

Neuropsychological testing



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Clinical neuropsychology is a field with historical origins in both psychology and neurology. The primary activity of neuropsychologists is assessment of brain functioning through structured and systematic behavioral observation. Neuropsychological tests are designed to examine a variety of cognitive abilities, including speed of information processing, attention, memory, language, and executive functions, which are necessary for goal-directed behavior.

By testing a range of cognitive abilities and examining patterns of performance in different cognitive areas, neuropsychologists can make inferences about underlying brain function. Neuropsychological testing is an important component of the assessment and treatment of traumatic brain injury, dementia, neurological conditions, and psychiatric disorders. Neuropsychological testing is also an important tool for examining the effects of toxic substances and medical conditions on brain functioning.

Before the introduction of neuroimaging techniques like the computed tomography (CAT scan) and magnetic resonance imaging (MRI), the primary focus of neuropsychology was diagnosis. Since clinicians lacked non-surgical methods for directly observing brain lesions or structural abnormalities in living patients, neuropsychological testing was the only way to determine which part of the brain was affected in a given patient. Neuropsychological tests can identify syndromes associated with problems in a particular area of the brain.

For instance, a patient who performs well on tests of attention, memory, and language, but poorly on tests that require visual spatial skills such as copying a complex geometric figure or making designs with colored blocks,

may have dysfunction in the right parietal lobe, the region of the brain involved in complex processing of visual information. When a patient complains of problems with verbal communication after a stroke, separate tests that examine production and comprehension of language help neuropsychologists identify the location of the stroke in the left hemisphere.

Neuropsychological tests can also be used as screening tests to see if more extensive diagnostic evaluation is appropriate. Neuropsychological screening of elderly people complaining of memory problems can help identify those at risk for dementia versus that experiencing normal age-related memory loss. As neuropsychological testing came to play a less vital role in localization of brain dysfunction, clinical neuropsychologists found new uses for their skills and knowledge.

By clarifying which cognitive abilities are impaired or preserved in patients with brain injury or illness, neuropsychologists can predict how well individuals will respond to different forms of treatment or rehabilitation. Although patterns of test scores illustrate profiles of cognitive strength and weakness, neuropsychologists can also learn a great deal about patients by observing how they approach a particular test. For example, two patients can complete a test in very different ways yet obtain similar scores.

One patient may work slowly and methodically, making no errors, while another rushes through the test, making several errors but quickly correcting them. Some individuals persevere despite repeated failure on a series of test items, while others refuse to continue after a few failures. These differences might not be apparent in test scores, but can help clinicians choose among rehabilitation and treatment approaches. Performance on neuropsychological

tests is usually evaluated through comparison to the average performance of large samples of normal individuals.

Most tests include tables of these normal scores, often divided into groups based on demographic variables like age and education that appear to affect cognitive functioning. This allows individuals to be compared to appropriate peers. The typical neuropsychological examination evaluates sensation and perception, gross and fine motor skills, basic and complex attention, visual spatial skills, receptive and productive language abilities, recall and recognition memory, and executive functions such as cognitive flexibility and abstraction.

Motivation and personality are often assessed as well, particularly when clients are seeking financial compensation for injuries, or cognitive complaints are not typical of the associated injury or illness. Some neuropsychologists prefer to use fixed test batteries like the Halstead-Reitan Battery or the Luria-Nebraska Battery for all patients. These batteries include tests of a wide range of cognitive functions, and those who advocate their use believe that all functions must be assessed in each patient in order to avoid diagnostic bias or failure to detect subtle problems.

The more common approach today, however, is to use a flexible battery based on hypotheses generated through a clinical interview, observation of the patient, and review of medical records. While this approach is more prone to bias, it has the advantage of preventing unnecessary testing. Since patients often find neuropsychological testing stressful and fatiguing, and these factors can negatively influence performance, advocates of the flexible

battery approach argue that tailoring test batteries to particular patients can provide more accurate information.

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