

TRANSLATION AND VALIDATION OF THE BULGARIAN
VERSION OF THE KNEE INJURY AND OSTEOARTHRITIS
OUTCOME SCORE (KOOS) IN PATIENTS WITH
OSTEOARTHRITIS

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Abstract

The Knee Injury and Osteoarthritis Outcome Score (KOOS) is one of the valid and reliable tools for patient-reported assessment of the knee joint in cases of injury or osteoarthritis, before or after knee replacement. The aim of this study was to evaluate the validity and reliability of the Bulgarian version of the KOOS questionnaire. First, the original English version was translated into Bulgarian, back-translated, and pilot-tested for clarity and acceptance. Then the Bulgarian version of the questionnaire was administered to 77 patients with osteoarthritis of the knee and some of them completed it again within a week. Internal consistency, test-retest reliability, and construct validity were assessed through Cronbach's alpha, Intraclass correlation coefficient, and correlation with the WOMAC questionnaire, respectively. Minimum Cronbach's alpha level of 0.7 was exceeded by all five subscales of the KOOS. Minimum ICC of 0.7 was exceeded by four of the subscales and the fifth had moderate ICC of 0.57. High correlation with the WOMAC score was found in four subscales and the fifth showed moderate correlation. The results suggest that the Bulgarian version of the KOOS is valid and reliable for use in Bulgarian patients with osteoarthritis of the knee.

Key words: KOOS, Bulgarian version, translation

Introduction. The Knee Injury and Osteoarthritis Outcome Score (KOOS) is one of the tools with good psychometric properties available for patient-reported

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assessment of the functional and symptomatic aspects of the knee joint in cases of injury or osteoarthritis, both before and after knee replacement; it is based on the widely used Western Ontario and McMaster Universities Arthritis Index (WOMAC) questionnaire, it contains the same questions within itself and allows for direct calculation of the WOMAC score [1-4]. KOOS is in the public domain and is free of charge; no licensing or permission to use KOOS is required [5]. Before clinical application, a patient-reported questionnaire in a different language should be translated and validated for use in the target population following a specific procedure [6,7]. Although the KOOS has been translated and validated for use in many countries, a Bulgarian version is not available yet [5]. This study was performed in order to assess the validity and reliability of the Bulgarian version of the KOOS in patients with osteoarthritis of the knee.

Material and methods. Study instruments. The KOOS contains 42 questions in five subscales: Symptoms, stiffness – seven questions (S); Pain – nine questions (P); Function, daily living (ADL) – 17 questions (A); Function, sports and recreational activities – five questions (SP), and knee-related Quality of Life (QoL) – four questions (Q). Each question scores from zero (no problems) to four (extreme problems) in Likert scale. A normalized score (100 indicating no symptoms and 0 indicating extremely severe symptoms) is calculated separately for each of the subscales. Twenty-four of the 42 questions comprise the WOMAC questionnaire. The consent of the authors of the KOOS was requested to translate it into Bulgarian and to validate it for use in Bulgaria.

Translation and linguistic adaptation. The KOOS was translated from the original English language into Bulgarian by two independent translators, one of them was a professional translator and the other had a medical background. The two translations were discussed and merged into a common translation that was then back-translated into English by two independent translators. As it proved impossible to find two native speakers of English who were fluent in Bulgarian, the back translations were performed by two native speakers of Bulgarian with non-medical higher education and one of them living in the UK and the other in the USA for more than ten years. The forward and back-translations did not reveal major discrepancies apart from questions P2 and SP4 where the word “pivoting” could not be translated directly into/from Bulgarian and a phrasal translation had to be used. Also, the words “socks/stockings” in questions A9 and A11 were changed to their single Bulgarian equivalent. After the pre-final questionnaire (KOOS-B1) was approved by all translators, it was compared with the pre-existing Bulgarian version of WOMAC [8]. Of the 24 questions in the Bulgarian WOMAC, seven (29%) coincided verbatim with the KOOS-B1 translation, eight (33%) had insignificant differences (e.g. the use of definite or indefinite articles), and nine (38%) had somewhat different wording but their meaning was deemed by the translators to be the same in both questionnaires. In all but two of the nine questions the KOOS-B1 wording was retained. After the final questionnaire was

ready (KOOS-B), it was completed by twelve patients to test the clarity and acceptability of the Bulgarian version. Then the questionnaire was completed by all the participants and within the next week the translated questionnaire was completed again by some of the patients who had not received any medical treatment in the meantime.

Patients. Seventy-seven patients diagnosed with osteoarthritis of the knee according to the EULAR criteria who were eligible for total knee replacement were enrolled for the study [9]. Age ranged from 50 to 81 years, ($M = 66.5$; $SD = 6.6$); 39% were male and 61% were female; the left or the right knee was evaluated in 45% and 55% of patients, respectively. The duration of symptoms ranged from 1 to 22 years ($M = 5.2$; $SD = 3.6$). Patients with bilateral involvement were only assessed regarding the knee that was to have surgery. Inclusion criteria were radiographic confirmation of the diagnosis, native Bulgarian language, and capability to read and answer the questions. Non-native speakers of Bulgarian, illiterate or mentally disabled patients were not included in the study. The study was approved by the local Ethics Committee and all patients gave written consent to participation.

Assessment of psychometric properties. To test the questionnaire's internal consistency and test-retest reliability, the Cronbach's alpha and the intraclass correlation coefficient (ICC) were used. Good internal consistency was accepted with Cronbach's alpha ≥ 0.7 [10]. The ICC(3.1) was estimated by having eleven patients respond to the questionnaire twice several days apart. $ICC \geq 0.7$ was accepted as reliable [10].

Construct validity was assessed by testing the KOOS-B subscales against the internal WOMAC whose questions were very close to the previously validated Bulgarian version of the WOMAC questionnaire. The normality of the score distributions was assessed through Shapiro–Wilk and d'Agostino–Pearson tests, and Spearman's and Pearson's coefficients were used to estimate the correlations accordingly.

For assessing floor or ceiling effect, a 15% margin was accepted [10].

Statistical analysis was performed using Microsoft Excel 2010 and the Real Statistics Resource Pack Ver.7.0.6 [11]. Statistical significance was accepted as $p < 0.05$.

Results. Normal distributions were found for all scores except Sports and QoL subscales (Fig. 1).

Floor effect was present in the Sports subscale where 24% of the patients achieved the minimal score of zero. No ceiling effect was detected in any of the subscales.

The mean score (standard deviation) for each subscale of the KOOS-B and the WOMAC were as follows: Pain – 45.51 (22.36); Symptoms – 50.24 (22.24); ADL – 45.27 (22.38); Sports – 25.02 (28.18); QoL – 24.92 (18.45); WOMAC – 46.51 (22.23) (Fig. 2).

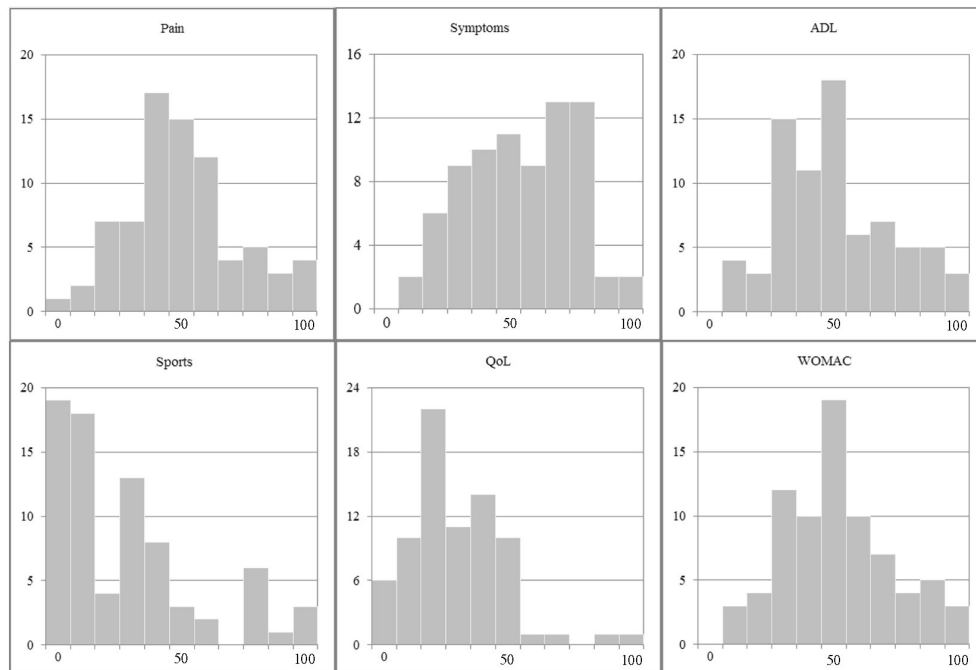


Fig. 1. Frequency distributions of the scores of KOOS-B subscales and WOMAC ($n = 77$)

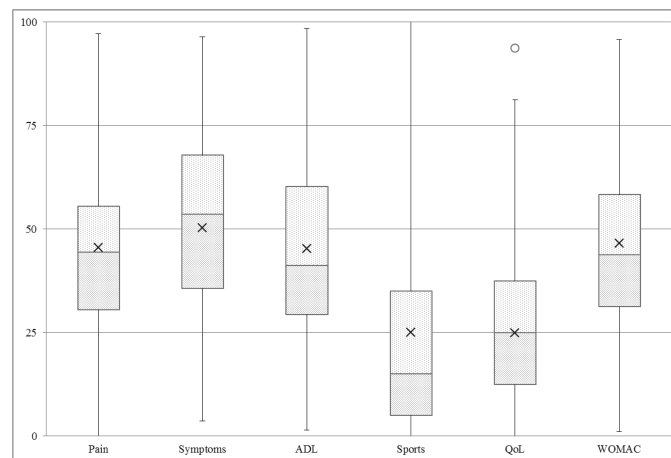


Fig. 2. Boxplot of KOOS-B scores and WOMAC score
($\times$ – mean, $\circ$ – outlier)

Table 1 summarizes the results of internal consistency measured by Cronbach's alpha, intraclass correlation coefficient, and Pearson and Spearman correlation coefficients against the WOMAC depending on the normality of the score distributions for each subscale of KOOS-B. For all subscales the variability of Cronbach's alpha with item removed was low with no outliers.

T a b l e 1

KOOS-B subscales: internal consistency, ICC(3.1), and correlation ($p < 0.001$) with the WOMAC score (SD – standard deviation, CI – 95% confidence interval)

	Pain	Symptoms	ADL	Sports	QoL
Cronbach's alpha total	0.928	0.805	0.972	0.956	0.864
Mean (SD) with missing item	0.92 (<0.01)	0.78 (0.02)	0.97 (<0.01)	0.94 (<0.01)	0.83 (0.06)
ICC	0.94	0.93	0.92	0.57	0.92
CI	0.790–0.983	0.774–0.982	0.721–0.977	–0.013–0.862	0.753–0.980
Pearson	0.943	0.742	0.990	–	–
Spearman	–	–	–	0.590	0.775

Discussion. The results of the present study indicate that the Bulgarian version of the KOOS is a valid and reliable instrument for assessment of pain, symptoms, activities of daily living, and quality of life regarding the knee joint in patients with osteoarthritis. However, the results of the Sports subscale should be interpreted with caution, if at all, because few elderly patients with osteoarthritis of the knee are actively engaged in sports, i.e. their answers do not actually reflect sporting or high-level activities. This is in line with the complete omission of the Sports subscale in the twelve-item KOOS-12 measure that is mainly aimed at patients with end-stage osteoarthritis [5].

The internal consistency for all subscales was very high with values of Cronbach's alpha above 0.7 and as high as 0.97 for the ADL subscale. This result might be biased because of the concentration of patients with more advanced osteoarthritis in a joint-replacement department. However, no ceiling effect was detected in any of the subscales of the KOOS-B. No single item was found to contribute more to the score than any of the others as evidenced by the low variability of alpha with each item removed.

With ICC above 0.9, test-retest reliability was very high for all subscales except the Sports subscale, where it was only moderate (0.57). No explanation was found for this deviation.

Construct validity assessed through the correlation with the Bulgarian version of WOMAC was acceptable for all subscales except the Sports subscale. Pearson's coefficient was above the accepted level of 0.7 for the Pain, Symptoms, and ADL subscales and Spearman's coefficient was acceptable for the QoL subscale. The Sports subscale had Spearman's coefficient of correlation of 0.59 which was logical regarding the nature of the questions and the characteristics of the subjects which were also the reasons for floor effect in this subscale. However, the subscales of the KOOS are to be calculated and reported separately so the inferior results of the

Sports subscale have no bearing on the use of the other parts of the questionnaire. Moreover, it underwent exactly the same process of translation and adaptation as the rest of the KOOS thus it might be speculated that this subscale would have the same linguistic adequacy especially bearing in mind that the text of question SP4 repeats that of P2 and the other four questions of the Sports subscale consist of one word each that pose no problem for translating or understanding.

Conclusions. This study revealed satisfactory results of the internal consistency, test-retest reliability, and construct validity tests for the Bulgarian version of KOOS subscales of Pain, Symptoms, ADL, and QoL. Although the Sports subscale showed inferior psychometric properties, the KOOS-B can be used as a valid and reliable instrument for assessment of the knee joint in Bulgarian patients with osteoarthritis. However, additional studies in younger active patients are needed to confirm the validity and reliability of the Bulgarian version of the KOOS in that population.

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