



## Information Bulletin

# Neuropsychological Evaluation and Brain Injury

Edited by:

Victor Zelek, Ph.D.  
Director of Neuropsychology Services  
Northeast Center for Special Care

Typically, neuropsychological evaluations are given to individuals who have suffered some form of brain injury, for example, traumatic head injury, strokes and brain tumors. Different types of brain injury include:

- Traumatic brain injury (TBI), concussion, acceleration-deceleration injury.
- Cerebro-vascular accident (CVA), which includes stroke and ruptured aneurysm.
- Brain tumor, which may originate in the brain or metastasize into the brain from other parts of the body.
- Anoxia (lack of oxygen), as in drowning, choking or strangulation. Anoxic brain injury may occur if the heart stops breathing for a brief period of time.
- Toxic injury, which is caused by neurotoxins, such as carbon monoxide, lead, mercury and certain illicit drugs.
- Infection may damage the brain, as in encephalitis, meningitis, abscess or chronic brain Lyme disease.
- Degenerative diseases that affect the brain include Alzheimer's Disease, Pick's Disease, Huntington's Disease, Lewy Body Disease and sometimes Multiple Sclerosis and Guillome-Barr Disease.

Individuals with less obvious brain/neurological dysfunction may also benefit from a neuropsychological evaluation. These include persons with developmental disorders, ADD, a learning disability and psychiatric disorder.

Clinical neuropsychologists are psychologists who are trained in a variety of disciplines that include clinical psychology, neuroanatomy, neurochemistry, neurophysiology and psychometrics. They attempt to understand how the brain functions by using objective

psychometric measures (tests). These measures are used to analyze and interpret an individual's responses to cognitive tasks by comparing those responses to a Normative Sample. Typically, Normative Samples for each test are comprised of large groups of people with similar characteristics (age, education and cultural background) as the test-taker.

Testing results are often reported in percentiles. For example, a score of 75th percentile on a memory test means that an individual did as well or better than 75 percent of the people in the Normative Sample did on that particular test. 50th percentile is average. A score of the 5th percentile indicates serious impairment.

A neuropsychologist makes inferences about what a person is able to do in his/her environment based on how that individual performs on a set of tasks, relative to how other people in the population perform on the tasks. The tests have usually been validated by clinical research studies that assess the specific relationships between performance on test measures, neurological and cognitive functions. Tests typically consist of paper and pencil tests, verbal tasks, structured and unstructured interviews, computerized tasks and constructional tasks.

### **Usefulness and Purpose of the Neuropsychological Evaluation**

A neuropsychological evaluation may be conducted for a variety of reasons. Some of these include:

- Clarification of diagnosis by assessing the cognitive profile and degree of cognitive impairment in suspected cases of brain injury.
- Establishing a baseline from which comparisons of the effectiveness of therapeutic interventions or changes in cognitive status can be made.
- Using the evaluation results to design a specific and targeted cognitive treatment plan.
- Assisting social workers and discharge planners by providing a realistic picture of cognitive strengths and goals for community placement and development of rehabilitation and training programs.
- Predicting prognostic outcomes with respect to community reintegration after brain injury.
- Documentation of cognitive status for vocational & educational, forensic or litigation proceedings.

While imaging techniques such as MRI, CT scan, PET or SPECT, can show damage to the brain's structural integrity, blood flow or metabolism, however, they cannot measure the amount of memory loss or capacity to sustain attention. Neurological testing evaluates such impairments of cognitive functioning. The types of cognitive deficits that are typically encountered after brain injury are diverse but tend to include impairments in:

- Attention/concentration/orientation.
- Executive functioning: planning, initiation, follow-through and organization.
- Visuo-spatial, perceptual skills
- Speech, language and comprehension.
- Memory: visual, auditory, short-term memory, long-term memory.
- Speed of information processing.
- Mental flexibility, reasoning, Problem solving and Judgment.

The rationale behind providing neuropsychological assessment services in a rehabilitation setting is to provide a better understanding of brain-behavior relationships so that the Interdisciplinary Treatment Team can focus on utilizing an individual's particular strengths to compensate for limitations in cognitive functions associated with their brain injury. In the larger context of an individual's own life, it provides the person with a sense of what he or she can do and how he or she can most effectively attain the things they have difficulty doing.

Why is it so important that the patient has a good understanding of his/her cognitive problems? Let's imagine that a person's car was damaged in an accident. The mechanic fixed it the best he could and it is usable, but there were two things that could not be fixed: the brakes are a little loose and every time you break it slightly veers to the left. Knowing this could be invaluable to the driver, since he/she could compensate for these problems by braking earlier and slightly turning the wheel to the right. Similarly, having good and continuous awareness of one's cognitive problems allows for evasive actions. When cognitive problems cannot be completely fixed and one has to live with them, compensatory strategies can go a long way.

### **What Does a Neuropsychological Evaluation Include?**

A comprehensive neuropsychological evaluation typically takes between 6-12 hrs to complete. Shorter 2-4 hour screens may be conducted. A comprehensive evaluation may be conducted over several days. The length of time taken is usually determined by factors such as an individual's age, attention span, motivation and endurance, nature of the impairment and referral reason. The evaluation includes obtaining data from a variety of sources: background history, behavioral observations and objective testing of abilities/skills.

At intake, a complete history of developmental, medical/psychological, educational, occupational and social concerns is obtained during the interview with client, family members and review of records. Inferences about premorbid characteristics are obtained using background information.

**Structured Testing:** Formal neuropsychological evaluation may be conducted using a fixed battery of tests or a flexible series of tests geared towards extrapolating information about an individual's ability to function in a variety of areas. The areas most commonly assessed include:

- **Gross Cognitive/Intellectual functioning:** Overall ability/aptitude. This gives an overall sense of a person's ability to handle his/her environment. It gives an estimate of overall cognitive functioning and may be helpful in detecting diffuse cognitive decline noted in head and acquired brain injuries.
- **Conceptual/abstract reasoning/executive ability/judgment:** The way in which a person is able to put together information to formulate hypotheses about a situation. Problem solving, planning/decision making, self awareness/insight, error correction or trouble shooting, anticipate & responding to novel situations/future needs, attention/interference control, regulate impulses & drives/inhibition of inappropriate actions, flexibility.
- **Attention/concentration/tracking:** The ability to focus mental resources on a task. These are important in monitoring what is going on in the environment and adapting to change. Sustained and shifting attention. Levels of arousal are important here.
- **Language:** The ability to communicate with others by using symbolic systems, such as speech (expressive), and ability to interpret such systems (receptive). Articulation, speech prosody, reading comprehension.
- **Learning/Memory:** The way in which an individual acquires information/knowledge about the world, and their ability to retain and retrieve such information when required to do so. It includes the dynamic process of encoding and categorizing information, storage and retrieval.
- **Academic/achievement (optional depending on purpose):** Basic skills of reading spelling, writing and mathematics may be assessed to get a sense of essential skills required to perform everyday tasks, and employment readiness.
- **Motor Functioning:** Psychomotor coordination. **Speed & Style of Processing:** The way in which information is encoded (taken in) and utilized. Factors, such as speed of processing, the strategies used (piecemeal/holistic). **Adaptive Functioning/Emotional/personality:** Daily living, social and communication skills. Emotional states, such as anxiety & depression affect how the brain processes information. Personality styles which affect how information is processed.
- **MOTIVATION/MALINGERING:** Occasionally, inclusion of explicit measures of task motivation is used to determine whether a person's performance is motivated by financial or emotional gain (e.g., need for attention).