

Neuropsychological Assessment (Testing) An Overview (Part 2)

Vincent W. Hevern, SJ, Ph.D.
Last reviewed: 20251014

Comprehensive Test Batteries

1. Halstead-Reitan Neuropsychological Test Battery (HRNTB or "the Halstead-Reitan")

- Grounded in the work of the early experimental/clinical neuropsychologist, Ward C. Halstead (d. 1969), at the University of Chicago between 1935-1969. He created the *Halstead Battery of Neuropsychological Tests*. These discriminated between normal and brain-injured adult patients.
- They were further refined by Ralph M. Reitan (d. 8/24/2014) at the University of Indiana Medical Center during the 1950s & 1960s. He also extended Halstead's approach to assess younger patients 9-14 years old. A subsequent battery, *Reitan-Indiana Neuropsychological Test Battery for Children*, can be used with children aged 5-8.
- Battery consists of 10 tests developed by Halstead and a series of additional tests developed by Reitan and others.

A. Afferent-Input-Sensory Tests

- Reitan-Kløve Sensory Perceptual Exam
- Double Simultaneous Stimulation
- Tactile Finger Recognition
- Fingertip Number Writing

B. Efferent-Output-Motor Tests

- Finger Oscillation Test (FOT) = Tapping Test
- Grip Strength
- Tactual Performance Test-Time

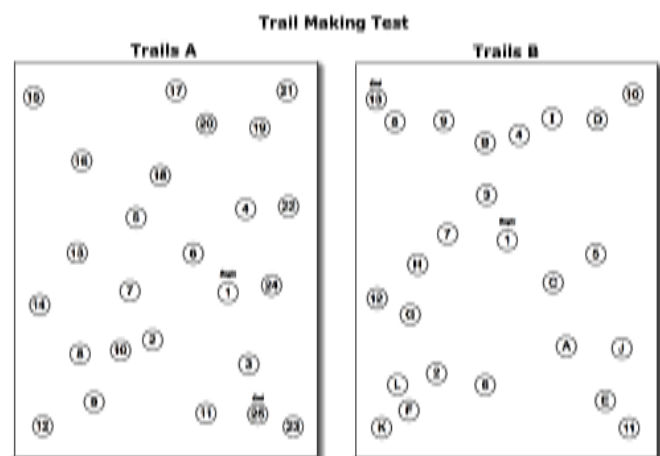
C. Central-Cortical-Interpretive-"Higher Function" Tests

1. Verbal

- WAIS/WISC Verbal Subtests
- Speech-Sounds Perception Test
- Reitan-Indiana Aphasia Screening Test

2. Visual-Spatial & Visual-Motor

- WAIS-WISC Performance Subtests
- Drawing Tasks from Reitan-Indiana Aphasia Screening Test (Clock, Key, Geometric figures)
- Trail Making Test (A & B) See diagram on right



3. Abstraction/Concept Formation

- **Category Test:** Examinee is presented with 208 cards of different visual stimuli and asked to indicate which number between 1 and 4 they are reminded of. Told only whether they are right or wrong. Used to assess underlying abstract concept formation.
 - Concepts include matching Arabic with Roman numerals, number of items on screen, uniqueness of item, quadrant of the screen, proportion of item that is filled with solid versus dotted lines, etc.
 - The HRNTB uses a big projection screen. There are newer "Booklet" versions of the CT (see illustration) that are available at much reduced cost.
- Trail Making Test (B)



4a. Basic Operational Needs • Attention & Concentration

- Speech-Sounds Perception Test
- Seashore Rhythm Test

4b. Basic Operational Needs • Memory

- Tactual Performance Test–Memory & Localization

2. Luria-Nebraska Neuropsychological Test Battery (LNNTB or "the Luria")

- Generated from the work of Anne-Lise Christensen's (1975) *Luria's Neuropsychological Investigation*. She observed A. R. Luria for 3 weeks in a clinical setting in Moscow in 1970 and developed a set of materials and techniques based on his work.
- Begun at the University of South Dakota and completed at the University of Nebraska (Lincoln) by Charles Golden in the late 1970s. A second form of the test was completed in 1985.
- Battery consists of 269 items across 11 clinical scales: reading, writing, arithmetic, visual, memory, expressive language, receptive language, motor function, rhythm, tactile, and intellectual. Each item is rated on a 3-score basis: 0 (normal), 1 (borderline), or 2 (impaired).
- Age: 13 years+
- Administration: 90-150 minutes
- There is a children's version – *Luria-Nebraska Neuropsychological Battery for Children* (LNNB-C) for children 8-12 years old.
- The LNNTB has been a controversial test battery from its inception and has not gained wide acceptance in the field. As Lezak et al. (2012) note, "this battery has significant problems which have likely contributed to its virtual absence in peer reviewed journal articles reporting independent studies" (p. 746). Among the critiques have been questions about (1) whether Luria's clinical use of his own testing techniques has been genuinely translated into a standardized format and (2) its validity in identifying patterns of brain-injured individuals vis-à-vis normal subjects.

3. Neuropsychological Assessment Battery (NAB)

- First appeared over two decades ago (Stern & White, 2003) and independent validity and clinical use data have now appeared in the research literature. Google Scholar indicates that there have been over 3,100 research articles published since the NAB first appeared.
- An initial brief 45-minute “screening module” evaluates a testee over the five cognitive domains (see below) of the NAB to determine whether a full-scale testing is necessary.
- 33 different tests in two equivalent forms & focused upon five areas of evaluation (which are called “modules”), i.e., *Attention, Language, Memory, Spatial, and Executive Functions* (Lezak et al., 2012, p. 746). Administration of the full NAB takes less than 4 hours.
- Standardization sample consisted of just over 1,400 individuals aged 18 to 97. Unique among neuropsychological batteries, all the tests in all the modules were co-normed on the same individuals
- Subsequent research has evaluated patients with dementia, TBI, aphasia, MS, ADHD, HIV/AIDS, etc.
- The NAB can be used flexibly and tests/modules can be targeted to issues of concern
- Each of the five cognitive domain modules includes a *test which relates to activities in daily life*. This increases the “ecological validity” of the NAB.
 - Attention: can an individual perform a task with a background of distracting noise?
 - Language: how well can a person comprehend/communicate by phone or writing an email?
 - Memory: can an individual remember lists of everyday objects, follow instructions that require multiple steps, or recall appointments?
 - Spatial: how well can an individual navigate the world, e.g., following directions to a particular place or read a map?
 - Executive Functions: needing judgment, reasoning, and problem-solving skills, can an individual plan a series of errands, organize a shopping trip and deal with financial matters?



4. NIH Toolbox for the Assessment of Neurological and Behavioral Function (NIH Toolbox)

<<http://www.nihtoolbox.org>>



- Initiative of the National Institutes of Health (NIH), “the NIH Toolbox® for the Assessment of Neurologic and Behavioral Function is a compilation of 47 brief, computerized, royalty-free measures designed to assess **sensory, motor, emotional, and cognitive** function” (Fox et al, 2022, p. 307)
- This multidimensional, standardized test battery was first made available in both English & Spanish for the rapid evaluation (< 2 hours) of people 3 to 85 years old (Gershon et al., 2013; NIH Toolbox Brochure, 2012). However, the latest version (#3) is also available in Hebrew, Arabic, French, or Italian
- Normative standardization sample is comprised of 4,859 subjects representative of US population based on gender, race & ethnicity and socioeconomic status

- This emerging test battery has been available since 2012. Version 1.1 available August 2015. The latest current version, 3.7.1, was released in July 2023. Version 2 will be retired in 2026.
- Version 3 of the test is administered on an iPad. While the app itself and access to the tests are free, the software necessary to score the battery has an annual subscription cost of ~\$600 for 2 iPads, \$1500 for 6 iPads, & \$2500 for 10 iPads.
- The test battery is used both for clinical and research purposes.
- The various individual tests across the four major subdomains are listed below. Choice of specific individual tests is made dependent on the age of the person being tested.

Cognitive Battery The mental processes involved in gaining knowledge and comprehension, such as thinking, knowing, remembering, judging, and problem-solving. These higher-level functions of the brain encompass language, imagination, perceptions, and the planning and execution of complex behaviors.	Motor Battery The ability to use and control muscles and movements. Motor performance includes voluntary control of both fine and gross motor functions including dexterity, strength, balance, locomotion, and endurance. Motor performance also requires the interaction of multiple body systems, including the nervous, muscular, cardiovascular, and sensory-perceptual systems.
<i>Fluid Intelligence Tests</i> • Flanker Inhibitory Control & Attention • Dimensional Change Card Sort • List Sorting Working Memory • Pattern Comparison Processing Speed • Picture Sequence Memory <i>Crystallized Cognitive Abilities</i> • Picture Vocabulary • Oral Reading Recognition <i>Supplemental Tests</i> • Oral Symbol Digit • Auditory Verbal Learning	• Standing Balance • 9-Hole Pegboard • Grip Strength • 2-minute Walk Endurance • 4-meter Walk Gait Speed Sensation Battery The biochemical and neurologic process of detecting incoming nerve impulses as nervous system activity. Sensory processors are vital to one's level of independence in relationship with others, academic and occupational endeavors, and activities of daily living. • Pain Intensity • Regional Taste Intensity • Odor Identification • Pain Interference • Words-in-noise • Near Visual Acuity • Distance Visual Acuity • Hearing Threshold
Emotion Battery Any strong feelings, such as joy, sorrow, or fear. An affective state of consciousness in which joy, sorrow, fear, hate, or the like is experienced (as distinguished from cognitive and volitional substates of consciousness). Emotions can be positive or negative and distressing. The NIH Toolbox Emotion measures include four major domains: Psychological Well-Being, Stress and Self-Efficacy, Social Relationships and Negative Affect.	
• Anger (affect, hostility, physical aggression) • Fear (affect, somatic arousal, over-anxious, separation anxiety) • Sadness/Depression • Positive affect • Meaning & Purpose • General Life Satisfaction • Perceived stress • Positive Peer Interaction • Social Withdrawal	• Self-efficacy • Emotional support • Instrumental support • Loneliness • Friendship • Perceived hostility • Perceived rejection • Apathy • Peer rejection (Fox et al, 2022 & https://nihtoolbox.org/assessments/)

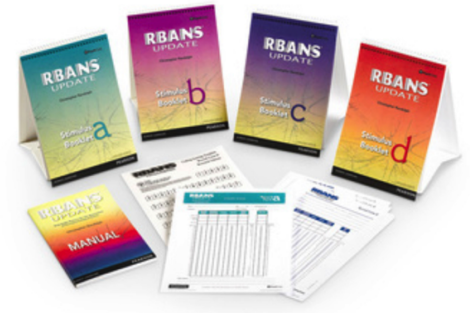
4a. The NIH Infant and Toddler (“Baby”) Toolbox (or NBT, 2025, September)



- Comprehensive descriptions of the NBT can be found at <https://nihbabytoolbox.org> as well as in a pdf found at https://echochildren.org/wp-content/uploads/2024/11/BabyToolboxIntro_ECHO-Discovery_v2.pdf. Further, detailed descriptions of the development and structure of the NBT are found in individual papers published in a special edition of the journal, *Infant Behavior and Development* (2025, September) available at <https://www.sciencedirect.com/special-issue/108S3JV73J2>.
- “In Spring 2019, the NIH Neuroscience Blueprint, managed by the National Institute of Child Health and Development (NICHD), commissioned the development of a downward extension of the NIH Toolbox for Assessment of Neuro- logical and Behavioral Function® (NIH Toolbox) for use with infants and toddlers. The Baby Toolbox research team, led by North- western University and comprised of multi-institutional experts across the US, was charged with creating a tablet-based nationally normed, standardized assessment battery of cognitive, motor, and social-emotional functioning for 1- to 42-month-olds in English and Spanish” (Blackwell, 2025).
 - The nationally representative sample of 2515 US English (n = 2042) and Spanish (n = 473) 1- to 48-month-olds outnumbers the size of other developmental assessment norming studies...The Baby Toolbox norming sample also specifically included children older than 42 months to minimize ceiling effects for high-performing individuals...
- Following up on the NIH Toolbox, “Developmental scientists and medical social science experts at Northwestern University have spearheaded the creation of the most recent NIH Toolbox, providing the newest nationally standardized assessment of cognitive, language, motor and social-emotional skill development in infants aged 16 days to 42 months.” (Kulke, 2025)
- “Before releasing the Baby Toolbox, the researchers conducted a comprehensive norming study on more than 2,500 infants and toddlers from English- and Spanish-speaking households. The study showed high test-retest correlations and demonstrated the app as a reliable, scalable tool for assessing development milestones in diverse populations.” (Kulke, 2025).
- Subdomains Measured by the NBT:
 - **Cognitive:** *Executive Function & Memory; Language, Math.* Employs caregiver reports & observations plus gaze technology for the direct measurement of infant responses, along with touch-based paradigms where toddlers interact with an iPad screen.
 - **Motor:** fine & gross motor skills measured by two child-friendly functional tasks: reaching to eat and locomoting from one place to another (+ supplementary measure of stationary postural control). Uses everyday objects such as a spoon and measuring cup.
 - **Social-Emotional Functioning:** *temperament, negative affect, psychological well-being, self-regulation, social relationships, and social communications.* Uses caregiver reports as well as the Social Observing Measure (examiners observing and coding behaviors as children pretend play, build with blocks, and view books.)

5. Repeatable Battery for the Assessment of Neuropsychological Status (RBANS; Randolph et al. 1998)

- Although RBANS Update was originally developed (in 1998) with a primary focus on assessment of dementia, special group studies are available for Alzheimer's Disease, Vascular Dementia, HIV Dementia, Huntington's Disease, Parkinson's Disease, Depression, Schizophrenia, and Closed Head Injury. RBANS also has utility as a screener for neurocognitive status in younger patients.
- Covers five domains: Immediate Memory, Visuospatial/Constructional, Language, Attention, and Delayed Memory (see more below).
- Screen for deficits in acute-care setting and neurocognitive status in adolescents (with norms for individuals as young as 12 years old)
- Track recovery during rehabilitation and progression of neurological disorders.
- Use as a stand-alone "core" battery for the detection and characterization of dementia in the elderly
- Use as a neuropsychological "screen battery" when lengthier standardization assessments are either impractical or inappropriate
- There are 4 separate forms of the RBANS. Thus, the ability to do repeat evaluations when an alternate form is needed to control for content practice effects.



[Above from <https://www.pearsonassessments.com/en-us/Store/Professional-Assessments/Cognition-%26-Neuro/Repeatable-Battery-for-the-Assessment-of-Neuropsychological-Status-Update/p/100000726>]

Cognitive domains evaluated include the following indexes and subtests:

1. Immediate Memory Index

- List Learning: Measures the ability to learn and recall a list of words.
- Story Memory: Assesses the recall of a short story read aloud by the examiner.

2. Visuospatial/Constructional Index

- Figure Copy: Measures the ability to copy a complex geometric design.
- Line Orientation: Assesses visuospatial judgment by asking the subject to match angles of lines.

3. Language Index

- Picture Naming: Measures expressive language by having the subject name pictures of objects.
- Semantic Fluency: Evaluates the ability to generate words within a specific semantic category (e.g., "fruits").

4. Attention Index

- Digit Span: Measures auditory attention and working memory by requiring the subject to repeat a series of numbers, both forward and backward.
- Coding: Measures processing speed and visual scanning by having the subject match numbers to corresponding symbols.

5. Delayed Memory Index

- List Recall: Requires the subject to recall the word list from the Immediate Memory section after a delay.
- List Recognition: Measures recognition memory for the word list, with a choice between target and distractor words.

- Story Memory Recall: Assesses the recall of the story from the Immediate Memory section after a delay.
- Figure Recall: Measures the subject's ability to reproduce the geometric figure from memory after a delay.

References

- Blackwell, C. K. (2025). Bringing developmental assessment to the 21st century: The NIH Baby Toolbox [Editorial]. *Infant Behavior and Development*, 80, 102127. <https://doi.org/10.1016/j.infbeh.2025.102127>
- Christensen, A.-L. (1975). *Luria's neuropsychological investigation: Manual*. New York, NY: SP/Spectrum Publications.
- Fox, R. S., Zhang, M., Amagai, S., et al. (2022). Uses of the NIH Toolbox® in clinical samples. *Neurology: Clinical Practice*, 12(4), 307-319. <https://doi.org/10.1212/CPJ.0000000000200060>
- Gershon R. C., Wagster, M. V., Hendrie, H. C., Fox, N., Cook, K. F., & Nowinski, C. J. (2013). Responding to the needs of the neurology research community: Introduction to the NIH Toolbox for the Assessment of Neurological and Behavioral Function. *Neurology*, 80 (11 Supplement 3). Accessed October 6, 2015 from http://www.neurology.org/content/80/11_Supplement_3
- Goldstein, G., & Beers, S. (Eds.). (2003). *Comprehensive handbook of psychological assessment. Vol. 1. Intellectual and neuropsychological assessment*. New York, NY: Wiley.
- NIH Toolbox Brochure (2012). Bethesda, MD: National Institutes of Health. Accessed Oct. 10, 2013 from [http://www.nihtoolbox.org/WhatAndWhy/Assessments/NIH Toolbox Brochure-2012.pdf](http://www.nihtoolbox.org/WhatAndWhy/Assessments/NIH%20Toolbox%20Brochure-2012.pdf)
- Kulke, S. (2025, August 25). A new tool to track infant development, starting at just 16 days old. Northwestern Now. <https://news.northwestern.edu/stories/2025/08/a-new-tool-to-track-infant-development-starting-at-just-16-days-old>
- Randolph, C., Tierney, M. C., Mohr, E., & Chase, T. N. (1998). The Repeatable Battery for the Assessment of Neuropsychological Status (RBANS): Preliminary clinical validity. *Journal of Clinical and Experimental Neuropsychology*, 20(3), 310-319. <https://doi.org/10.1076/jcen.20.3.310.823>
- Reitan, R. M. (1994). Ward Halstead's contributions to neuropsychology and the Halstead-Reitan neuropsychological test battery. *Journal of Clinical Psychology*, 50, 47-70.
- Reitan, R. M., & Wolfson, D. (1993). *The Halstead-Reitan neuropsychological test battery* (2nd ed.). Tucson, AZ: Neuropsychology Press.
- Stern, R. A., & White, T. (2003). *Neuropsychological Assessment Battery (NAB)*. Lutz, FL: Psychological Assessment Resources.
- Strauss, E., Sherman, E. M. S., & Spreen, O. (2006). *A compendium of neuropsychological tests: Administration, norms, and commentary* (3rd ed.). New York: Oxford University Press. (This 3rd edition is 1240 pages long compared to the 1st edition's 442 pages.)