Psychometric properties of the Knee injury and Osteoarthritis Outcome Score for Children (KOOS-Child) in children with knee disorders
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Background The Knee injury and Osteoarthritis Outcome Score (KOOS) is a self-administered valid and reliable questionnaire for adults with joint injury or degenerative disease. Recent data indicate a lack of comprehensibility when this is used with children¹. Thus, a preliminary KOOS-Child was developed. This study aims to evaluate psychometric properties of the final KOOS-Child when used in children with knee disorders.

Methods 115 children (boys/girls 51/64, 7–16 years) with knee disorders were recruited. All children (n=115) completed the KOOS-Child, the Child-Health Assessment Questionnaire (CHAQ) and the EQ-5D-Youth version (EQ-5D-Y) at baseline to evaluate construct validity. Two additional administrations (1–3 weeks and 3 months) were performed for analyses of reliability (internal consistency and test–retest; n=72) and responsiveness (n=91). An anchor-based approach was used to evaluate responsiveness and interpretability.

Results After item reduction, the final KOOS-Child consists of 39 items divided into five subscales. No floor or ceiling effects (≤15%) were found. An exploratory factor analysis on subscale level demonstrated that items in all subscales except for Symptoms loaded on one factor (Eigenvalues 3.1–5.5, Symptom: 2 factors, Eigenvalue >1). Sufficient homogeneity was found for all subscales (Cronbach’s α = 0.80–0.90) except for the Symptoms subscale (α = 0.59). Test–retest reliability was substantial to excellent for all subscales (Intraclass Correlation Coefficient 0.78–0.91, Smallest Detectable Change (SDC)nd 14.6–22.6, SDCgroup 1.7–2.7). Construct validity was confirmed, and greater effect sizes were seen in those reporting improved clinical status. Minimal important changes greater than the SDCs were found for patients reporting to be better and much better.

Conclusions The final KOOS-Child demonstrates good psychometric properties and supports the use of the KOOS-Child when evaluating children with knee disorders.

Reference:
KOOS-Child KNEE SURVEY

Today’s date: __________________ Date of birth: __________________

Name: __________________________________________________________

INSTRUCTIONS
These questions collect information about how your injured knee affects you. Answer every question by ticking the appropriate box, only one box for each question. If you are unsure about how to answer a question, please select the best answer you can.

KNEE PROBLEMS

S1. During the past 7 days, how often has your knee been swollen?
   Never   Rarely   Sometimes   Often   Always

S2. During the past 7 days, how often has your knee made any noise/sounds?
   Never   Rarely   Sometimes   Often   Always

S3. During the past 7 days, how often did your knee get stuck?
   Never   Rarely   Sometimes   Often   Always

S4. During the past 7 days, how often have you been able to fully straighten your knee on your own?
   Always   Often   Sometimes   Rarely   Never

S5. During the past 7, days how often have you been able to fully bend your knee on your own?
   Always   Often   Sometimes   Rarely   Never

S6. During the past 7 days, how much difficulty have you had moving your knee just after waking up in the morning?
   No difficulty   A little   Some   A lot   Extreme difficulty

S7. During the past 7 days, how much difficulty have you had later in the day moving your knee after being sedentary for a while?
   None   A little   Some   A lot   Extreme

P1. During the past month, how often have you experienced knee pain?
   Never   Rarely   Sometimes   Often   All the time
## HOW PAINFUL

**How much knee pain** have you experienced in the past 7 days during the following activities? Check the best answer for each item

<table>
<thead>
<tr>
<th>Activity</th>
<th>No pain</th>
<th>A little pain</th>
<th>Some pain</th>
<th>A lot of pain</th>
<th>Extreme pain</th>
</tr>
</thead>
<tbody>
<tr>
<td>P2. Twisting/pivoting on your injured knee when walking/standing/running</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>P3. Fully straightening your injured knee</td>
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<tr>
<td>P4. Fully bending your injured knee</td>
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<td></td>
</tr>
<tr>
<td>P6a. Walking up stairs</td>
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<td></td>
</tr>
<tr>
<td>P6b. Walking down stairs</td>
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<td></td>
</tr>
<tr>
<td>P8a. Sitting with your injured knee bent</td>
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</tr>
<tr>
<td>P9. Standing upright on both legs for any amount of time</td>
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</tbody>
</table>

## DIFFICULTY DURING DAILY ACTIVITIES

A1. During the past 7 days, how much difficulty have you had walking down stairs?
   - No difficulty
   - A little
   - Some
   - A lot
   - Extreme difficulty

A2. During the past 7 days, how much difficulty have you had walking up stairs?
   - No difficulty
   - A little
   - Some
   - A lot
   - Extreme difficulty

A3. During the past 7 days, how much difficulty have you had standing up from a chair?
   - No difficulty
   - A little
   - Some
   - A lot
   - Extreme difficulty

A5. During the past 7 days, how much difficulty have you had to bend down and pick up an object from the floor?
   - No difficulty
   - A little
   - Some
   - A lot
   - Extreme difficulty

A7. During the past 7 days, how much difficulty have you had getting in to/out of a car?
   - No difficulty
   - A little
   - Some
   - A lot
   - Extreme difficulty
A10. During the past 7 days, how much difficulty have you had to get out of bed?

No difficulty        A little        Some        A lot        Extreme difficulty

A12. During the past 7 days, how much difficulty have you had to change knee position when lying in bed?

No difficulty        A little        Some        A lot        Extreme difficulty

A13. During the past 7 days, how much difficulty have you had getting in to/out of the bathtub/shower?

No difficulty        A little        Some        A lot        Extreme difficulty

A14. During the past 7 days, how much difficulty have you had to sit in a chair with your injured knee bent?

No difficulty        A little        Some        A lot        Extreme difficulty

A16. During the past 7 days, how much difficulty have you had to carry heavy bags/backpacks etc?

No difficulty        A little        Some        A lot        Extreme difficulty

A17. During the past 7 days, how much difficulty have you had to do light chores such as cleaning your room, filling/emptying the dishwasher, making your bed, etc?

No difficulty        A little        Some        A lot        Extreme difficulty

**DIFFICULTY DURING SPORTS AND PLAYING**

<table>
<thead>
<tr>
<th>SP1. During the past 7 days, how much difficulty have you had to squat down during play or sports activities?</th>
</tr>
</thead>
<tbody>
<tr>
<td>No difficulty                        A little        Some        A lot        Extreme difficulty</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>SP2. During the past 7 days, how much difficulty have you had to run during play or sports activities?</th>
</tr>
</thead>
<tbody>
<tr>
<td>No difficulty                        A little        Some        A lot        Extreme difficulty</td>
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</table>

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<thead>
<tr>
<th>SP3. During the past 7 days, how much difficulty have you had to jump during play or sports activities?</th>
</tr>
</thead>
<tbody>
<tr>
<td>No difficulty                        A little        Some        A lot        Extreme difficulty</td>
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<thead>
<tr>
<th>SP4. During the past 7 days, how much difficulty have you had to twist/pivot because of your injured knee during play or sports activities?</th>
</tr>
</thead>
<tbody>
<tr>
<td>No difficulty                        A little        Some        A lot        Extreme difficulty</td>
</tr>
</tbody>
</table>
SP5. During the past 7 days, how much difficulty have you had to kneel because of your injured knee?

No difficulty  A little  Some  A lot  Extreme difficulty

SPN6. During the past 7 days, how much difficulty have you had to keep your balance when walking /running on uneven ground?

No difficulty  A little  Some  A lot  Extreme difficulty

SPN7. During the past 7 days, how much difficulty have you had playing sports because of your injured knee?

No difficulty  A little  Some  A lot  Extreme difficulty

HOW HAS YOUR INJURY AFFECTED YOUR LIFE?

Q1. How often do you think about your knee problem?

Never  Rarely  Sometimes  Often  All the time

Q2. How much have you changed your lifestyle because of your injured knee?

Not at all  A little  Some  A lot  Very much

Q3. How much do you trust your injured knee?

Not at all  A little  Some  A lot  Completely

Q4. Overall, how much difficulty do you have with your injured knee?

No difficulty  A little  Some  A lot  Extreme difficulty

QN5. How much difficulty have you had getting to school or walking around in school (climbing stairs, opening doors, carrying books, participating during recess) because of your injured knee?

No difficulty  A little  Some  A lot  Extreme difficulty

QN6. How much difficulty have you had to do things with friends because of your injured knee?

No difficulty  A little  Some  A lot  Extreme difficulty

Thank you very much for completing all the questions in this questionnaire!