Knee Injury and Osteoarthritis Outcome Score: Validity and Reliability of an Indonesian Version

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Background: The Knee injury and Osteoarthritis Outcome Score (KOOS) is a useful diagnostic tool to assess knee ligament injury and osteoarthritis, but no validated Indonesian version of the KOOS was available.

Methods: We used the forward-backward translation protocol to develop the Indonesian version of the KOOS. The translated questionnaire was administered twice to 51 subjects diagnosed with a knee ligament injury and osteoarthritis. Validity of the questionnaire was assessed by analyzing the correlation between the score of each subscale and the overall score of the 36-Item Short Form Health Survey (SF-36) using the Pearson correlation coefficient. Reliability was measured by evaluating internal consistency (Cronbach $\alpha$) and test-retest reliability (intraclass correlation coefficient).

Results: For construct validity, moderate Pearson correlation coefficients were found between the KOOS subscales and the SF-36. Cronbach $\alpha$ was 0.84 to 0.97 for all subscales, indicating adequate internal consistency. The test-retest reliability was excellent, with intraclass correlation coefficients ranging from 0.91 to 0.99 for all subscales. No significant differences were found in the KOOS subscale responses between the first administration of the questionnaire and the second administration within 21 days.

Conclusion: The Indonesian version of the KOOS was determined to be valid and reliable and is therefore an objective instrument for evaluating knee ligament injury and knee osteoarthritis in the Indonesian population.

Keywords: Activities of daily living, diagnostic self-evaluation, Indonesia, knee injuries, osteoarthritis–knee, pain measurement, quality of life, validation study

INTRODUCTION

Ligament injury frequently occurs during sports or as a result of trauma and is a structural, mechanical, and physiological change in the ligament that causes joint stability disruption.1,2 One of the most prevalent causes of knee pain, with an estimated prevalence of 20% in the adult population, ligament injury is associated with a substantially increased risk for the development of osteoarthritis in the patellofemoral and tibiofemoral joints.1-3 Tools for diagnosing knee ligament injury and osteoarthritis, such as the Lysholm Knee Scoring Scale and the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), focus only on either the short-term or long-term consequences of knee ligament injury.4,5 Consequently, Roos and Lohmander developed an independent questionnaire as an extension of the WOMAC—the Knee injury and Osteoarthritis Outcome Score (KOOS)—to assess both short-term and long-term symptoms and function in patients with a knee ligament injury and osteoarthritis.6 The KOOS is a self-administered questionnaire for patients with anterior cruciate ligament injury, meniscus injury, or posttraumatic osteoarthritis and includes 42 items in 5 separately scored subscales related to symptoms, pain, activity of daily living, sport and recreation function, and quality of life (QOL).6,7 American English and Swedish versions of the KOOS were developed simultaneously, and KOOS translations are available in German, Danish, Russian, Italian, Spanish, French, Polish, Greek, Arabic, Portuguese, Persian, and Turkish.8 However, no validated knee ligament injury and osteoarthritis questionnaire was available in the Indonesian language. The objective of this study was to develop an Indonesian version of the KOOS and evaluate its validity and reliability.

METHODS

Study Design and Sample

The population in this cross-sectional study was 51 patients with a knee ligament injury and osteoarthritis from Saiful Anwar General Hospital and Persada Hospital, Malang, East Java, Indonesia. The inclusion criteria were...
mental health. The first 4 components evaluate the physical 

eral health, vitality, social functioning, role emotional, and 

36 are physical functioning, role physical, bodily pain, gen-

KOOS

Development of the Indonesian Version of the 
KOOS

The first author (K.Y.P) requested permission to develop 

an Indonesian version of the KOOS by sending an email to 

webmanager@koos.nu according to the 2012 KOOS guide-

line and was approved by Morten Pedersen on March 9, 

2019. The forward-backward translation protocol was used 

during the translation process.

Two independent translators translated the American 

English questionnaire into Indonesian. One translator is an 

orthopedic expert, and the other is a professional transla-

tor. The 2 versions were then compared and discussed to 

correct any discrepancies. The resulting Indonesian transla-


tion was then translated back to English by one orthopedic 

expert and one professional translator. The resulting back-


translation was assessed to confirm the similarity to the origi-


al American English version.

The Indonesian translation was given to 3 orthopedic 

experts for review, and an expert committee consisting 

of translators, health care workers, the authors, and aca-

demic methodology experts also assessed the translation 

for the similarity of each question to the original version 

and for ease of understanding. The committee’s sugges-


tions were used to design a prefinal version of the Indonesian 

KOOS.

Preliminary Testing of the Indonesian Version of 
the KOOS and Finalization

The prefinal version of the Indonesian version of the KOOS 

was tested with 51 subjects with osteoarthritis and knee lig-

ament injury to assess their understanding and interpreta-


tion of each item on the questionnaire. After making any 

necessary changes to the wording to ensure understand-


ing, the committee finalized the Indonesian version of the 

KOOS.

Research Procedure

The Indonesian version of the KOOS was used simultane-

ously with the Indonesian version of the 36-Item Short Form 

Health Survey (SF-36). The same 51 subjects who tested 

the prefinal version were asked to complete the Indonesian 

version of the KOOS and the SF-36 twice within an interval 

of 21 days.

The SF-36 is routinely used to assess health-related QOL,5 

and the Indonesian version had been previously developed 

and studied.10-12 The 8 components assessed in the SF-

36 are physical functioning, role physical, bodily pain, gen-

eral health, vitality, social functioning, role emotional, and 

mental health. The first 4 components evaluate the physical 

health/physical components scale, and the other 4 assess 

the mental health/mental components scale. The SF-36 is 

widely used to assess several musculoskeletal problems, 

including knee osteoarthritis, as it evaluates general health 

aspects and is applicable to all age groups.10,13

Statistical Analysis

The validity of an instrument can be determined by analyz-

ing its instrument’s correlation with other preexisting instru-

ments that measure a similar outcome, a test that is also 

called construct validity. The construct validity of the Indone-

sian version of the KOOS was determined by analyzing the 

correlation between the score of each subscale and the over-

all score of the SF-36 using the Pearson correlation coef-


ficient. P values <0.05 were deemed statistically signifi-

cant. Pearson correlation coefficients of 0.1 to 0.3, 0.3 to 

0.5, and >0.5 were considered weak, moderate, and strong, 

respectively.

The reliability test was divided into internal consistency 

and test-retest reliability. Internal consistency was measured 

by calculating the value of Cronbach α, and the test-retest 

reliability was evaluated by measuring the intraclass corre-

lation coefficient (ICC) with a 95% CI.14 Cronbach α >0.70 

was considered to denote adequate internal consistency. 

ICCs <0.50, of 0.50 to 0.75, of 0.75 to 0.90, and >0.90 were 

indicative of poor, moderate, good, and excellent reliability, 

respectively.14,15

Subscale scores on the Indonesian version of the KOOS 

from the first and second administrations within a 21-day 

interval were compared using the paired t test.

SPSS statistical software, version 25 (IBM Corp) for 

Microsoft Windows was used for all analyses.

RESULTS

Of the 51 study subjects, 30 (58.8%) were males with a 

mean age of 36.4 ± 16.7 years, and 21 (41.2%) were females 

with a mean age of 50.2 ± 14.0 years.

The results of the validity test, presented by KOOS sub-

scale, are shown in Table 1. The analysis showed a signifi-

cant positive correlation between the score of each subscale 

and the overall score of the SF-36. All Pearson correlation 

coefficients were >0.30, indicating a moderate correlation 

as defined in the Methods section.

Table 1. Validity Test of the Indonesian Version of the Knee 
Injury and Osteoarthritis Outcome Score (KOOS)

<table>
<thead>
<tr>
<th>KOOS Subscale</th>
<th>Pearson Correlation Coefficient</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptoms</td>
<td>0.50</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Pain</td>
<td>0.51</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Activity of daily living</td>
<td>0.53</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Sport and recreation function</td>
<td>0.45</td>
<td>0.001</td>
</tr>
<tr>
<td>Quality of life</td>
<td>0.48</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Note: Pearson correlation coefficients between 0.1 and 0.3, between 0.3 and 0.5, and >0.5 indicate weak, moderate, and strong validity, respectively.
Table 2. Reliability Test of the Indonesian Version of the Knee injury and Osteoarthritis Outcome Score (KOOS)

<table>
<thead>
<tr>
<th>KOOS Subscale</th>
<th>Internal Consistency</th>
<th>Test-Retest Reliability</th>
<th>Intraclass Correlation Coefficient (CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptoms</td>
<td>0.84</td>
<td>0.97 (0.95-0.98)</td>
<td></td>
</tr>
<tr>
<td>Pain</td>
<td>0.94</td>
<td>0.91 (0.87-0.94)</td>
<td></td>
</tr>
<tr>
<td>Activity of daily living</td>
<td>0.97</td>
<td>0.99 (0.98-0.99)</td>
<td></td>
</tr>
<tr>
<td>Sport and recreation function</td>
<td>0.96</td>
<td>0.98 (0.96-0.99)</td>
<td></td>
</tr>
<tr>
<td>Quality of life</td>
<td>0.86</td>
<td>0.99 (0.98-0.99)</td>
<td></td>
</tr>
</tbody>
</table>

Notes: Cronbach α > 0.70 denotes adequate internal consistency. Intraclass correlation coefficients < 0.50, between 0.50 and 0.75, between 0.75 and 0.90, and > 0.90 indicate poor, moderate, good, and excellent reliability, respectively.

The results of the reliability test, presented by KOOS subscale, are shown in Table 2. All questionnaire subscales had Cronbach α values > 0.70, denoting adequate internal consistency as defined in the Methods section. In the analysis of test-retest reliability, all ICCs were > 0.90, indicative of excellent reliability as defined in the Methods section.

The Figure shows mean scores for each KOOS subscale at the 2 administrations of the questionnaire. The results of the paired t test showed no significant differences in the mean scores between the first and the second administrations for each subscale.

DISCUSSION

Our analysis of the construct validity of an Indonesian version of the KOOS demonstrated a significant positive correlation between the score of each KOOS subscale and the overall score of the SF-36. All P values were < 0.001, and all Pearson correlation coefficients were > 0.30, indicating a moderate correlation. Hence, the results confirmed the validity of the questionnaire. Studies by Roos et al., Cheung et al., and Gonçalves et al. also showed a moderate correlation between the KOOS and the SF-36. This moderate correlation is caused by the generic nature of the SF-36 that emphasizes the assessment of overall QOL (including mental health) and is therefore less responsive than the KOOS for assessing knee-specific symptoms, function, and QOL.

Both the internal consistency and the test-retest reliability results confirmed the reliability of the Indonesian version of the KOOS. We found that all the KOOS subscales on the Indonesian version have adequate internal consistency, with all Cronbach α values > 0.70 (range, 0.84-0.97). These values are comparable to those for the Finnish version (Cronbach α range, 0.79-0.96) and the Malaysian version (Cronbach α range, 0.78-0.95). Our test-retest reliability analysis showed that the Indonesian version of the KOOS has excellent reliability, with all ICC values > 0.90 (range, 0.91-0.99). Our results are similar to those for the Italian version (ICC range,
The validity of the instrument to detect clinical changes over time is essential to analyze the responsiveness of the instrument, so the ability of the instrument to detect clinical changes over time is unknown.

CONCLUSION

The Indonesian version of the KOOS exhibited adequate internal consistency, excellent test-retest reliability, and moderate construct validity and is therefore an objective tool for evaluating knee ligament injury and osteoarthritis in the Indonesian population. However, additional adaptation and validation studies of similar instruments are needed.

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REFERENCES


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