.

Cross-cultural adaptation should be carried out to use this verified English form in the different language and culture, and the measurement properties of the translated form should be validated.

The purpose of this study was to perform a cross-cultural adaptation for use of Korean speaking patients and to test the measurement properties of the Korean version of IKDC (K-IKDC) Subjective Knee Form, which can be applied to most knee conditions.

Materials and Methods

The Korean Knee Society launched a committee for translation and cross-cultural adaptation of the IKDC Subjective Knee Form in September 2006. Translation and cross-cultural adaptation procedures were performed by the guidelines of Guillemin et al.[7] and the recommended protocol was developed by the American Academy of Orthopedic Surgeons (AAOS) Institute for Work and Health[8], which consisted of six stages.

1. Translation and Cross-Cultural Adaptation Procedures

1) Translation

Forward translation from English to Korean was independently made by two bilingual translators who spoke Korean as their mother tongue.

2) Synthesis

Two sets of translations were integrated into a single survey form by the translators. The synthesis was performed by consensus of two translators rather than one person compromising their feelings.

3) Back translation

Another two bilingual translators, who spoke English as their mother tongue and did not participate in the forward translation step, independently translated the integrated form backward to English. As recommended by Guillemin et al.[7], the backward translation into English should reflect the same item content as the original version.

4) Expert committee review

An expert committee composed of 2 methodologists, 4 health professionals (members of the K-IKDC, Orthopedic surgeons), 2 language professionals, and 2 translators reviewed all versions of the questionnaire and resolved any discrepancies. They checked all item contents in view of semantic, empirical, and conceptual cross-cultural equivalence.

5) Pretesting

A pre-final version of the questionnaire was tested on 30 consecutive patients to examine the accuracy of wording and ease of understanding. After completing the questionnaire, the patients were interviewed to determine if all questions were clearly understood.

6) Submission and appraisal of all written reports by the AAOS

All procedural documents were submitted to the AOSSM committee and the K-IKDC Subjective Knee Form was approved in April 2008.

2. Validation Procedure

A validation procedure was conducted on the patients, who visited the clinic with knee-related disorders in 3 university hospitals. Approval from the institutional review board of each university and the informed consents were obtained from all subjects.

All subjects were asked to answer the K-IKDC, Lysholm scale, and the Korean version of the Short Form-36 (SF-36)[9]. The Lysholm scale is an 8-item questionnaire originally designed to evaluate patients after knee ligament surgery. It evaluates stability, pain, locking, swelling, stair climbing, limping, use of a support, and squatting on a 100-point scale[10]. This scale has been used extensively for clinical research studies and has good construct

validity and adequate test–retest reliability[11-13]. The SF-36 is one of the most widely used generic health-related quality of life questionaires[14]. It contains 36 items that measure perceived health in eight domains: physical functioning (PF), role-physical (RP), bodily pain (BP), general health (GH), vitality (VT), social functioning (SF), role-emotional (RE), and mental health (MH), which are summarized in a physical component summary and a mental component summary.

1) Reliability

Test-retest reliability and internal consistency were evaluated for the test of reliability. Test-retest reliability which is often called as reproducibility or repeatability measures whether the instrument produces the same results by repeated administration to stable subjects.

After 2 weeks from the first visit, the patients were asked to answer the K-IKDC again at the second visit. This interval was thought to be long enough for the patients to have forgotten previous responses but not so long that their condition would have changed[13]. At the second interview, the global rate of change was also questioned with a 5-point Likert scale to verify changes in general knee status. Only the patients who answered no change were considered stable and included in the reliability analysis. Intraclass correlation coefficient was used for determining test-retest reliability. Internal consistency was assessed using the Cronbach's alpha, which addresses the homogeneity of the questions within a questionnaire. An alpha value of 0.7 was considered fair, 0.8, good, and 0.9, excellent[15].

2) Validity

Validity refers to how precise the "true value" estimated by the questionnaire is. The content validity was evaluated by the distribution of the final K-IKDC scores and represented by the floor or ceiling effect. Floor effects were determined as the proportion of patients who obtained the lowest possible score and ceiling effects as the proportion of patients who obtained the highest possible score. A ceiling effect and floor effect <20% were considered acceptable.

The construct validity was tested by Pearson's correlation coefficient of the K-IKDC with Lysholm scores and SF-36 scores. Construct validity is composed of convergent validity and divergent validity. Convergent validity refers to the degree to which a measure is correlated with other measures that it is theoretically predicted to be correlated with, while divergent validity refers to the degree to which a measure is not correlated with other measures that it is predicted not to be correlated with. The Lysholm

score and three domains (bodily pain, role of physical limitations, and physical functioning) of the SF-36 were assumed to be highly correlated with the K-IKDC.

3) Responsiveness

Responsiveness, or the ability to reflect changes in patient status, was assessed for the K-IKDC using standardized response means (SRMs) calculated by the following formula: (mean postoperative score–mean preoperative score)/standard deviation of the change in score. High responsiveness indicates a greater ability to detect changes. K-IKDC was administrated to the participants at initial visit and at 3 months later. One hundred four participants were recruited for evaluating the responsiveness. Small effects were considered >0.20, moderate effects were considered >0.50, and large effects were considered >0.80[16].

3. Statistical Analysis

Intraclass Correlation coefficient was calculated for test-retest reliability and Cronbach's alpha value was for internal consisten-

Table 1. Demographics of Participants

Characteristic	No. (%)
Age (yr)	
≤19	26 (17.3)
20–29	44 (29.3)
30–39	28 (18.7)
40–49	18 (12.0)
50≤	34 (22.7)
Sex	
Male	98 (65.3)
Female	52 (34.7)
Diagnosis	
Patellofemoral pain syndrome	30 (20.0)
Patella tendinitis	15 (10.0)
Biceps tendinitis	1 (0.7)
Medial hamstring tendinitis	1 (0.7)
Iliotibial band syndrome	1 (0.7)
Meniscus tear	41 (27.3)
Osteoarthritis	18 (12.0)
Anterior cruciate ligament	27 (18.0)
Medial collateral ligament	12 (8.0)
Posterior cruciate ligament	2 (1.3)
Lateral collateral ligament	1 (0.7)
Patella tendon rupture	1 (0.7)

cy. Validity was evaluated by the correlation analysis with K-IK-DC with SF-36 and Lysholm score. Standardized response mean was used for evaluating the responsiveness. These analyses were performed with SPSS ver. 16.0 (SPSS Inc., Chicago, IL, USA), and p-values<0.05 were considered significant.

Results

One hundred fifty patients (98 males and 52 females) were recruited in this survey. They were an average of 30.5 years of age (range, 9 to 68 years). Meniscus tear was most common in 41 patients (27.3%) followed by patellofemoral pain syndrome in 30 patients (20.0%) (Table 1).

1. Reliability

Internal consistency was measured using data from 150 patients. The Cronbach's α value was 0.91, using 18 items of the K-IKDC, indicating strong internal consistency.

Test–retest reliability was assessed from the 126 patients who completed follow-up questionnaires. The average interval between the two tests was 14.4 days (range, 11 to 17 days). The intraclass correlation coefficients was 0.94 (p<0.01).

2. Validity

1) Content validity

The Kolmogorov-Smirnov test for normal distributions did not rule out the hypothesis that the distributions of the K-IKDC results were homogeneous (p=0.20). Thus, the K-IKDC score followed a normal distribution and neither a ceiling effect nor a floor effect was observed (Fig. 1).
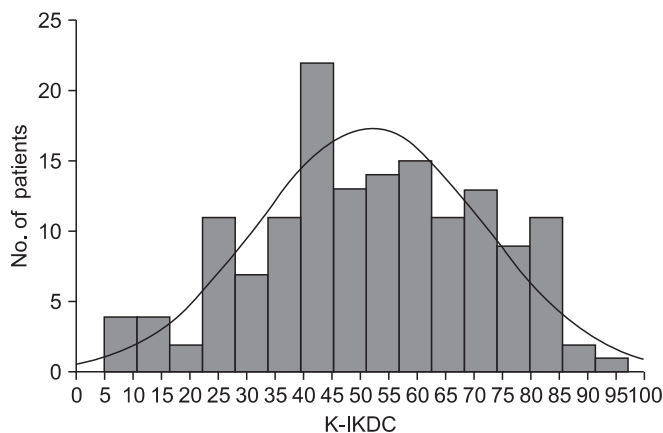

Fig. 1. Distribution of Korean version of International Knee Documentation Committee (K-IKDC) Subjective Knee Form scores.

2) Construct validity

The K-IKDC showed excellent correlation with the Lysholm score (p=0.82), which rates knee function and objective physical signs in the presence of ligament injury or other illnesses. For the SF-36, the dimension related to physical health showed good correlation (summary measure of physical health, p=0.61) but those related to mental health (summary measure of mental health, p=0.35) did not (Table 2). This indicated that the K-IKDC had good convergent validity and good divergent validity.

3. Responsiveness

The responsiveness was evaluated by 3-month-interval administration of K-IKDC to 104 patients. There was a moderate responsiveness of SRM 0.69 (Table 3).

Discussion

Our purpose was to translate the English version of the IKDC

Table 2. Pearson Correlation Coefficient of Korean Version of International Knee Documentation Committee with Lysholm Score and Short Form-36 (Construct Validity)

Construct validity	Correlation coefficient	p-value
Lysholm	0.82	<0.01
Short form-36		
Total	0.57	<0.01
General health	0.11	0.16
Physical functioning	0.66	<0.01
Role-limitation due to physical function	0.49	<0.01
Bodily pain	0.30	<0.01
Vitality	0.15	0.06
Social functioning	0.48	<0.01
Role-limitation due to emotional function	0.30	<0.01
Mental health	0.15	0.04

Table 3. Reliability and Responsiveness of Korean Version of International Knee Documentation Committee Subjective Knee Form

Measurement properties	Value
Internal consistency	
Crohnbach's alpha	0.91
Test-retest reliability	
Intraclass correlation coefficient	0.94
Responsiveness	
Standardized response mean	0.69

Subjective Knee Form to a Korean version with cross-cultural adaptation method and to validate it. We confirmed that the K-IKDC could reflect the same item content as the original English version and preserved good validity and reliability.

The IKDC Subjective Knee Form was presented in 2001, which consisted of 18 items that inquire about symptoms and limitations in function and sports activities due to knee impairment for every knee-related injury[3,4]. Validation procedures with the patients who had various knee related problems showed that it was a reliable and valid instrument. However, similar to most questionnaires in the literature, the outcome questionnaire in English could have some difficulties with simple translation in different language groups with different cultures. The cross-cultural adaptation guidelines described by Guillemin et al.[7] are widely accepted and used for the translation and adaptation of questionnaires. According to these guidelines, cross-cultural adaptation of the IKDC Subjective Knee Form was performed in many countries and was approved by AOSSM in ten different languages including Korean until July 2011.

As Korean-speaking patients can use the K-IKDC in a simple and effective manner, the IKDC subjective form can be propagated among Korean researchers.

The authors held an expert committee several times to maintain cross-cultural equivalence of the cultural and linguistic aspects during the cross-cultural adaptation process. For example, "pivoting," "giving way," and "squat" are common expressions in English, but there are no similar Korean expressions that could convey the original meaning of these words. Thus, the authors discussed and created some phrases composed of several words that could be understood easily among Koreans without changing the original meaning. In addition, Koreans are familiar with the metric system, so miles were converted to meters.

To evaluate construct validity, we analyzed the correlation with Lysholm score and the SF-36. The K-IKDC showed excellent correlation with Lysholm score (r=0.82) and good correlation with the PF, RP, and BP domains of the SF-36, whereas it showed poor correlation with RE, VT, and the MH domains of the SF-36. Good convergent and divergent validity were achieved. These results were the same as expected and agreed with the original version and other studies for cross cultural adaptation[1,3,6,17].

Our study had several limitations. A subgroup analysis would have revealed the characteristics of the K-IKDC according to disease entity, but the sample size was not large enough. The absence of a standardized Korean language disability measure for knee disease was another limitation, which could be used as a gold standard for evaluating the construct validity of K-IKDC. Fur-

ther studies are required, which analyze the influence of various factors, such as occupation, socioeconomic status, and disease entity.

Conclusions

The K-IKDC Subjective Knee Form demonstrated good measurement properties. We suggest that this instrument is an excellent evaluation instrument that can be used for Korean patients with knee-related injuries.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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