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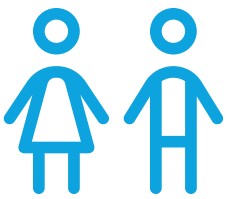

The K-CAT®

A new paradigm for screening and measurement-based care in youth

For additional information, please visit our website at www.adaptivetestingtechnologies.com, send an email to info@adaptivetestingtechnologies.com, or call us at (312) 878-6490 ext. 303

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At least half of youths with mental disorders are unrecognized and untreated. Rapid, accurate assessment of child mental disorders could facilitate identification and referral and potentially reduce the occurrence of functional disability that stems from early-onset mental disorders. Child psychopathology screening and measurement has been based primarily on subjective judgment and classical test theory. Typically, impairment level is determined by a total score requiring that all respondents be administered the same items. This traditional approach weighs equally the responses to items such as "Do you feel sad?" and "Do you feel like everyone would be better off if you were dead?" Clearly, this approach is far from optimal. An alternative to full scale administration is adaptive testing in which different individuals may receive differently symptom items that are targeted to their specific impairment level.

What is the K-CAT®?

The K-CAT® is a suite of 10 computer adaptive tests (CAT) that represents a fundamental scientific breakthrough in child psychopathology screening and measurement based on the combination of child self-report and parent ratings of the child. Its applications in mental health measurement are widespread and can lead to dramatic savings for our healthcare system based on identifying high utilizers of physical healthcare services and providing a stepped care approach to treatment. The K-CAT® can identify youth ages 7 to 17 with a wide array of mental health disorders and concomitant high risk of suicide leading to the saving of human life. The K-CAT® was developed by Adaptive Testing Technologies, a leader in the design, testing, and implementation of large-scale mental health adaptive testing systems. Our tools have been validated against semi-structured research interviews and published in top-tier peer-reviewed journals, such a JAACAP.

How does the K-CAT® work?

The K-CAT® is based on multidimensional item response theory (MIRT). Within computer adaptive testing (CAT), individuals' initial item responses are used to determine a provisional estimate of their standing on the measured trait to be used for subsequent item selection. Based on MIRT procedures, estimates of items (e.g. difficulty, discrimination) and individuals (e.g., severity of depression) can be obtained to more efficiently identify suitable item subsets for each individual. MIRT weighs more severe items more heavily than less severe items in deriving a test score. MIRT also provides an estimate of uncertainty that can be used to assess the significance of change. The KCAT® adaptively selects a small set of items from a large bank of approximately 1,060 items. Instead of fixing the items and allowing the precision of measurement to vary, we fix the precision of measurement and allow the items to vary. The result is a dramatic increase in the precision of measurement with the same and in some cases even lower burden of measurement for the patient and the complete elimination of clinician burden.

What K-CAT® modules are available?

The K-CAT® is a suite of child and adolescent CATs for depression, anxiety, mania/hypomania, suicidality, ADHD, conduct disorder (CD), substance use disorder (SUD), and oppositional defiant disorder (ODD). These modules rapidly and accurately assess child psychopathology dimensions based on parent and child ratings of 1,060 items each. Average completion times for the child and parent are 7.56 and 5.03 minutes, respectively, with an average of 7 items per domain.

What are the advantages of the K-CAT®?

We can dramatically increase precision while eliminating clinician burden and minimizing subject burden. The K-CAT® provides constant precision of measurement throughout the entire severity continuum for any disorder that we measure. The adaptive nature of the K-CAT® targets a patient's specific level of severity at that point in time. The K-CAT® is ideal for longitudinal assessments essential for measurement-based care. The K-CAT® is cloud-based and scalable to any size population via a HIPAA secure Amazon Web Services (AWS) platform, meaning patients can be screened, measured, and monitored in or out of the clinic.

What are the potential applications of the K-CAT®?

The K-CAT® is ideal for a variety of clinical settings. In specialty mental health care, our tools help conserve clinician assessment time and prove useful for ongoing monitoring of treatment response. Our tools are also ideal for clinical research by facilitating the recruitment of a large number of potential participants for phenotypic characterization and for pragmatic clinical trials. The K-CAT® could be used to identify patients who may need specialty care and/or hospitalization. Finally, our tools could be used to develop clinician support tools that could help formulate recommendations that best fit patient needs.

Can you integrate with the Electronic Health Record?

We have fully integrated the CAT-MH®, the adult version of the K-CAT®, into the Epic EHR at the University of Chicago and developed clinical workflows designed around their integration. This enables screening and measurement in the clinic using computers, and remote screening and assessment via the patient portal, with results immediately displayed in the EHR.

Validation

Unlike most traditional mental health measures, the CAT-MH® and K-CAT® have been fully validated against lengthy structured clinical interviews (e.g. SCID for DSM-5) and extant clinician-rated measures. In the following, we briefly describe the results of these validations and properties of the different CAT scales for adults and youth.

Depression: The CAT-Depression Inventory[1] (CAT-DI) reproduces the information in a final bank of 3 89 items using adaptive administration of 12 items in approximately 2 minutes while maintaining a correlation of 0.95 with the total bank score. In terms of convergent validity, correlations were r=0.81 with the PHQ-9, r=0.75 with the HAM-D, and r=0.84 with the CES-D. In general, t he distribution of scores between the diagnostic categories showed greater overlap (i.e., less diagnostic specificity), greater variability, and greater skewness for these other scales relative to the CAT-MH®. In terms of diagnostic validity, the CAD-MDD (our brief adaptive diagnostic screener for MDD) has a sensitivity (Se) of 0.95 and specificity (Sp) of 0.87 for an hour-long SCID DSM-5 diagnosis of MDD22. A thresholded CAT-DI yielded Se of 0.92 and Sp of 0.88 for a SCID DSM-5 diagnosis of MDD[1].

Anxiety: The CAT-ANX[6] reproduces the information in a bank of 437 items using adaptive administration of 12 items in approximately 2 minutes while maintaining a correlation of r=0.94 with the total bank score. Relative to a SCID DSM-5 diagnosis of generalized anxiety disorder (GAD), a thresholded CAT-ANX produced Se of 0.86 and Sp of 0.86.

Suicidality: The CAT-SS[8] reproduces the information in a 111 item bank that provides a crosswalk between symptoms of depression, anxiety and suicidality, using an average of 10 items in less than 2 minutes, while maintain a correlation of r=0.96 with the total 111 item bank score. The CAT-SS was validated against a 20 minute Columbia scale structured clinical interview and demonstrated Se of 1.0 and Sp of 0.95 for ideation or worse (kappa 0.81); active ideation Se=1.0, Sp=0.95; suicide alert Se=1.0, Sp=0.89; and lifetime attempt Se=0.58 and Sp=0.88 for the CAT-SS high risk versus low-risk groups.

Substance Use Disorder: The CAT-SUD[10] reproduces the information in a bank of 168 items using adaptive administration of 11 items in 2 minutes with a total item bank correlation of r=0.91. The CAT-SUD was validated against the CIDI structured clinical interview diagnosis of SUD and demonstrated an AUC=0.85 across the range of the scale.

Mania/hypomania: The CAT-MANIA[7] reproduces the information in the 89 item bank using adaptive administration of 17 items in 3.4 minutes. This has been reduced to approximately 12 items in 2 minutes through refined CAT termination criteria. The CAT-MANIA was validated against the SCID DSM-5 structured clinical interview for bipolar disorder (BP, BP I, BP II). Across the range of the scale, the probability of a positive diagnosis of bipolar disorder increased 12-fold.

PTSD: The CAT-PTSD measure is an adaptive version of the 20 item PCL-5. The CAT-PTSD can be adaptively administered using an average of 6 items in approximately 1 minute, while maintaining a correlation of r=0.97 with the 20 item fixed-length PCL-5. Since the PCL-5 is a validated instrument and given the almost perfect correlation between the CAT-PTSD and the PCL-5, the CAT-PTSD is also a valid instrument. Working with the Veterans Administration (VA), we have created a new CAT-PTSD based on a 211 item expanded item bank9. Adaptive administration reduces the average number of items administered to 10 items yet maintains a correlation of 0.95 with the 211 item score. The new CAT-PTSD is correlated r=0.88 with the PCL-5 and was also validated against the SCID DSM-5 PTSD diagnosis with AUC=0.85. An adaptive 6-item CAD-PTSD diagnostic screener was also developed9 which reproduces the DSM-5 PTSD diagnosis with AUC=0.91.

Psychosis: The CAT-Psychosis measures are adaptive clinician-administered and patient self-report psychosis measures[11]. The measures extract the information from the 144 item bank in an average of 12 items, maintaining a correlation of r=0.92 with t he total bank score in 5 minutes for the clinician guided interview and 1 minute and 20 seconds for the patient self-report. The measures were validated against the SCID DSM-5 psychosis diagnosis with AUC=0.97 for the clinician ratings and AUC=0.85 for the patient self-report. Test-retest reliability was r=0.86 for the clinician and r=0.82 for the patient self-report. For the clinician-administered version, inter-rater reliability was ICC=0.73.

Academic Press

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