

# Validation of the NIH Toolbox Cognitive Battery in intellectual disability

Rebecca H. Shields, MS, Aaron J. Kaat, PhD, Forrest J. McKenzie, BS, et al.

Cite as: *Neurology*® 2020;94:e1229-e1240. doi:10.1212/WNL.0000000000009131

## Correspondence

Dr. Hessler  
drhessler@ucdavis.edu

## Study objective and summary result

This study aimed to evaluate the psychometric properties of the NIH Toolbox Cognitive Battery (NIHTB-CB) as an assessment tool for patients with intellectual disability (ID); the results showed that the NIHTB-CB is a reliable and valid assessment tool for patients with mental ages  $\geq 5$  years.

## What is known and what this paper adds

The development of therapeutic strategies for ID has been hindered by the lack of scalable, psychometrically supported, and broadly accepted cognitive endpoints. This investigation provides evidence that the NIHTB-CB may satisfy this unmet need. A supplemental administration manual for use of the NIHTB-CB in individuals with ID was developed and is available on the NIHTB website.

## Participants and setting

The investigators assessed 242 individuals with fragile X syndrome (FXS;  $n = 75$ ), Down syndrome ( $n = 91$ ), and other forms of ID (OID;  $n = 76$ ). These individuals had chronologic ages of 6–25 years, full-scale IQs  $< 80$ , and mental ages  $\geq 3$  years. Recruitment occurred through the University of Denver, Rush University Medical Center, and the University of CA, Davis.

## Design, size, and duration

Over a 2-day baseline period, the participants completed the NIHTB-CB and 7 other cognitive tests that were used to assess the convergent validities of various NIHTB-CB components. To assess the NIHTB-CB's test-retest reliability, the investigators had the participants complete the NIHTB-CB again a month later.

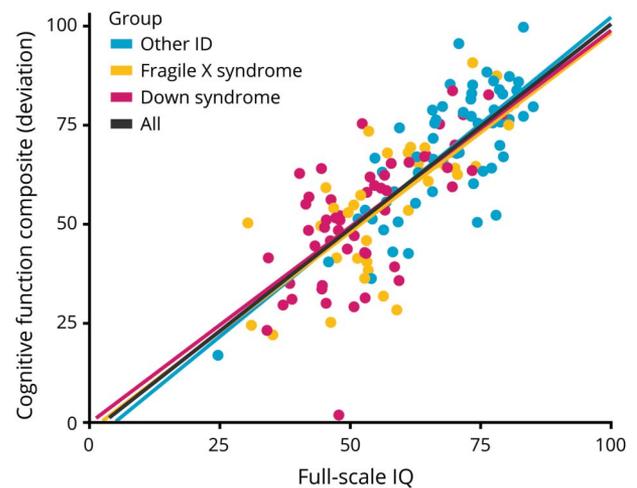
## Primary outcome measures

The primary outcomes were the convergent validities and test-retest reliabilities of various NIHTB-CB components.

## Main results and the role of chance

The full NIHTB-CB was highly feasible for participants with mental ages  $\geq 5$  years, and feasibility varied across tests for participants with mental ages of 3–4 years. The convergent validities and test-retest reliabilities of various NIHTB-CB components ranged from moderate to strong. The NIHTB-CB

**Figure** Data are shown for the overall participant sample and the FXS, Down syndrome, and OID groups. Correlations between full-scale IQs and NIHTB-CB Cognitive Function Composite scores



detected several expected cognitive strengths and weaknesses between syndromes.

## Bias, confounding, and other reasons for caution

Construct validation of tests for ID is challenging due to a paucity of fully adequate convergent validity measures.

## Generalizability to other populations

The present study's reliance on data from the US may limit the generalizability of the results to dissimilar countries.

## Study funding/potential competing interests

This study was funded by the NIH, the US Administration on Intellectual and Developmental Disabilities, and the MIND Institute. Some authors report consulting for healthcare companies, conducting clinical trials for healthcare companies, and developing and validating testing standards for healthcare companies. Go to [Neurology.org/N](http://Neurology.org/N) for full disclosures.

*A draft of the short-form article was written by M. Dalefield, a writer with Editage, a division of Cactus Communications. The corresponding author(s) of the full-length article and the journal editors edited and approved the final version.*

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**Validation of the NIH Toolbox Cognitive Battery in intellectual disability**  
Rebecca H. Shields, Aaron J. Kaat, Forrest J. McKenzie, et al.  
*Neurology* 2020;94:e1229-e1240 Published Online before print February 24, 2020  
DOI 10.1212/WNL.00000000000009131

**This information is current as of February 24, 2020**

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