Neurocognitive Issues
Section 4

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Cognitive Complications

Learning Objectives

Over 5 million Americans experience disabilities due to brain injury
Long-term care and supervision may be required for persons with brain injury due to cognitive and communication dysfunction, leading to increased caregiver burden and cost of care.

What is Cognition?

It is a complex collection...

It is a process...

Cognitive Skills and Processes

- Attention
- Association
- Attention Span
- Awareness
- Categorizing
- Decision-making
- Insight
- Maintenance of temporal order of stimuli
- Memory
- Organizing
- Planning
- Problem-solving
- Reasoning
- Retention
- Selective attention
- Stimuli
- Recognition
- Stimuli
- Discrimination
- Synthesis of information
- Training

Cognitive Skills and Processes Identified by ASHA and ACRM.
Domains of Cognitive Functioning

Categorization

Attention

Because we do not have unlimited processing resources, attention helps us to best allocate these resources.

Subtypes of Attention

<table>
<thead>
<tr>
<th>Subtypes of Attention</th>
<th>Descriptions</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focused Attention</td>
<td>Selecting one source of information (i.e., a talk) while withholding responses to other stimuli</td>
<td>Responding to pain; turning to see a loud sound behind you</td>
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<tr>
<td>Sustained Attention</td>
<td>Maintaining attention to complete a task accurately and efficiently over a period of time</td>
<td>Reading a book; watching a TV show; listening to a presentation</td>
</tr>
<tr>
<td>Selective Attention</td>
<td>Maintaining attention in the presence of distractions</td>
<td>Focusing on the presenter at a conference while ignoring others talking outside; studying while music is playing</td>
</tr>
<tr>
<td>Alternating Attention</td>
<td>Shifting between tasks that demand different behavioral or cognitive skills</td>
<td>Reading a recipe and stirring a pot; filing and answering the phone</td>
</tr>
<tr>
<td>Divided Attention</td>
<td>Requires the ability to respond simultaneously to multiple task demands while maintaining speed and accuracy</td>
<td>Cooking multiple courses at the same time</td>
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</tbody>
</table>

Categorization

Individuals with brain injuries tend to base decisions about category membership according to a single attribute and have difficulty responding to more complex and multidimensional stimuli.

Memory

Memory Processes

- Encoding: Where perceived information is put in a context that can be stored
- Storage: Stabilization of a memory
- Retrieval: The search for a memory or activation of a memory

Sensory Memory

Short Term Memory

Working Memory

Long Term Memory

Rehearsal

Memory Processes

- Building memory through deliberate processing
- Establishing long-term memory
- Temporary storage and processing of information
- Permanent consolidation and storage of information
Long Term Memory

**LONG TERM MEMORY**
(Permanent Consolidation & Storage)

- **EXPLICIT MEMORY**
  (Memory with Conscious Benefit)
- **IMPLICIT MEMORY**
  (Memory without Conscious Benefit)

- **SEMANTIC MEMORY**
  (Words, Names, Concepts)
- **EPISODIC MEMORY**
  (Personal Experiences)
- **PROCEDURAL MEMORY**
  (Skills & Tasks)

Processing Speed

**Executive Functions**

- Hold information in mind to complete tasks
- Update & manipulate information
- Age-appropriate insight of strengths & weaknesses
- Spontaneous planning of new tasks
- Anticipate future events
- Prioritize
- Intermediate and long term goal setting, appropriate to ability
- Independently initiate new activity
- Seek and search for new information
- Persist
- Conceive new ideas
- Independently assess behavior
- Respond to and make changes as needed
- Impulse control
- Manage distractions
- Delay responses
- Move freely from one activity to another
- Consider more than one solution when problem solving

**Metacognition**

- Diminished self-awareness
- Failure to recognize a personal disability
- Reductions in self-awareness can have important consequences for outcomes, including:
  - Compliance with rehabilitation
  - Ability to return to independent living
- Used to enhance an individual's ability to internalize awareness and control over behaviors
- The primary goal of metacognitive strategy training is to enhance a person's ability to internalize awareness and control over their behavior

**Anosognosia**

- Diminished self-awareness
- Failure to recognize a personal disability
- Reductions in self-awareness can have important consequences for outcomes, including:
  - Compliance with rehabilitation
  - Ability to return to independent living
Common Factors that Interfere with Cognitive Function Following a Brain Injury

Hearing
Vision
Communicative Functions
Medical Stability
Emotional and Behavioral Control
Comorbid Conditions

It is important to consider all factors (physical, language and speech, neurologic, and emotional/behavioral) when providing cognitive rehabilitation.

Models of Cognitive Rehabilitation

Compensatory Approach
- Assumes certain cognitive functions cannot be recovered due to damage
- Focuses on development of strategies to accommodate limitations. For example, external devices such as planners, checklists, smartphones
- A functional application is essential

Restorative Approach
- Repeated exposure and repetition of stimulation through experience can change brain’s plasticity and reorganization of the brain can occur
- Uses therapeutic exercises designed to reestablish or strengthen specific cognitive skills or processes

Overall Principles

Environmental Stimulus Approach
Overall Principles

- Task Complexity

Cognitive Distance

- Concrete
- Cognitive Distance
- Abstract

Neurobehavioral Complications

Common Neurobehavioral Changes after Brain Injury

- Aggression
- Agitation/irritability, poor frustration tolerance
- Poor initiation/apathy
- Denial of deficits/poor self-awareness
- Disinhibition/inappropriate sexual behavior
- Eating disturbances

- Emotional changes including flattened emotions, inability to express emotions
- Impulsivity
- Poor judgment and reasoning
- Psychosis - delusions, euphoria, hallucinations
- Nighttime disturbances
- Anxiety

Learning Objectives

Be able to identify and define common neurobehavioral complications of brain injury

Be able to articulate the concept and purpose behind a functional analysis

Be able to explain crisis prevention & behavior management strategies for individuals with a brain injury

Gain an understanding of de-escalation techniques to consider when individuals with brain injury are demonstrating increased frustration and agitation

Coma-Emergent Agitation

Environmental

Interventions & Demands

Education & Research

Provide a sterile andEther

Use a sterile andEther

Intervene immediately and avoid stimulation

Provide a calm and well-lit environment

Identify all staff who are willing and able to take the lead and conduct 1:1s with these individuals

Provide an opportunity for the individual to communicate specific preferences, specific activities, changes in condition

Provide sensory stimulation

Allow for increased movement as tolerated, including moving in a safe environment

Provide warm and supportive environment

Provide repeated opportunities to communicate

Provide opportunities for family members to be involved with the individual

Provide opportunities for family members to be involved with the individual

Provide repeated opportunities to communicate

Provide a calm and well-lit environment
The Stability Triangle

The Stability Triangle provides a guiding philosophy for the development of a comprehensive treatment plan.

- Establish Medical Stability
- Promote Stable Behavior
- Develop Stable Activity Plan

Applied Behavior Analysis

- May be addressed by:
  - Behavior Analyst
  - Psychologist
  - Special Educators

Behavior Program Elements

- Assess Behavior
- Define Target Behavior
- Collect Data
- Change Behavior

Four Term Contingency

- Establishing Operation: Any event that temporarily alters the effectiveness of some stimulus or occurs in a stimulus.
- Discriminative Stimulus: An event or stimulus that produces a response and sets the occasion for the behavior to occur.
- Response/Behavior: Anything that can be done and measured.
- Consequence: Any event that changes the probability of the response in the future (two main types of consequences: reinforcement and punishment).

Behavior Program Elements

- Functional Analysis
- Operational Definition

Behavior Program Elements

- Assess Behavior
- Define Target Behavior
- Collect Data
- Change Behavior

Four Term Contingency Examples

Example 1

- Establishing Operation: Mary was given her 9 am pain medication which alleviates significant orthopedic pain.
- Discriminative Stimulus: Dr. Hill clearly told that her pain is significant and must be treated.
- Response/Behavior: She was able to sit down and was able to focus better.
- Consequence: She feels better and is less distracted.

Example 2

- Establishing Operation: Mary was given her 9 am pain medication which alleviates significant orthopedic pain.
- Discriminative Stimulus: Dr. Hill clearly told that her pain is significant and must be treated.
- Response/Behavior: She attended her physical therapy session.
- Consequence: She had a very good session and was praised highly throughout.

Behavior Program Elements

- Assess Behavior
- Define Target Behavior
- Collect Data
- Change Behavior
**Behavior Program Elements**

**Consequence Based Intervention**

- **Positive Consequences**
  - A stimulus is added – the likelihood of the behavior increases
  - A stimulus is removed – the likelihood of the behavior decreases

- **Negative Consequences**
  - A stimulus is added – the likelihood of the behavior decreases
  - A stimulus is removed – the likelihood of the behavior increases

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**Schedules of Reinforcement**

- **Extinction**
- **Intermittent Reinforcement**
- **Continuous Reinforcement**

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**Prompting & Cueing**

A process by which an individual is supported to display a correct response

- **Visual**
- **Audible**
- **Tactile**
- **Environmental**

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**Task Analysis**

A task analysis is a list of very specific steps involved in completing a task.
This can be used to break down larger tasks into smaller component steps.

1. Turn on Water
2. Get Soap
3. Scrub
4. Rinse
5. Turn off Water
6. Get Towel
7. Dry Hands
8. Hang Up Towel

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**Shaping**

Goal: Train Butch to roll over when you say "roll over"
**Fading**

Example:
Teaching a child to read the word "Apple".

**Generalization vs. Discrimination**

**Other Communication Considerations**

- Personal space
- Body posture and motion
- Facial expression and gaze
- Tone, volume, and cadence of speech

**Crisis Intervention**

- **Expectations**
  - All staff should be trained in de-escalation skills and crisis intervention.
  - This should include guidelines for effective and supportive non-verbal and para-verbal behavior.

- **De-escalation Techniques**
  - Active Listening
  - Orientation
  - Redirection
  - Setting Limits
  - Withdrawing Attention
  - Contracting

**CBIS Considerations**

- Remain objective and neutral in the face of problem behaviors.
- Avoid labeling individuals and their behaviors.
- Behaviors are related to Brain Injury factors (e.g., communication difficulties, lack of awareness, pain, etc.); they are not personal.
- Daily activities of the CBIS involve:
  - Observation & reporting
  - Data collection
  - Implementation of strategies and approaches.

**Neuropsychology**
Learning Objectives

Be able to distinguish between restorative and compensatory approaches to cognitive treatment

Be able to discuss the concept of the functional systems model

Be able to explain the difference between clinical and experimental neuropsychology

Be able to identify the four components of cognitive rehabilitation

General History

What is Neuropsychology?

Neuropsychology is the science of brain-behavior relationships

<table>
<thead>
<tr>
<th>Field of Study</th>
<th>Focus</th>
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<tbody>
<tr>
<td>Psychology</td>
<td>Focuses on understanding behavior without always considering the role of the nervous system</td>
</tr>
<tr>
<td>Neurology</td>
<td>Focuses on the functioning of the nervous system without always considering its effect on behavior</td>
</tr>
<tr>
<td>Neuropsychology</td>
<td>Focuses on how the two interact</td>
</tr>
</tbody>
</table>

Clinical vs. Experimental Neuropsychology:

Differences in approaches

Branches of Neuropsychology

- Experimental
  - Intact Brains
    - Testing is used to study healthy brains throughout the lifespan
  - Brains with Lesions
    - Testing is used to relate behavior changes to lesion sites

Neuropsychology Assessment

Results of a neuropsychological evaluation provide a detailed description of the individual's abilities, strengths, and weaknesses in various areas of functioning

The Assessment Process

- Review
- Clinical Interview
- Standardized Testing
- Report & Feedback
The Assessment Process

Cognitive Education
Focuses on developing a patient's awareness of cognitive and functional deficits through education on weaknesses and strengths.

Cognitive Training
Focuses on resolving the cognitive and functional deficits through the application of restorative approaches.

Strategy Training
Focuses on the application of compensatory approaches to address residual deficits not amenable to natural recovery and cognitive training.

Functional Training
Focuses on real-world improvements in daily functioning.

Cognitive Rehabilitation

**NEUROPLASTICITY**
The ability of the nervous system to reorganize and compensate for injuries, functions and memories.

**ADAPTABILITY**
Individuals' capacity to change behaviors in order to adapt to changes in their internal or external environment.

**RESTORATIVE**
Areas to re-establish lost functionalities to develop new functions.

**COMPENSATORY**
Diagnostically examine the effects of deficits and barriers to efficient functioning.

- Neuroplastic interventions and technology
- Neurocognitive retraining
- Use of technology and applications for cognitive training
- Development of internal and external environmental strategies
- Technical and social skills training
- Adaptations and accessibility strategies