The Mobile Toolbox for monitoring cognitive function

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The National Institutes of Health Toolbox for the Assessment of Neurological and Behavioral Function (NIH Toolbox)[1] was designed to serve as a common resource across research and clinical applications. The NIH Toolbox has been validated in hundreds of clinical studies and is used at more than 950 institutions worldwide.

Technological advances over the past decade have made it possible to increase the accessibility of these sorts of tools and platforms and to decrease their cost. Researchers can assess large samples without the need to bring participants into clinical settings. The availability of smartphone tests can eliminate the need for in-person visits, should be applicable to all types of neuropsychological research, and might transform clinical assessments of neuropsychological function. Furthermore, the use of mobile phone technology to assess cognition would allow the examination of the influence of transient psychological (eg, stress), somatic (eg, pain), or contextual (eg, social interactions) states on cognitive performance in a real-world environment.[2]

The National Institute on Aging has funded the development of the Mobile Toolbox, a library of cognitive tests and supplemental scales, which is also a research platform for app creation, study management, data collection, and data management (funded under NIH

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awards U2CAG060426 and U02AG060408). The Mobile Toolbox was designed to enable the integration of cognitive testing into clinical and epidemiological research studies. The system includes a gallery of open-source, cutting-edge, validated, and normed smartphone versions of assessments, including derivatives from the cognition and emotion batteries in the NIH Toolbox,[3, 4] Patient Reported Outcomes Measurement Information System,[5] International Cognitive Ability Resource,[6] and the addition of ultra-brief versions of cognitive tests for use in burst design research.

The validation of the self-administered Mobile Toolbox tests in healthy adults aged 20–85 years against the in-person version of the NIH Toolbox and other validity measures, and the results of a national age-stratified (including adults aged 20–85 years) norming study demographically matching the 2020 US Census, will be reported soon. Additional studies are being conducted to replicate the norming study and to calculate change scores at months 6, 12, 18, and 24 in healthy cohorts, including the Emory Healthy Aging Study, the Brain Health Registry, and the Human Connectome Project; people at risk for mild cognitive impairment or Alzheimer's disease, including the Emory Healthy Aging Study, the Harvard Aging Brain Study, and the Einstein Aging Study; people with cognitive impairment, from the Emory University Goizueta Alzheimer's Disease Research Center, Atlanta, GA, USA; people with Parkinson's disease from the mPower study; participants in trials featuring dietary and cognitive interventions (recruited at the Albert Einstein College of Medicine, Bronx, NY, USA, and at The Pennsylvania State University, State College, PA, USA); people with HIV-associated neurocognitive disorders (recruited at the University of California, San Diego, CA, USA); and people with multiple sclerosis (recruited from the University of Michigan, Ann Arbor, MI, USA).

Clinical researchers will be able to use the Mobile Toolbox to design smartphone-based cognitive test batteries made up of measures with strong validity evidence; deploy and manage mobile phone data collection in their research studies; allow study participants to register and contribute data remotely using their own smartphones; and analyse results in the context of large-scale norming data. The Mobile Toolbox will be open for integration and evaluation of additional tests developed across the research community. Given that all components are open source, researchers and developers can also integrate tests and supplemental scales into their own development efforts. The Mobile Toolbox will be made available for early adopters starting on July 18, 2022.

For more on the Mobile Toolbox see http://www.mobiletoolbox.org

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