Neuropsychological Evaluation in Traumatic Brain Injury

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KEYWORDS

• Neuropsychology • Assessment • Cognition • Brain-behavior relationships • Psychometrics • Outcome • Rehabilitation

KEY POINTS

- Neuropsychology is a subspecialty of professional psychology that involves the scientific study and clinical application of brain-behavior relationships.
- Neuropsychological evaluation integrates objective psychometric tests with other clinical data to comprehensively characterize the cognitive, behavioral, and emotional effects secondary to traumatic brain injury (TBI).
- Neuropsychological evaluation can help delineate normal individual differences from the neurologic effects of injury. Neuropsychological testing is also useful for identifying if psychological conditions (eg, depression) or other non-neurologic factors are affecting symptom presentation.
- Neuropsychological evaluation can further contribute to evidence-based TBI patient care through serial assessment of cognitive and functional status over time, informing TBI rehabilitation, and evaluating the effectiveness of interventions.

AN OVERVIEW OF NEUROPSYCHOLOGY

Neuropsychology involves the scientific study and clinical application of brain-behavior relationships.[1] It is a specialty of professional psychology that "applies principles of assessment and intervention based upon the scientific study of human behavior as it relates to normal and abnormal functioning of the central nervous system."[2] A clinical neuropsychologist has advanced doctoral education as well as

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internship and specialty postdoctoral residency/fellowship training in the foundations of brain-behavior relationships (eg, functional neuroanatomy, neurologic disease, and psychopharmacology) in addition to clinical (eg, psychopathology and personality assessment) and general (eg, learning, development, and statistics and psychometrics) psychology.[3] Specialty board certification in clinical neuropsychology is also available.

Professionally, clinical neuropsychologists engage in evaluation/assessment, intervention, consultation, and research related to the cognitive, behavioral, and emotional manifestation(s) of known or suspected brain dysfunction with an extensive array of clinical populations, such as TBI and other acquired brain injury (eg, anoxia and stroke), neurodegenerative/dementing and neurologic conditions (eg, Alzheimer disease, Parkinson disease, multiple sclerosis, and epilepsy), learning disorders, neurodevelopmental conditions, and psychiatric disorders.[2] Among the varied professional activities performed by clinical neuropsychologists, evaluation through the use of objective, psychometric tests is most predominant and serves as the main focus of this review, with emphasis on its relevance to moderate to severe TBI.

CLINICAL UTILITY OF NEUROPSYCHOLOGICAL EVALUATION

Although modern neuroimaging techniques have greatly reduced the historical role of the neuropsychologist in localizing lesions of the central nervous system based on psychometric testing, neuropsychological evaluation continues to meaningfully contribute to patient care by elucidating the functional sequelae secondary to central nervous system pathology/dysfunction. From a clinical and patient care standpoint, this is particularly valuable given that similar structural neuroanatomic lesions can have striking diverse cognitive and behavioral symptom presentations among individual patients.[4,5] Consequently, there are 6 broad clinical questions that commonly generate a referral for a neuropsychological evaluation[5]:

Referral Question	Examples
1. Differential diagnosis	Are the patient's reported cognitive difficulties due to TBI or is some other condition, such as a psychiatric disorder, sleep disturbance, chronic pain, or substance misuse, or are other non-neurologic factors contributing?
2. Characterization of cognitive, behavioral, and emotional abilities/limitations	What cognitive and behavioral deficits does a patient with a moderate TBI have? How may these affect daily functioning? How have a patient's cognitive deficits resulting from a penetrating TBI and subsequent posttraumatic epilepsy changed over the past year since initial evaluation? Is a treatable psychiatric condition that can have an adverse impact on engagement in TBI rehabilitation (eg, depression) present?
3. Treatment planning	What specific cognitive impairments should be targeted for rehabilitation for a patient with a subarachnoid hemorrhage? What behavioral interventions would be effective for a patient with disinhibited and hypersexual behavior after TBI? What academic accommodations does a patient with a TBI and residual cognitive deficits need if he/she wishes to pursue college coursework?

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