Brain Injury and Advancing Age: Differentiating and Working with Cognitive Changes Related to BI and Neurodegenerative Conditions

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Outline

1. Overview of Neuropsychology, Evaluation and Cognitive Domains

2. Cognitive Profiles of BI and Neurodegenerative Conditions

3. Considerations and Strategies when Working with BI and Neurodegenerative Conditions

Neuropsychology

- Study of the relationship between brain and behavior, and brain anatomy and function, including cognitive, emotional and behavioral, and sensory and motor functioning.

- Neuropsychologist is a Clinical Psychologist who specializes in brain anatomy and function, and the testing of brain functions, including cognitive, emotional and behavioral, and some motor functioning.

- Various settings - inpatient and outpatient

(Schoenberg & Scott, 2011)

Neuropsychological Evaluation

- Assess Cognitive Abilities or Thinking Skills
  - Attention
  - Working Memory
  - Learning and Memory
  - Language abilities
  - Visuospatial skills
  - Processing Speed
  - Executive Functions
- Assess Emotional and Behavioral Functioning
  - Depression
  - Anxiety
  - Bipolar and Mood Disorder
  - Post-Traumatic Stress Disorder (PTSD)
  - Attention-Deficit/Hyperactivity Disorder (ADHD)

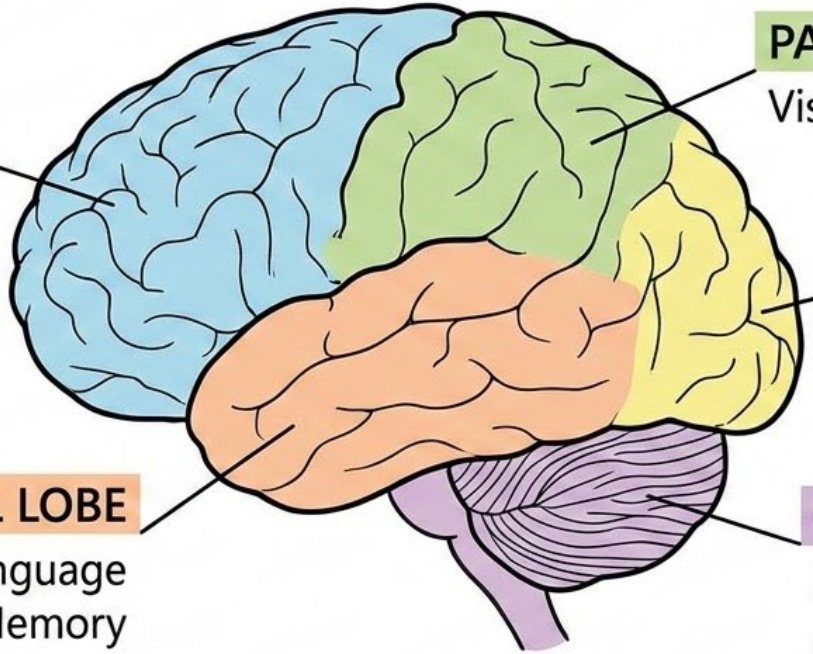
Cognitive Domains

- Attention and Working Memory
- Learning and Memory
- Language - receptive and expressive
- Visuospatial Skills
- Processing Speed
- Executive Functions - organizing, planning, sequencing, judgment, decision-making, problem-solving, reasoning, cognitive flexibility, initiation, insight, and regulation of attention, emotions, behaviors, verbal output
    - Role in language and memory

The Brain and Cognition

- Cognitive Domains and Brain Regions
  - Attention and Working Memory – Frontal Lobe
  - Learning and Memory – Frontal and Temporal Lobes
  - Language – Frontal and Temporal Lobes
  - Visuospatial Skills – Parietal and Occipital Lobes
  - Processing Speed – Frontal Lobe and Cerebellum
  - Executive Functions – Frontal Lobe and Cerebellum

Brain Regions and Cognitive Abilities



FRONTAL LOBE

Attention
Working Memory
Executive Functions
Personality

PARIETAL LOBE

Visuospatial Skills

OCCIPITAL LOBE

Visuoperceptual Ability

TEMPORAL LOBE

Language
Memory

CEREBELLUM

Processing Speed
Executive Functions
Behavior

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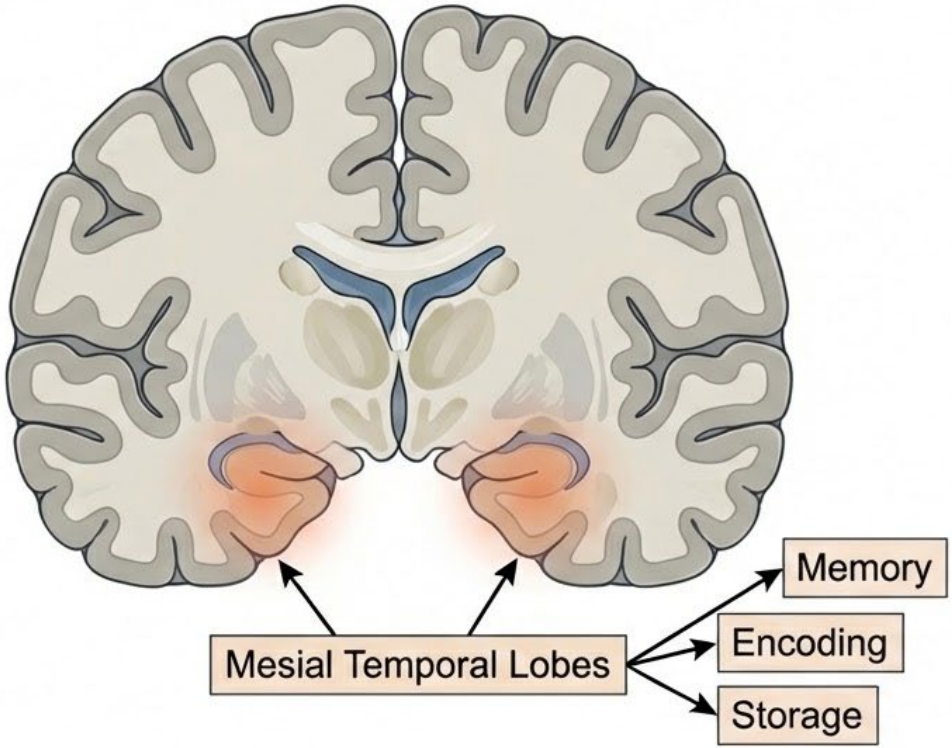

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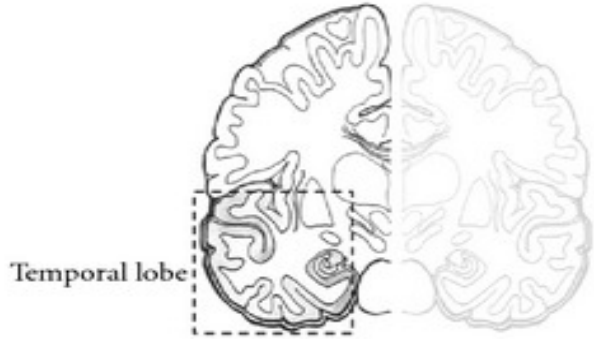

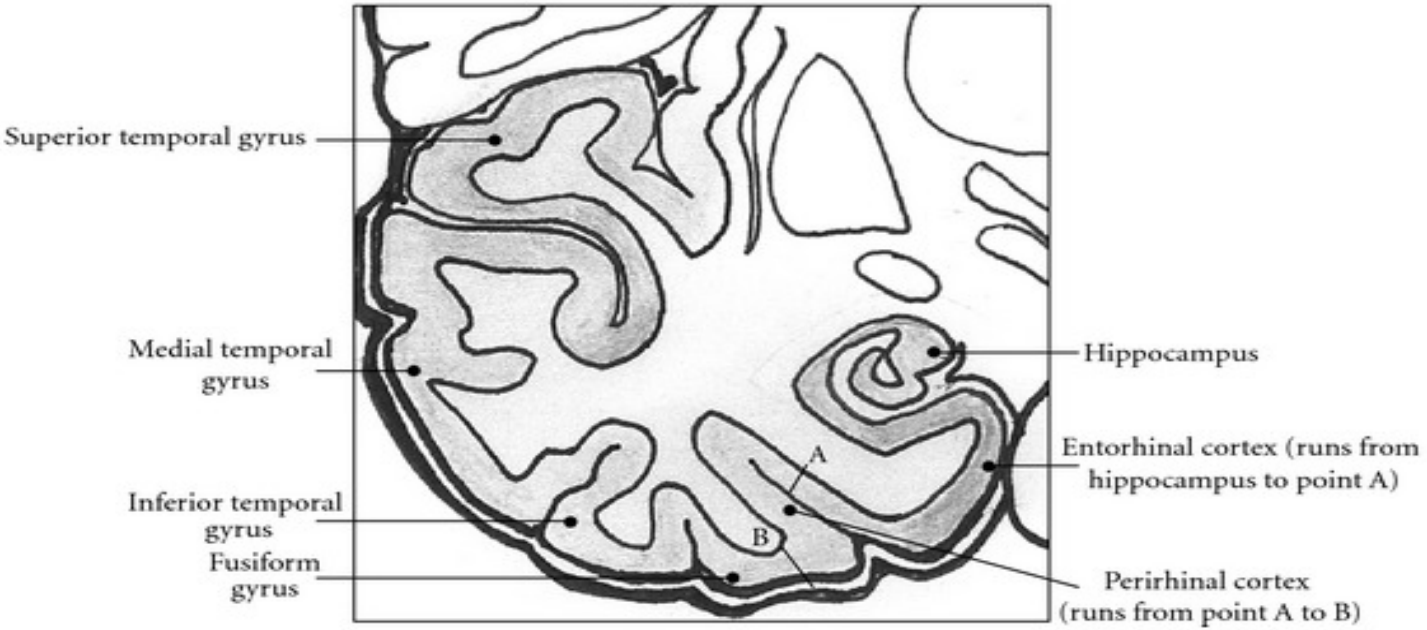

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Cognitive Profiles

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Brain Injuries

Concussion

(no intracranial injury on structural brain imaging)

Difficulty in:

- Attention
- Working Memory
- Executive Functions - including those involved in language and memory
- Processing Speed

- Foggy/slower thinking

- Typically recover with other post-concussive symptoms

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(McCrea, 2008; Parsons & Hammeke, 2014; Sattler et al, 2025)

Traumatic Brain Injury (TBI)
(intracranial injury present on structural brain imaging)

Deficits or difficulty in:

- Attention
- Working Memory
- Executive Functions - incl those involved in language and memory
- Processing Speed
- WAIS indices - lower attention/working memory and processing speed, and lower general nonverbal/perceptual abilities than general verbal abilities
- Other cognitive abilities depending on location of injury - intracranial bleed, axonal shear injury, edema/swelling
- Diffuse axonal injury (DAI) - emotional/behavioral changes, fatigue

(Schoenberg & Scott, 2011; Parsons & Hammeke, 2014; Sattler et al., 2025)

Traumatic Encephalopathy Syndrome (TES) or Chronic Traumatic Encephalopathy (CTE)

Deficits or difficulty in:

- Executive Functions
- Memory - episodic
- Attention

- Motor symptoms - including parkinsonian features
- Neuropsychiatric and neurobehavioral symptoms - including dysregulation

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(Katz et al., 2021)

Anoxic Brain Injury (ABI)

Deficits or difficulty in:

- Attention
- Executive Functions
- Processing Speed
- Memory - new learning, consolidation and retrieval, can include amnesia
- Other cognitive abilities depending on location of injury
- Retrograde amnesia - autobiographical

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(Parsons & Hammeke, 2014)

Stroke

Deficits or difficulty in:

- Attention
- Working Memory
- Processing Speed
- Executive Functions - incl those involved in language and memory
- Other cognitive abilities depending on location of injury

- Sensory and motor symptoms
- Emotional and behavioral changes

(Schoenberg & Scott, 2011; Parsons & Hammeke, 2014)

Recovery from BI

- Acute and subacute recovery - can have improvement
- Recovery trajectory is not linear; can have fluctuations within this
- Recovery occurs over 3-6 months and up to 12-24 months and beyond, and depends on many factors: type, severity and location of injury, age, prior insults to brain, other medical conditions, lifestyle factors

- Can have declines later related to normal aging changes, or presence of neurodegenerative condition

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(McCrea, 2008; Schoenberg & Scott, 201; Husseini et al., 2023; Sattler et al., 2025)

Diagnosing Cognitive Difficulties

- Mild Cognitive Impairment (MCI) or Mild Neurocognitive Disorder
  - Certain number and level of cognitive weaknesses on testing and little to no difficulty with daily functioning

- Dementia or Major Neurocognitive Disorder
  - Certain number and level of cognitive deficits on testing, and more significant impact on daily functioning, which may be mild, moderate or severe

- Following diagnosis, some may improve over time (i.e., recovery after BI) and some may worsen over time (i.e. neurodegenerative conditions)

Long term effects of TBI

- Research is mixed - some studies found no increased rates/risk of cognitive decline, or MCI or dementia later in life
- Concussions - 3 or more with LOC in lifetime and 4 or more may be associated with lower cognitive test scores and higher rates of MCI or neurocognitive disorder later in life
- TBI - history of moderate to severe TBI may increase risk for by 1.5-3 times, and result in earlier expression by 1-3 years of a neurodegenerative condition and MCI or dementia, such as Alzheimer's Disease (AD), and some Frontotemporal Dementia (FTD) and Parkinson's Disease (PD)
- May be dose dependent, and depend on number and severity of TBIs

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(McCrea, 2008; Schaffert et al., 2018; Kuzma et al., 2018; Husseini et al., 2023; Lennon et al., 2023)

Long term effects of Stroke

- Stroke - history of stroke may increase risk of MCI and dementia or neurodegenerative condition, including vascular and AD

- Rates 12 months after stroke: MCI = 22-80%; Dementia 7-41%

    - 7 years after stroke/TIA, 37% had MCI and 22%had dementia.
    - 3 months, and 1-14 years after stroke, 22% had MCI/ dementia.
    - 1 year after hemorrhagic stroke, 9-23% had new onset dementia, and 4 years after 28% had new onset dementia.
    - 5 years after all types stroke cumulative

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(Schaffert et al., 2018; Kuzma et al., 2018; Husseini et al., 2023)

Neurodegenerative Conditions

Alzheimer's Disease (AD)

Deficits and difficulty in:

- Language - semantic language, naming
- Visuospatial skills
- Memory - storage
- Executive Functions - this varies
- Amnestic memory loss: absent recall due to rapid forgetting and poor storage of information

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(Schoenberg & Scott, 2011; Lichtenberger & Kaufman, 2013; Sattler et al., 2025)

Frontotemporal Dementia (FTD)

Deficits or difficulty in:

- Attention
- Working Memory
- Executive Functions
- Language - language variant (lvFTD)
    - Primary Progressive Aphasia (PPA)
- Personality and Behavior - behavioral variant (bvFTD)
    - Socially inappropriate and disinhibited behavior

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(Schoenberg & Scott, 2011; Parsons & Hammeke, 2014; Sattler et al., 2025)

Lewy Body Dementia (LBD)

Deficits or difficulty in:

- Attention
- Working Memory
- Visuospatial skills
- Executive Functions

- Visual hallucinations - typically well-formed; animals, small people
- Fluctuations in attention
- Parkinsonian features

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(Schoenberg & Scott, 2011; Parsons & Hammeke, 2014; Sattler et al., 2025)

Parkinson's Disease (PD)

Deficits or difficulty in:

- Attention
- Working Memory
- Executive Functions
- Processing Speed
- Visuospatial Skills
- Memory - learning and recall, with stronger recognition
- Parkinsonian symptoms - motor symptoms,

(Schoenberg & Scott, 2011; Parsons & Hammeke, 2014; Sattler et al., 2025)

Multiple Sclerosis (MS)

Deficits or difficulty in:

- Attention
- Working Memory
- Executive Functions
- Processing speed
- Visuospatial skills
- Other cognitive abilities depending on location of lesion

- Fatigue
- Vision, sensory and motor symptoms
- Symptoms can fluctuate
- Neuropsychiatric symptoms - mood, depression

(Schoenberg & Scott, 2011; Parsons & Hammeke, 2014)

Neurodegenerative Conditions

- Progressively decline over time, to varying degrees and with varying timelines

- Can have fluctuations within this

Normal Aging Changes

Difficulty with:

- Attention
- Working Memory
- Executive Functions
- Processing speed
- Visuospatial skills

- Verbal abilities remain more stable throughout the lifespan
- Age and education are the most significant predictors of changes throughout the lifespan; used to determine

(Lichtenberger & Kaufman, 2013;

When and How to Refer for Neuropsychological Evaluation

- Cognitive difficulties are present
- History of head injury
- Neurodegenerative condition - presence or absence of medical condition; family history of that medical condition or a dementia

- Discuss with Primary Care Physician (PCP) or other medical provider

- May see Neurology first, then they refer to Neuropsychology

Considerations and Strategies when Working with BI and Neurodegenerative Conditions

Brain Injuries

Considerations	Strategies
1. Overstimulation and fatigue	1. Minimize stimulation in the environment. Ask the individual about preferences re: lighting in the room. Reduce distractions and interruptions. Pace activity: 20-30 minutes of activity with 5-10 minute stimulus/rest breaks in between. Allow ample time.
1. Shorter attention span or scattered attention	2. Direct attention to the current task/activity. Present information and instructions 1 step at a time.

Brain Injuries

Considerations	Strategies
3. Limited working memory capacity	3. Simplify information, and deliver it in a clear and concise manner. Use short, brief chunks and statements.
4. Difficulty with learning information and retrieving information from memory	4. Reduce the amount of information to be remembered. Encourage use of learning strategies: repetition, chunking/grouping, association, context, meaning. Provide retrieval assistance: cues, prompts, reminders; emphasize recognition memory.
5.Slower responding and retrieval of words	5. Allow sufficient time to respond. Suggest words they may be searching for.

Brain Injuries

Considerations	Strategies
6. Difficulty with abstract and inferential reasoning	6. Provide information in more concrete and explicit terms rather than abstract or implicit.
7. Decreased initiation	7. Schedule all activities during the day on a calendar; Behavioral activation Set goals
8. “Sundowning” - more fatigue, cognitive problems, slowing, confusion, irritability later in the day	8. Do important tasks/activities and have important conversations earlier in the day.
9. Anosognosia - decreased awareness of and insight into changes and difficulties	9. Increase awareness of difficulties and challenges by drawing attention to them in the moment and discussing them and their impact. Identify and problem-solve.

Brain Injuries

Considerations

10. Emotional and behavioral changes - depression, anxiety, mood swings, irritability, apathy, withdrawn, dysregulated, traumatic stress response, grief, adjustment, role transition, identify, pseudobulbar affect, catastrophic reaction

Strategies

10. Offer support and validation of emotions. Reduce triggers for emotional reactions.

Encourage individual to seek additional support and treatment if needed.

For apathy - goal-setting, problem-solving, and behavioral activation.

(Schoenberg & Scott, 2011; Tay et al., 2021; Chan et al., 2024; Sattler et al., 2025)

Neurodegenerative Conditions

Alzheimer's Disease (AD)

Considerations

1. Rapid forgetting and poor storage of new and recent information, with amnesia for the information

Strategies

1. Provide information verbally and visually, and in written and picture/image format.

   Repeat information.

   Ask the individual to repeat/paraphrase information.

   Write down information, and use notes, lists, reminders and calendar.

   Provide recognition cues, prompts, and reminders to help with recall of information.

Alzheimer's Disease (AD)

Considerations	Strategies
2. Difficulty producing words, names of people, places and objects	2. Allow the individual some time to produce the word themselves, then offer the word they may be looking for.
3. Social skills and communication may be relatively intact, which may mask cognitive difficulties.	3. Do not assume information is retained
4. Sundowning	4. Do important and effortful tasks/activities earlier in the day. Provide orientation information as needed.
5. Varying degrees of awareness of cognitive difficulties and emotional distress related to this	5. Offer support re: difficulties and encourage use of strategies/compensations. Offer empathy and validate feelings.

Frontotemporal Dementia (FTD)

Considerations	Strategies
1. Behavioral dysregulation – inappropriate comments and behavior, impulsive behavior	1. Maintain a structured and safe environment. Formulate questions for yes/no responses, and as closed questions rather than open-ended questions, such as a question with 2 possible responses offered. Use checklists with steps and a timer to stay on task.
2. More withdrawn and quiet behavior, and speech and language difficulties	2. Attempt to engage the individual. Check with the individual about their understanding of the information. Communicate via writing or nonverbally, with pictures/images or communication board.

Lewy Body Dementia (LBD)

Considerations	Strategies
1. Hallucinations and delusions	1. If distressing, explain it may not be present or reality, and the brain may be producing it, and gently direct attention away from it. If not distressing or harmful, do not correct or counter it.
2. Fluctuations in attention	2. Allow sufficient time for tasks/activities and take a break while the individual is less attentive. Bring the individual's attention back to the present moment or activity.

Lewy Body Dementia (LBD)

Considerations	Strategies
3. Motor symptoms, falls	3. Encourage the individual to move slowly and intentionally, and use assistive devices. Use fall precautions and maintain a safe environment.

Parkinson's Disease (PD) and Multiple Sclerosis (MS)

Considerations	Strategies
1. Fatigue	1. Pace activity with rest breaks in between.
2. Slower motor and processing speed	2. Allow sufficient time. Present and complete 1 step/instruction at a time.

Normal Aging Changes

Considerations

1. They are normal, but can be distressing.

Strategies

1. Offer empathy and reassurance.Encourage use of compensatory strategies.

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Thank you!

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