An Introduction to Neuropsychological Assessment

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Learning Objectives

• Define neuropsychology and introduce the basic components of neuropsychological assessment.
• Identify the phases of neuropsychological evaluation.
• Identify cognitive domains commonly assessed within neuropsychological evaluations.
• Learn how to interpret test data and how to apply it clinically.
Overview of Neuropsychology

- **Neuropsychology** is the study of the relationship between the structure and function of the brain and one’s behavior. Cognition and physiology are considered interrelated and inseparable. The field of neuropsychology aims to study, assess, and treat behaviors based on brain functioning.

- Goal is to understand how behavior, emotion, cognition and perception may be related to, and underpinned by, the chemical, electrophysiological, anatomical and integrative functions of the central nervous system.

- Fueled by advancements in imaging technology, neuropsychological thinking started to gather momentum during the 1950s and 1960s.
Overview of Neuropsychology

- Neuropsychology subdisciplines
  - **Experimental Neuropsychology**: research based, largely focused on advancing the understanding of normal brain functioning.
  - **Cognitive Neuropsychology**: Seeks to understand the neuroanatomical and neurofunctional correlates of discrete cognitive processes. Relies heavily on case studies of individuals with CNS lesions.
  - **Clinical Neuropsychology**: Assessment and rehabilitation of individuals with disturbed function consequent upon brain injury.

- A comprehensive neuropsychological assessment can assist with clarifying the reasons or causes for one’s behaviors and emotions.
Overview of Neuropsychological Evaluations

- **Neuropsychological testing** is the evaluation of cognitive abilities and psychiatric/personality functioning using a battery of standardized assessment measures.

- A **test battery** involves tests of a variety of cognitive ability areas, with more than one test per ability area.

- **Cognitive ability areas include**: general cognitive functioning (IQ), processing speed, achievement, executive functioning, attention, memory, language, visual perception, somatosensory function, motor function, and mood/personality.
Overview of Neuropsychological Evaluations

- NP batteries are tailored to the individual client
- A well-done evaluation of cognitive abilities and skills can provide the foundation for an accurate diagnosis and useful **recommendations** for treatment, which can be applied clinically.

  — Recommendations include individual psychotherapy, family psychotherapy, psychiatric intervention, behavioral interventions, training and coaching, special education services and intervention and other specialized intervention, such as occupational therapy, speech therapy, vision therapy, neurological consultations, nutritional counseling, etc.
Overview of Neuropsychological Evaluations

- Neuropsychological evaluations were originally targeted to assess individuals who had experienced brain injuries in wartime.
- Currently, NP evaluations are useful to assess a whole range of neuropsychiatric conditions.
  - TBI, dementia, neurological conditions, psychiatric disorders, in addition to examining the effects of toxic substances and medical condition on overall brain functioning.
  - Academic evaluation
  - Competency to stand trial or manage financial affairs
  - Assess ability to live independently or with supervision
  - Candidacy for surgical procedure
  - Assess dementia vs. pseudodementia
  - TBI vs. malingering or unconscious exaggeration of symptoms
  - Establish “baseline” information on abilities before potential problem
    - Families with a history of dementia
    - Rise in school evaluation for athletes, due to increased recognition of the cognitive implications of concussions
Neuropsychological testing is performed by a licensed psychologist.

Duration of testing varies depending on the referral question

— Generally 6-8 hours is needed to complete a thorough evaluation.

— Some evaluators elect to complete testing in a single day, but others break testing down into several days.

— Testing is completed on a 1:1 basis with minimal distractions.
Phases of Neuropsychological Evaluation

- **Evaluate the Referral Question**
  - Clinical Interview
  - Clarify the purpose of testing to ensure appropriate battery is selected
- May need to refer out based on level of competence and access to appropriate assessments
  - Uncover hidden agendas, unspoken expectations
  - Prepare client for testing
  - Explain limitations in testing
    - While neuropsychological tests have been designed to identify cognitive impairments stemming from a brain insult and their severity, the vast majority of tests were not designed to predict how patients would function day to day in real world settings.
Phases of Neuropsychological Evaluation

- **Acquire Knowledge Related to the Content of the Problem**
  — Before testing, examiners carefully consider the problem, the adequacy of the tests they will use, and the specific applicability of that test to an individual’s unique situation.
  — Alone, each neuropsychological test has strengths and weaknesses in its validity, reliability, sensitivity, and specificity.

  - **Reliability** = “consistency” or “repeatability” of the measures
  - **Validity** = how well the test measures what it purports to measure
  - **Sensitivity** = a test’s ability to identify persons with a disorder
  - **Specificity** = a test’s ability to differentiate patients with a certain abnormality from those with other abnormalities or with no abnormality

  — Identify variables that may impact testing.
    - Culture, primary language, visual impairment, hearing impairment, restricted mobility, substance use
Phases of Neuropsychological Evaluation

• **Collect Data**
  – Sources of data = scores obtained on assessments, personal history, behavioral observations, and a clinical interview.
    • School records, previous evaluations, medical records, police reports, parent/teacher evaluations and interviews
  – Assessments alone do not provide enough information
Phases of Neuropsychological Evaluation

• Interpret Data
  – Interpret all sources of data and generate a neuropsychological report.
    • Report provides a description of the client’s present level of functioning and considerations relating to etiology, prognosis, and treatment recommendations.
Neuropsychological Report

- Basic Information — Name, Date of Injury, Date of Evaluation, Handedness, Date of Birth
- Reason for Referral
- Background information (Clinical Interview & Records)
  - Medical History
  - Medication History
  - Social Emotional Functioning
  - Educational/Vocational History
  - Pertinent Family Information
- Behavioral Observations
- List of Tests Administered
- Results of Testing (Usually by cognitive domain)
- Summary of Findings
- Diagnosis
- Recommendations
- Signature
Phases of Neuropsychological Evaluation

• **Interpret Data**
  – Within a NP report, test scores can be summarized by various standardized scores, which include: scaled scores, standard scores, T-Scores, and Percentile scores.
  • These scores are generated based on the normal bell curve.
The Normal Curve

- The frequency distributions of many attributes (physical, biological, and psychological), as they occur across individuals in nature, tend to conform to a bell shaped curve.
- The normal distribution is a theoretical concept of how large samples of ratio or interval level data will look once plotted. Since many variables tend to have approximately normal distributions it is one of the most important concepts in statistics.
Normal distributions share several key features.

- They are unimodal, meaning that there is only one peak in the distribution.
- Measures of central tendency including the mean, median, and mode all fall at the same midline point and are all equal.
- Symmetrical: When divided at the mean a normal distribution takes the form of a symmetrical bell-shaped curve, with an equal number of scores above and below the midpoint.
The Normal Curve

- The normal curve is the basis of many commonly used statistical and psychometric models and is the assumed distribution for many psychological variables. Many assessments assume a normal distribution.
The Normal Curve

- **Standard Deviations** are used to measure how much variation exists in a distribution. Low SDs are close to the mean whereas high SDs are spread out over a large range.

- 34.13% of the scores lie between the mean and 1 standard deviation above the mean (or below the mean).

- Approximately two-thirds of the scores lie within 1 standard deviation of the mean (68.26%).

- Approximately 95% of the scores lie within 2 standard deviations of the mean.

- Over 99% of the scores fall within 3 standard deviations of the mean.

- Scores that fall more than 2 standard deviations = “clinically significant”
Z-Score

- Z-scores are used to measure how many SDs above or below the mean a particular score is.
Standardized Scores

- With SDs, percentile ranks, T-scores, standard scores, or scaled scores can be derived from raw scores obtained on tests.
  - The standardized scores provide a more meaningful description of the individual scores within the distribution.
  - The raw data from neuropsychological tests are converted to standardized scores for interpretation.
  - Scores can be compared with normative data based on a number of different demographic criteria, including (but not limited to) age, race, gender, and socioeconomic status.
• Standard score = 115
  • “Tom is exactly 1 SD above the mean, placing him in the high average range”
  • “Tom performed at the 84th percentile”
  • “Tom obtained a T-score of 60”
  • “Tom performed better than 83 percent of individuals in the standardized group”
Interpretation of Raw Data

• Each assessment comes with a manual. The manual provides tables, based on demographics, that allow psychologists to quickly convert raw scores into standardized scores for interpretation.

• Computer scoring is also available for commonly used assessments.
Neuropsychologists write reports differently depending on their style and audience.

- Some reports are easier to interpret than others

<table>
<thead>
<tr>
<th>Standardized Score</th>
<th>Average Range of Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scaled Score (ScS)</td>
<td>8 to 10</td>
</tr>
<tr>
<td>Standard Score (SS)</td>
<td>90 to 110</td>
</tr>
<tr>
<td>T-score (T)</td>
<td>43 to 56</td>
</tr>
<tr>
<td>Percentile Score</td>
<td>25 to 75</td>
</tr>
</tbody>
</table>

*Refer to psychometric table listed under the “Helpful Resources” slide*
Clinical Utility of Results Obtained in Neuropsychological Evaluations

- Refer to the Neuropsychologist for support and guidance.

- Repeat evaluations could be conducted to evaluate progress through treatment.

- Test results help professionals **develop a treatment plan** that pulls from the individual’s identified cognitive strengths and supports their found weaknesses. The goal is to help the individual progress to their most independent level of functioning.
Examples

• Significant memory deficits.
  – Follow-up treatment may include assisting the individual with learning how to use schedules, auditory reminders, visual reminders (check lists), daily journal
  – CRT

• Student: poor auditory processor, but adequate visual processor
  – Academic accommodations: Teachers provide handouts that match lecture to assist with learning, record lectures for later review

• Attention problems
  – Ensure eye contact, ask individual to repeat important information in their own words, have students record lectures or sit in front of the class
  – Break tasks down to be manageable
  – Pharmacological intervention
  – CRT

• High IQ/Academics, but behavioral and mood deficits
  – Increase challenge academically or vocationally
  – Pharmacological intervention
  – Therapy
Clinical Utility of Results Obtained in Neuropsychological Evaluations

- Recognition of a **diagnosis** guides treatment
  - Psychiatric Disorder – psychological services & pharmacological intervention
  - TBI/Cognitive Disorder – Need for OT, SLP, a nurse, case manager, PM&R
  - Autism – communication skills training, staff education to understand the social and communication limitations, music therapy
  - Alcohol Abuse – treatment should include a detox program, AA, intensive outpatient program, etc.
Utility of Testing by Profession

- **Prescribing Doctors/Nurses**: medication management and treatment planning.
  - Testing can be used to document the functional effects of medical interventions, changes in medications or neurological procedures.
  - Results of testing can signal need for supervision of medications or need of compensatory strategies to ensure appropriate administration of medications.
  - History of substance abuse
    - Interaction effects
    - History of misuse of prescribed drugs
  - Identification of mood disorder, pain, attention disorder, etc. that warrants medication.
Utility of Testing by Profession

- **Case Managers**
  - Share neuropsychological report with external providers
  - Explain results to client and answer related questions
  - Monitor progress and challenges since the last evaluation, share information with neuropsychologist, and schedule re-administration
  - Highlight key findings to certain providers & make appropriate referrals
    - E.g. Substance abuse to prescribing doctors or visual deficits to Neuro-opthalmologists
Utility of Testing by Profession

- **Certified Rehabilitation Counselors (CRCs)**
  
  — Connect client with helpful organizations and community resources based on their cognitive strengths and weaknesses.
  
  — Recommend services and carry out recommendations outlines in NP report.
Utility of Testing by Profession

- **Counselors/Psychologists**
  
  — Use test findings to assist with education for the client, their significant others, and family members

  — Understanding deficits and identifying a means of compensating or treating deficits is key to emotional well-being.

  — Test findings can guide treatment goals.

  — Data collected can provide an overview of emotional functioning over participant’s course of treatment

  — Determine need for behavioral intervention plan/incentive plan
Utility of Testing by Profession

• **Speech Language Therapists**
  
  — Guide their own evaluations

  — Provide remediation for cognitive-communication deficits

  — Specific interests on deficits that interfere with independence, home management, and occupational maintenance
Utility of Testing by Profession

- **Occupational Therapists**
  - Guide their own evaluations
  - Adaptive equipment to address physical limitations and visual deficits
  - Work with client to develop compensatory strategies to address cognitive deficits outlines in NP report
  - Take note of emotional/behavioral deficits, motivation level, impulse control issues as this may be a barrier within their treatment
Utility of Testing by Profession

- **Physical Therapist**

  - Emotional/behavioral functioning to ensure safety while engaged in physical activity. Especially important to know triggers, such as pain.
  
  - Recognition of Visual/Auditory deficits
  
  - History of physical/sexual abuse
  
  - Level of comprehension for directives
Utility of Testing by Profession

- **Vocational Specialist**
  - Determine appropriate supports necessary to be successful in the work force (job coach, vocational evaluation, referral to MRS/DVR (Michigan Rehabilitation Services, Division of Vocational Rehabilitation, etc.))
  - Volunteer, part-time work, full-time, school
  - Need for meaningful activity
References/Helpful Resources


- [http://faculty.pepperdine.edu/shimels/Courses/Files/ConvTable.pdf](http://faculty.pepperdine.edu/shimels/Courses/Files/ConvTable.pdf) or google psychometric conversion table.

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