Neuropsychological Test Batteries

1. 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.

2. Neuropsychological Assessment Battery (NAB)
   - First appeared about a decade ago (Stern & White, 2003) and independent validity and clinical use data are beginning to appear in the research literature. A promising new instrument.
   - 36 different tests in two equivalent forms & focused upon five areas of evaluation (which are called “modules”), i.e., Attention, Language, Memory, Spatial, and Executive (Lezak et al., 2012, p. 746). Administration takes less than 4 hours.
   - Standardization sample of 1,400 subjects including 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

3. NIH Toolbox for the Assessment of Neurological and Behavioral Function (NIH Toolbox) <http://www.nihtoolbox.org>
   - Initiative of the National Institutes of Health (NIH) to create a multidimensional, standardized test battery in English & Spanish for the rapid evaluation (< 2 hours) of cognitive, emotional, motor, and sensory functions of people 3 to 85 years old (Gershon et al., 2013; NIH Toolbox Brochure, 2012)
   - 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
   - Administered on both the Web and on an iPad.
4. 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 above

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

Individual Tests & Batteries: Selected Examples

A. Memory

1. Rey–Osterrieth Complex Figure Test (ROCF)

- Developed by Swiss psychologist, André Rey (1941), and standardized by his Belgian graduate assistant, Paul-Alexandre Osterieth (1944).
- Examinee copies the figure using a pencil; 30 minutes later, examinee is asked to draw it again from memory.
- Taps (a) visuospatial construction ability & (b) visual memory
- Right hemisphere damage: loss of overall shape/gestalt
- Left hemisphere damage: errors of detail in figure

2. Wechsler Memory Scale-4th Edition (WMS-IV; 2008)

- Test includes a variety of measures. Two important subtests are:
  - Logical Memory Test: Examinee listens to a short paragraph which tells a story and then must tell the story back. Scored on how many distinctive items examinee remembers.
  - Verbal Paired Associates Test: Examinee is given a list of ten word pairs, e.g., metal-iron, fruit-pear. After reading the list, the examiner says one of the word pairs and the examinee must give the other.
- Concepts or types of Memory tested: short-term, long-term, encoding, storage-consolidation, retrieval, autobiographical (episodic) vs. informational (semantic), declarative vs. procedural


- Examinees are read a list of words, selected after careful study of their frequency of use across multiple demographic variables, and asked to recall them across a series of trials. In addition to recall and recognition scores, CVLT–II measures encoding strategies, learning rates, error types, and other process data. CVLT–II includes forced-choice items useful for detecting malingering, thereby helping to reduce false results.

  Types of memory functions assessed:
  - semantic vs. serial ordering
  - serial position (primacy vs. recency effect)
  - proactive interference
  - retroactive interference

B. Language

- Boston Naming Test: Examinee must identify what is pictured on a set of cards
- Boston Diagnostic Aphasia Examination (Battery) [Howard Goodglass & Edith Kaplan]
C. Executive Functions

• **Delis-Kaplan Executive Function System** (D-KEFS, 2001)
  - The nine new stand-alone tests in the D-KEFS comprehensively assess the key components of executive function believed to be mediated primarily by the frontal lobe.
    - Sorting Test: problem solving, verbal and spatial concept formation, flexibility of thinking
    - Trail Making Test: flexibility of thinking on a visual motor task
    - Verbal Fluency Test: fluent productivity in the verbal domain
    - Design Fluency Test: fluent productivity in the spatial domain
    - Color-word Interference Test: verbal inhibition
    - Tower Test: planning and reasoning, impulsivity
    - 20 Question Test: hypothesis testing, verbal and spatial abstract thinking
    - Word Context Test: deductive reasoning
    - Proverb Test: metaphorical thinking and comprehending abstract thought
  - D-KEFS results can be used to assess the integrity of the frontal system of the brain to determine how deficits in abstract, creative thinking may impact on an individual's daily life, and to plan coping strategies and rehabilitation programs tailored to each patient's profile of executive function strengths and weaknesses.

• **Stroop Test**
  - Examinee must say the color of printed words which are different from the color named in the word

• **Wisconsin Card Sort Test** (WCST)
  - Measures ability to form abstract concepts and to shift and maintain the cognitive set that goes with the concept
  - Four “target” cards are placed on table: 1 red triangle, 2 green stars, 3 yellow crosses, and 4 blue circles.
  - Examinee is presented with a stack of cards and told to place each of them on the right target card. Examiner will only tell them if they are “right” or “wrong”.
  - Examinee has choice of category: color, number, or shape.
  - First criterion: color. Then changed to number, then to shape.

• Category Test (HRNTB)
• Trails-B

• **Cookie Thief Story** from Boston Diagnostic Aphasia Exam: what is happening in this picture.

Description of card: *On right side, mother is washing dishes, but fails to see that the sink is overflowing and the water is pouring onto the floor. On the left side behind her back, children are stealing cookies: a boy in the upper left is reaching into a cookie jar to give cookies to himself and his sister who is on the lower left, but at the same time the stool he is standing on is tipping over.*
Measures concepts such as (1) visual perception in each of the four quadrants (upper right & left; lower right & left); (2) understanding that two different stories are happening (to the mother at the sink and to the children at the cookie jar); (3) understanding of the interrelationships between mother & children (they are sneaking the cookies while she is otherwise busy).

Planning

- Porteus Maze Test
- WISC Mazes subtest

Carrying Out Goals/Plans

- Constructional tasks such as Tinkertoy Test

References


