ADVANCEMENTS IN UNDERSTANDING COGNITION IN PARKINSON'S DISEASE (PD)

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Living Well with Parkinson's Disease (PD)

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OVERVIEW

- Understanding cognition in PD
  - Cognitive decline in patients with PD
  - Prevalence
  - Cognitive domains affected
  - Diagnosis, treatment, and research
  - Support for patients and caregivers

PARKINSON'S DISEASE (PD)

- Chronic neurodegenerative disorder that primarily affects the motor nervous system, causing tremors, muscle stiffness, and difficulty moving.
- It can also affect cognitive function, including memory, thinking, and decision-making.
- This is caused by the loss of neurons that produce dopamine, a chemical that sends messages to an area of the brain controlling movement, coordination, and regulates a person's cognition and mood.

PREVALENCE OF PD

- **930,000 in the USA-** 1.2 million by 2030 (a 20% increase)
- **Men are 1.5** more likely to be diagnosed
- The incidence of PD increases with age
  - **60 years (average age at diagnosis)**
  - Four percent diagnosed before age 50

IMPACT OF PD ON DAILY LIFE

- Motor and non-motor symptoms can affect the ability to perform day-to-day activities.
  - Muscle rigidity, slowness of movement, and tremors can affect simple tasks such as dressing, cooking, or writing.
  - Non-motor symptoms: Symptoms that do not involve movement or "invisible" symptoms
    - Loss of sense of smell
    - Constipation
    - Sleep disorders
    - Daytime tiredness or sleepiness
    - Low blood pressure
    - Urinary urgency and frequency
    - Pain
    - **Cognitive changes**


WHAT IS COGNITION?

COGNITION

- Mental processes we use to acquire, process, store, and utilize information
  - Attention
  - Perception
  - Memory
  - Thinking
  - Problem-Solving
  - Reasoning
  - Language

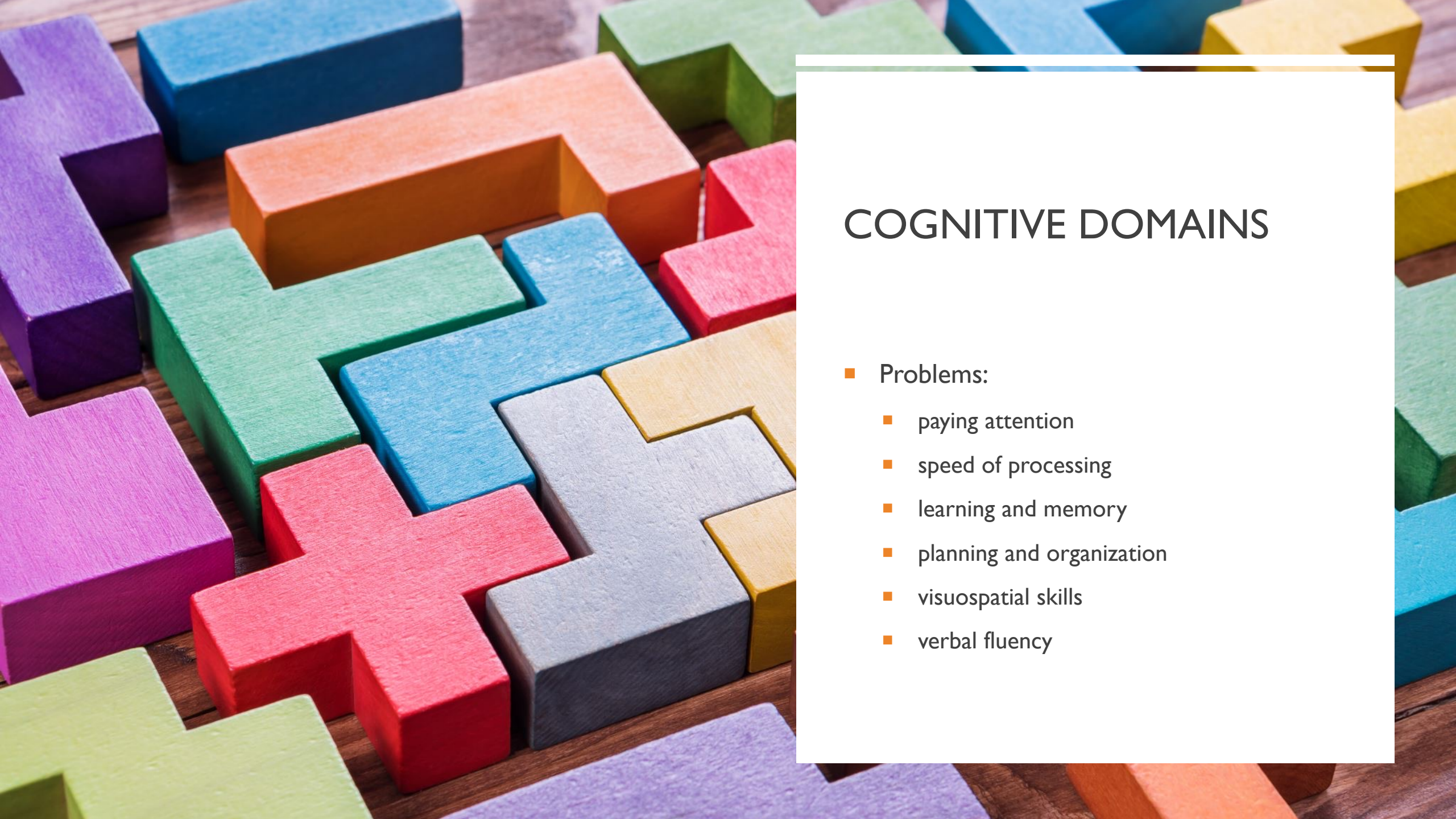
COGNITION AND PD

COGNITIVE CHANGES IN PD

- Many patients with PD exhibit good cognitive functioning.
- **Cognitive problems** may arise as PD progresses, representing **one of the most prevalent non-motor symptoms** in patients with PD.
  - 20% patients – Mild Cognitive Impairment
  - 30-40% patients- Progress to more advanced states such as **dementia (Major Neurocognitive Disorder)**
    - Risks

    1. Advanced age (70+)
    2. Hallucinations
    3. Cardiovascular disease
    4. Gait instability
    5. Limited access to medical care

WHAT ARE THE COGNITIVE DOMAINS AFFECTED IN PATIENTS WITH PD?



COGNITIVE DOMAINS

- Problems:
  - paying attention
  - speed of processing
  - learning and memory
  - planning and organization
  - visuospatial skills
  - verbal fluency

COGNITIVE DOMAINS AND CLINICAL FEATURES

- Executive Functioning
  - Planning- Trouble organizing
  - Cognitive Flexibility- Perseveration, difficulty switching tasks
  - Motor Inhibition- Driving errors
  - Cognitive Inhibition- Impulsivity, sexual disinhibition, obsessions
  - Working Memory- Forgetting reason for entering a room
  - Motor Sequencing- Difficulty using new tools
  - Timing- Misjudging time
  - Controlling Attention- Missing road signs
  - Initiation- Procrastination of tasks

COGNITIVE DOMAINS AND CLINICAL FEATURES

- Arousal- Fluctuations, delirium, daytime somnolence
- Visuospatial
  - Perceptual discrimination- Recognizing objects in the fridge; illusions, hallucinations
  - Face recognition/ discrimination- Confusion in social settings
  - Emotion recognition- Interpersonal difficulties
  - Spatial orientation- Getting lost
  - Visual construction- Trouble cooking or making minor repairs
  - Visual memory- Losing wallet, keys

COGNITIVE DOMAINS AND CLINICAL FEATURES

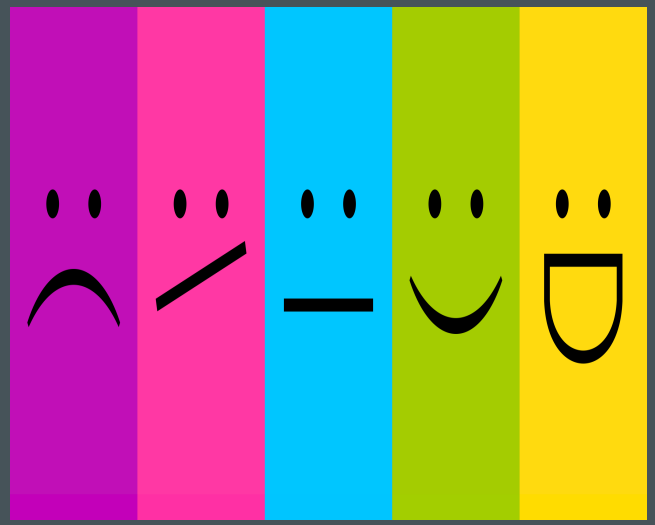
- Episodic memory- Forgetting conversations, recent events
- Language- Expressive or receptive difficulties (naming, understanding instructions)
- Deficits in these areas (memory and language) may indicate overlapping pathology.

WHAT IS THE CAUSE BEHIND COGNITIVE DECLINE IN PD?

WHY DO COGNITIVE CHANGES OCCUR?

- PD is associated with neurobiological changes in the brain that can affect cognition.
  - Degeneration of dopamine-producing neurons in the substantia nigra can contribute to changes in cognition.
  - PD can also affect other brain areas related to cognition: prefrontal cortex, amygdala, and hippocampus.
- Combination of factors: neurotransmitter dysregulation, neuroinflammation, protein aggregation (such as alpha-synuclein), and cerebrovascular disease.
- Comorbid conditions such as depression, anxiety, and sleep disturbances can exacerbate cognitive symptoms.

EMOTIONAL AND BEHAVIORAL CHANGES



PD can have a significant impact on the emotional health and well-being of patients.

- Depression- 50%
- Anxiety- 50-60%
  - Panic attacks
- Apathy- 40-60%
- Hallucinations
- Impulse control problems
- Evaluation should be done simultaneously with cognitive assessment.

NEUROPSYCHOLOGICAL ASSESSMENT

NEUROPSYCHOLOGICAL ASSESSMENT

To answer a referral question from the neurologist

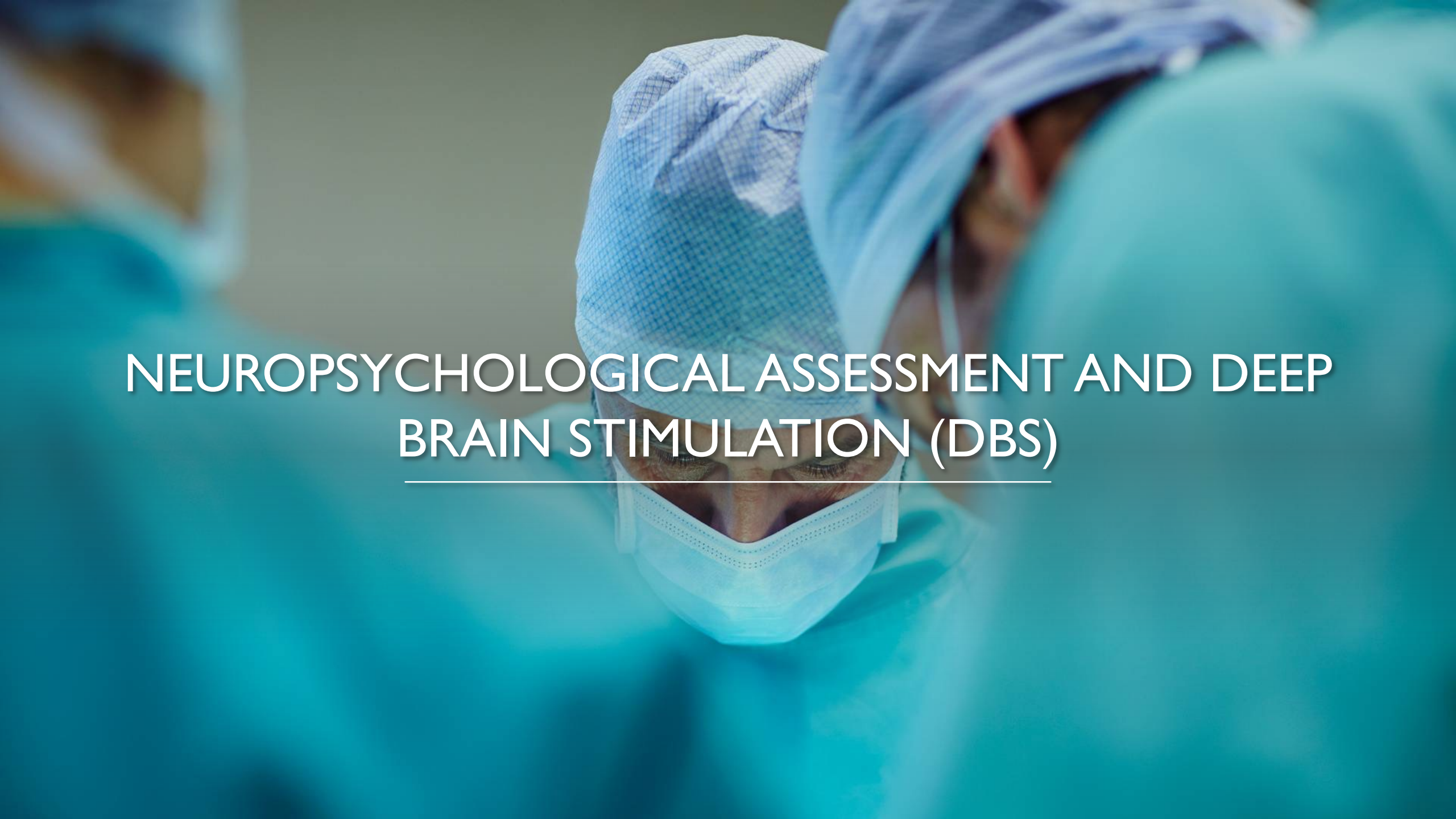
Confirm a diagnosis (Mild vs Major Neurocognitive Disorder)

Describe cognitive and emotional status

Establish or monitor treatment

NEUROPSYCHOLOGICAL ASSESSMENT

- **Comprehensive** assessment using well validated tests
  - Clinical interview
  - Cognitive and emotional status
  - Cognitive profile
- Normative data adjusted for age and education
  - Monitor cognitive changes over time
  - Areas of strengths and weaknesses
  - Functional changes
- Recommendations tailored for each patient
- Findings are integrated with neuroimaging and laboratory results



NEUROPSYCHOLOGICAL ASSESSMENT AND DEEP BRAIN STIMULATION (DBS)

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- DBS is a surgical intervention for management of motor symptoms and improvement of quality of life in patients.
  - Mixed research findings of its impact on cognition
  - Some studies have found stability or improvement after DBS, others have shown cognitive decline, particularly in older patients
- DBS candidates undergo comprehensive neuropsychological assessments
  - Identify cognitive, emotional, and behavioral factors
  - Assess level of family/social support
  - Delineate goals and expectations for surgery

DIAGNOSIS OF COGNITIVE IMPAIRMENTS

PD-MILD COGNITIVE IMPAIRMENT (MCI)

Mild Neurocognitive Disorder

- Prevalence- 20-27%
- Subtle cognitive decline that do not have significant impact on daily functioning
  - "non-amnestic, single domain" – most common profile
- Prodromal or transitional state that can be observed in early or newly diagnosed patients.
- It can increase the risk for developing dementia.

PD-MAJOR COGNITIVE IMPAIRMENT (DEMENTIA)

Major Neurocognitive Disorder

- Prevalence- 30-40% (eventually up to 80+%)
- It involves impairment in more than one cognitive domain, significant decline from premorbid levels, and impairments in daily functioning.
- Risks
  - MCI
  - Older age
  - Higher severity of motor symptoms
  - Gait dysfunction
  - Autonomic symptoms
  - Hallucinations
  - Limited cognitive reserve
- Late manifestation of the disease and poor response to treatment

TREATMENT TEAM

PD is a complex and multifactorial condition

Treatment should be comprehensive

- Neurologists
- Nurses
- Physical, occupational, and speech therapists
- Nutritionists
- Social workers
- Neuropsychologists

TREATMENT

- PD does not affect all individuals the same way.
- The severity and nature of cognitive symptoms can also change over time.
- Management of cognitive symptoms focuses on helping patient in maintaining cognitive function and quality of life.
  - Pharmacological interventions
  - Non-pharmacological interventions

TREATMENT

- Pharmacological interventions
  - FDA-approved treatments for AD that work on the cholinergic system in the brain (a neurochemical involved in attention and memory).
  - Donepezil (Aricept)
  - Rivastigmine (Exelon)- Only FDA-approved medication treat dementia in PD.
  - Galantamine (Razadyne)
  - Memantine (Namenda)
  - There is no FDA-approved medication for PD-MCI

TREATMENT

- Non-pharmacological interventions –
  - Cognitive rehabilitation
    - Physical therapy
      - Exercise
      - Nutrition

CURRENT RESEARCH

- Studies focused on the relationship between motor and non-motor symptoms, the underlying mechanisms of cognitive impairments, and therapeutic strategies

  1. **Pathophysiological mechanisms**
  2. **Biomarkers**
  3. **Neuroimaging studies**
  4. **Genetics**
  5. **Non-motor symptoms**
  6. **Interventions**
  7. **Precision medicine**

SUPPORT FOR PATIENTS AND THEIR FAMILIES

RECEIVING A DIAGNOSIS OF PD

- Every person diagnosed with PD is unique and has a specific journey.
- There is no universal description of the condition.
- Do not face the disease alone.
- Learn about the condition and its options.
- Consume valid and correct information.
- PD is a changing condition.
- Stay active and engaged.

COGNITIVE STRATEGIES

- Use an agenda, calendar, or electronic devices (e.g., cellphone, tablet)
- Implement effective organization strategies
- Simplify activities into small and manageable steps to make them easier to complete.
- Break down lengthy tasks into small steps
- Work on tasks for short periods of time (e.g., 15-20 minutes)
- Take breaks of 5 minutes between intervals. This way, you can maintain focus and avoid feeling overwhelmed.

LIVING WELL WITH PD

- **Exercise and daily activities**
  - Start or continue an exercise routine
  - Walking
  - Strength training or Tai Chi
  - Swimming, cycling, dancing, and non-contact boxing
  - Occupational therapy: writing, cooking, driving, bathing, dressing, grooming
  - Speech and language therapy: changes in voice volume and speech patterns; dysphagia
  - Good nutrition

LIVING WELL WITH PD

- **Social support**
  - Staying active in social interactions with family and friends is very important.
  - Consider joining a support group.
  - Receive practical and valuable information on living with PD.
  - Receive support from others with the condition.

CAREGIVER SUPPORT

- Education and information
- Access to resources
- Respite care
- Training and skills development
- Emotional support
- Financial and legal assistance
- Community resources
- Advocacy and empowerment

TAKEAWAY POINTS

- Cognitive impairment represents a significant challenge in PD.
- It can affect a substantial portion of patients and impact various cognitive domains.
- Accurate diagnosis and assessment rely on comprehensive evaluation.
- Management of cognitive impairment in PD involves a multifaceted approach addressing both pharmacological and non-pharmacological interventions.
- Therefore, it is important to stay informed about the latest advancements in research and treatment.

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THANK YOU!