

A User's Guide to:

The Knee injury and Osteoarthritis Outcome Score for children

KOOS-Child

KOOS-Child is a patient-reported outcome measure employing five-item Likert scales. KOOS-Child covers 5 dimensions (subscales): Pain, Symptoms (titled “Knee problems” in the KOOS-Child), Difficulty during daily activities (ADL), Function in sport and play (Sports/Play) and knee-related Quality of Life (QOL).

The psychometric testing of the preliminary version of the KOOS-Child (LK 1.0) [1] has been completed and a final version KOOS-Child (LK 2.0) is now available [2]. 9 items (P5, P7, P8b, A4, A6, A8, A9, A11, A15) in the 1.0 version have been deleted due to high ceiling effects. Thus, 39 items have been kept in the 2.0 version. Since items have been deleted, but no items have been added, you can always calculate KOOS-Child scores from the 1.0 version. Please note that there are two KOOS-Child scoring files (excel) available, one for use when data was collected using the preliminary KOOS-Child questionnaire form (LK 1.0) and one for use when data was collected with the final KOOS-Child (LK 2.0) questionnaire form. When the scoring file for KOOS Child LK 1.0 is used the result is automatically converted to the LK 2.0 scores.

The structure of the 5 KOOS-Child subscales as well as the numbering of the items has been kept in the final version (LK 2.0). The subscales are scored separately as previously: Pain (8 items); Symptoms (7 items); ADL (11 items); Sport/Rec (7 items); and QOL (6 items). Standardized answer options are given (5 Likert boxes) and each question gets a score from 0 to 4, where 0 indicates no problem. The five scores are calculated as the sum of the items included, in accordance with score calculations of the KOOS score. Raw scores are then transformed to a 0-100 scale, with zero representing extreme knee problems and 100 representing no knee problems, as common in orthopedic scales. Scores between 0 and 100 represent the percentage of total possible score achieved. An aggregate score is not calculated since it is regarded desirable to analyze and interpret the different dimensions separately.

KOOS-Child (LK 2.0) Scoring instructions

Assign the following scores to the boxes:

None	A little	Some	A lot	Extreme
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
0	1	2	3	4

Missing data: If a mark is placed outside a box, the closest box is chosen. If two boxes are marked, that which indicated the more severe problems is chosen.

As long as at least 50% of the subscale items are answered for each subscale, a mean score can be calculated. If more than 50% of the subscales items are omitted, the response is considered invalid and no subscale score is calculated. For the

subscale pain this means that 4 items must be answered, for symptoms 4 items, for ADL 6 items, for Sport/Play 4 items and for QOL 3 items must be answered to calculate a subscale score. Subscale scores are independent and can be reported for any number of the individual subscales, i.e. if a particular subscale is not considered valid (for example the subscale Sport/Play 2 weeks after ACL reconstruction) the results from the other subscale can be reported at this time point.

Guidelines on applicability of subscales and items: It is important to determine whether or not each subscale is relevant at the time point chosen, considering the specific study population. For example, Difficulty with Sports/Play function may not be relevant to assess 2 weeks post-operatively.

Pain and ADL subscales: If a subject avoids an activity (e.g. twisting/pivoting or going up or down stairs) due to doctor's order or because the subject has chosen to avoid the activity, the subject should be instructed to choose "(4) Extreme" for those items.

Sports/Play subscale: The same as above. Also, if a subject does not normally engage in an activity (e.g. running or jumping), the subject should be instructed to leave the item blank.

Score calculation: Apply the mean of the observed items within the subscale (e.g. KOOS-Child Pain), divide with 4, and multiply with 100; when this number is then subtracted from 100 you have the KOOS-Child subscale estimate for that particular cross-sectional assessment of the individual patient. Manual scoring formulas as well as excel formulas are provided below. Excel spreadsheets are available at koos.nu For manual calculations, please use the formulas provided below for each subscale:

$$1. \text{ PAIN} \quad 100 - \frac{\text{Mean Score (P1-P9)} \times 100}{4} = \text{KOOS} - \text{child Pain}$$

$$2. \text{ SYMPTOMS} \quad 100 - \frac{\text{Mean Score (S1-S7)} \times 100}{4} = \text{KOOS} - \text{child Symptoms}$$

$$3. \text{ ADL} \quad 100 - \frac{\text{Mean Score (A1-A17)} \times 100}{4} = \text{KOOS} - \text{child ADL}$$

$$4. \text{ SPORT/PLAY} \quad 100 - \frac{\text{Mean Score (SP1-SP7)} \times 100}{4} = \text{KOOS} - \text{child Sport/Play}$$

$$5. \text{ QOL} \quad 100 - \frac{\text{Mean Score (Q1-QN6)} \times 100}{4} = \text{KOOS} - \text{child QOL}$$

KOOS-Child (LK 2.0) Excel scoring files

Please note that there are TWO KOOS-Child scoring files (excel) available, one for use when data was collected using the preliminary KOOS-Child questionnaire form (LK 1.0) and one for use when data was collected with the final KOOS-Child (LK 2.0) questionnaire form. When the scoring file for KOOS-Child LK 1.0 is used the result is

automatically converted to the LK 2.0 scores. Excel spreadsheets with formulas to calculate the five subscale scores are available from www.koos.nu. If you for any reason prefer to use your own spreadsheets, the excel formulas for KOOS-Child LK 2.0 are given below.

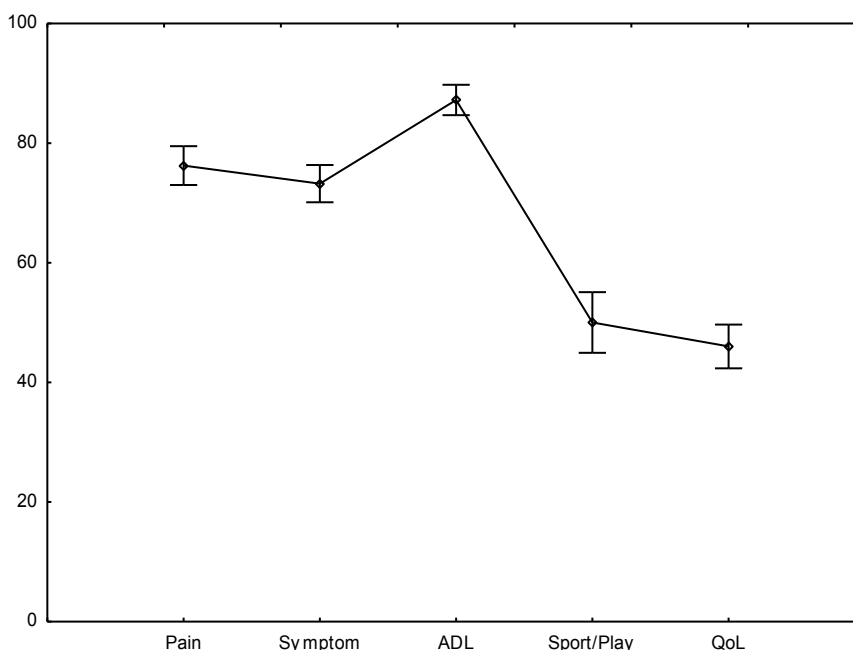
Excel formulation: When the raw data has been entered in the order the items occur in the KOOS questionnaires available from koos.nu, these excel formulations can be copy-pasted directly into an English version of an excel spreadsheet to automatically calculate the five sub score scales. Please note that it has been considered that the items in the subscale symptoms appear first in the questionnaire.

KOOS-Child Pain:	=100-AVERAGE(I2:P2)/4*100
KOOS-Child Symptoms:	=100-AVERAGE(B2:H2)/4*100
KOOS-Child ADL:	=100-AVERAGE(Q2:AA2)/4*100
KOOS-Child Sport/Play:	=100-AVERAGE(AB2:AH2)/4*100
KOOS-Child QoL:	=100-AVERAGE(AI2:AN2)/4*100

KOOS-Child Profile

To visualize differences in the five different KOOS-Child sub scores and change between different administrations of the KOOS-Child (e.g. pre-treatment to post-treatment), KOOS-Child Profiles can be plotted.

The profile below shows the mean subscale scores $\pm 95\%$ Confidence Intervals for a cohort of 115 children (56% girls, aged 7-16) suffering from a knee injury (e.g. ACL injury, Patellar dislocation, Osgood-Schlatter lesion) and treated in primary and secondary care at different time points from injury/onset.



Reference

1. Örtqvist M, Roos EM, Brostrom EW, Janarv P-M, Iversen MD.
Development of the Knee Injury and Osteoarthritis Outcome Score for Children (KOOS-Child):
Comprehensibility and Content Validity. *Acta Orthop* 2012;83:666-73.
2. Örtqvist M, Iversen MD, Janarv P-M, Brostrom EW, Roos EM.
Psychometric properties of the Knee injury and Osteoarthritis Outcome Score for Children (KOOS-Child) in children with knee disorders. Submitted October 2013.