

# Quality of Life in Children: Development and Application of Computer-Adaptive Testing in Routine Pediatric Care (Kids-CAT)



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## 1. Aims

Assessing Health-Related Quality of Life (HRQoL) via Computerized Adaptive Testing (CAT) promises to provide greater measurement precision coupled with a lower test burden. Currently, there are no German CAT tools available to assess pediatric QoL in healthy or chronically ill children in an efficient and precise way.

This study aimed at building a CAT to assess HRQoL in children and adolescents: the Kids-CAT. The Kids-CAT was developed along the European KIDSCREEN-27 QoL domain structure, allowing for a shorter, yet equally valid and precise assessment via CAT technology.

## 2. Methods

The Kids-CAT is developed combining classical test theory and item response theory methods, using large archival data of European KIDSCREEN and DISABKIDS health surveys in healthy and chronically ill children (n=10,577 to 19,580).

Methods are applied in line with the US pediatric Patient Reported Measurement Information System (PROMIS) project. Item bank development includes the investigation of unidimensionality and local independency of each item bank, exploration of differential item functioning (DIF), evaluation of item response curves (IRCs), and estimation of item parameters using the Generalized Partial Credit Model (GPCM).

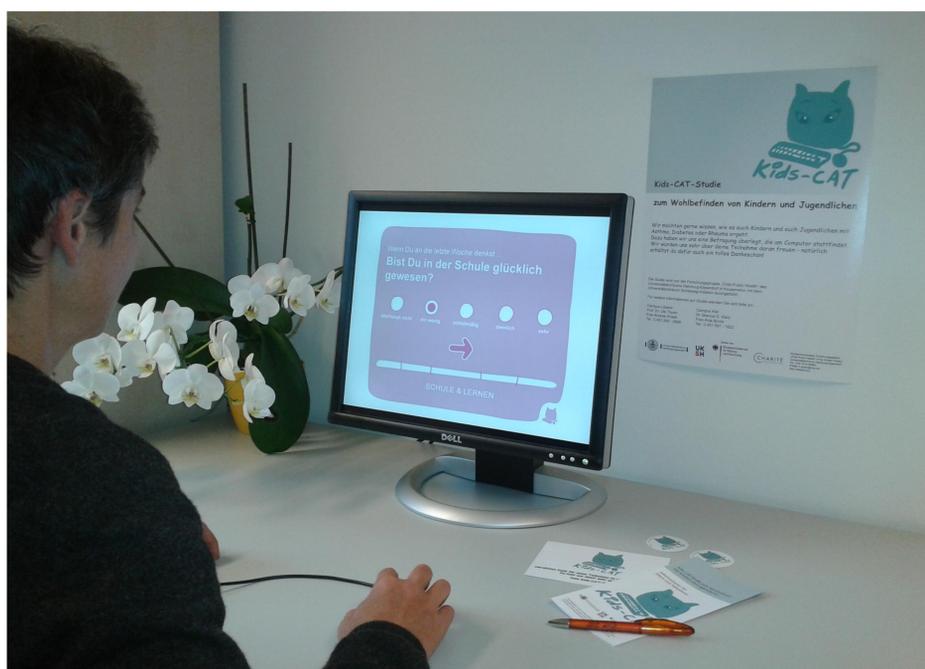


Figure 1 – Screen view of one item of the Kids-CAT

## 3. Results

A total of 155 items were selected from an initial item pool of 379 items. Those selected showed the highest levels of content validity, had factor loadings of  $>.4$  and residual correlations  $<.25$ , had no DIF ( $R^2 < 5\%$  and  $p < 0.001$ ), displayed monotonic and chronologically ordered response option curves, and allowed item calibration.

The final Kids-CAT instrument contains five item banks covering psychological (46 items), physical (26 items), family (26 items), peer (26 items), and school wellbeing (31 items), showing good psychometric properties (high content validity, internal consistency, low DIF). The developed CAT-software allows for an easy administration of on average 4-6 items per bank in a longitudinal study with 300 children with asthma, diabetes, and rheumatism easy scoring, and feedback-reporting of the scores.

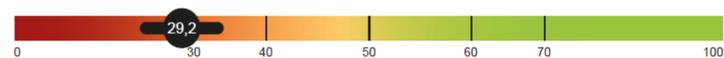
### Kids-CAT Report / Quality of Life

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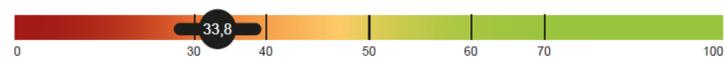


#### PHYSICAL WELL-BEING



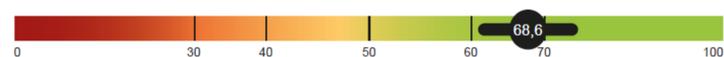
Dieser Wert liegt unterhalb des Normbereichs\*. Der Patient fühlt sich sehr ausgepumpt, sehr unwohl, gar nicht fit bzw. überhaupt nicht energetisch.

#### EMOTIONAL WELL-BEING



Dieser Wert liegt im unteren Normbereich\*. Der Patient ist emotional nicht völlig ausbalanciert bzw. blickt nicht überwiegend positiv in die Zukunft.

#### AUTONOMY AND PARENT RELATION



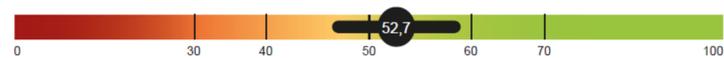
Dieser Wert liegt im oberen Normbereich\*. Der Patient hat sehr gute Beziehungen zu seinen Eltern bzw. ist sehr zufrieden mit seinen individuellen Freiheiten/ Möglichkeiten.

#### SOCIAL SUPPORT AND PEERS



Dieser Wert liegt im Normbereich, leicht unter dem Mittelwert der Referenzgruppe\*. Der Patient fühlt akzeptiert, unterstützt bzw. in seine Peer-group integriert.

#### SCHOOL WELL-BEING



Dieser Wert liegt im Normbereich\*, leicht über dem Mittelwert der Referenzgruppe. Der Patient fühlt sich in der Schule wohl.

\* Die Normwerte basieren auf deutschsprachigen Stichproben von Kindern und Jugendlichen im Alter von 6-18 Jahren (N=10.000). Der Normbereich ist definiert als +/- eine Standardabweichung um den Mittelwert (T=50 +/- 10), d.h. lediglich 16% der Befragten aus den Referenzstichproben lagen unterhalb des Normbereichs (Farbbereiche rot und orange).

Figure 2 – Feedback-reporting

## 4. Conclusions

The Kids-CAT has the potential to advance pediatric HRQoL measurement by making it less burdensome for respondents and enhancing the patient-doctor communication via instant score reports.