# COGNITION & PARKINSON'S DISEASE

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# 01

# COGNITION

# WHAT IS COGNITION?

- **Cognition** is a general term that refers to the mental abilities that we use to process information and apply knowledge
- These mental processes allow us to perform daily functions such as paying **attention**, **solving problems**, **remembering** where items are, and how to do certain **tasks**

# NON-MOTOR PD SYMPTOMS

- Non-motor symptoms in Parkinson's Disease are common and affect:
  - *Cognition*
  - *Behavior*
  - *Sleep*
  - *Sensory functions*

# 02

# NEUROPSYCHOLOGY

# WHAT IS NEUROPSYCHOLOGY?

- Neuropsychology studies the relationship between the **brain** and **behavior**
- Neuropsychologists conduct **evaluations** to characterize **behavioral** and **cognitive** changes resulting from central nervous system disease or injury, like Parkinson's Disease or another neurological disorder

# WHAT IS A NEUROPSYCHOLOGICAL EVALUATION?

- A neuropsychological evaluation is an **assessment** of how one's **brain functions**, which indirectly provides information about the **structural** and **functional** integrity of the brain
- The evaluation involves an **interview** and the administration of **tests**
- The tests are typically pencil and paper type and question and answer tests. Some types might be computer- or iPad-based or self-report measures

# WHAT IS A NEUROPSYCHOLOGICAL EVALUATION?

- Neuropsychological tests are **standardized**, meaning that they are given in the same manner to all patients and scored in a similar manner time after time
- An individual's scores on tests are interpreted by **comparing** their score to that of healthy individuals of a similar demographic background (i.e., of similar age, education, gender, and/or ethnic background) and to expected **levels of functioning**
- In this way, a neuropsychologist can determine whether one's performance on any given task represents a **deficit**, **strength**, or **weakness**

# WHAT IS A NEUROPSYCHOLOGICAL EVALUATION?

- Although individual scores are important, the neuropsychologist looks at all of the data from the evaluation to determine a pattern of **cognitive strengths** and **weaknesses** and, in turn, to understand more about how the brain is functioning
- Neuropsychological tests evaluate functioning in multiple areas including: **intelligence, executive functioning, attention, memory, language, visuospatial skills, mood**, and **personality**

# WHAT IS A NEUROPSYCHOLOGICAL EVALUATION?

- A complete evaluation generally takes between **two** and **five hours** to complete, but it can take up to **eight hours**, depending on the complexity of the issues to be addressed by the evaluation and the patient's condition
- Occasionally, it is necessary to complete the evaluation **over two or more sessions**

# 03

# COGNITIVE DOMAINS

# COGNITIVE DOMAINS

- Attention and working memory
- Processing speed
- Language
- Visuospatial skills
- Learning and memory
- Executive functioning

# ATTENTION & WORKING MEMORY

- **Attention** is the ability to selectively **focus** on a particular aspect of one's environment, often while ignoring competing stimuli
- **Working memory** refers to the memory process of temporarily storing information in one's mind and manipulating it over a short period of time
    - *Mental arithmetic is one example of working memory function*
    - *Writing down or memorizing someone's phone number is another example*

# PROCESSING SPEED & LANGUAGE

- **Processing speed** is a way of describing how the brain receives, understands, and responds to information
- **Language** abilities include the following:
  - *Naming objects*
  - *Generating words*
  - *Comprehension*
  - *Expression*

# VISUOSPATIAL SKILLS

- **Visuospatial functions** tell us where things are around us in space, give us a spatial map of our environment, and involve our sense of direction
- These abilities allow us to **estimate distance** and **depth perception**, use mental imagery, copy drawings, or construct objects or shapes
- **Examples** include: being able to give someone directions to your house by tracing the route in your mind, avoiding obstacles in one's path, and putting together a puzzle

# MEMORY

- In general, memory involves being able to **learn** (encode) and **remember** (recall/retrieve) information
- Memory includes: **immediate memory** (seconds to minutes), **short-term memory** (minutes to days), and **long-term memory** (days to years)
- **Declarative memory**: Memory for facts, concepts, or events
- **Procedural memory**: Memory for how to do certain tasks like tie our shoes or ride a bicycle as well as working memory
- **Working memory**: Memory process of temporarily storing information in one's mind and manipulating it over a short period of time

# EXECUTIVE FUNCTIONING

- **Executive functioning** includes the ability to **plan**, **organize**, **initiate**, and **regulate** goal-directed behavior
- These activities may include multitasking, solving problems, starting new tasks, and switching tasks
- Think of the “CEO” of a company and the many tasks involved in directing the organization

# 04

# COGNITIVE IMPAIRMENT, DEMENTIA, AND PARKINSON'S DISEASE

# COGNITIVE IMPAIRMENT & PARKINSON'S DISEASE

- Cognitive impairment may include a disturbance of **memory**, **thinking**, and/or **language** abilities
- Cognitive impairment is a non-motor symptom that can be associated with PD
- Cognitive disturbances can arise at any time in the course of PD and **vary widely** in severity
- Some people **don't experience any problems** and others have **subtle** changes that are only detectable on formal testing
- Still others have issues they describe as **mild** or somewhat **annoying**, and some will go through more significant changes that interfere with the ability to perform daily activities

# WHY COGNITIVE CHANGES OCCUR

- The exact causes of cognitive impairment and dementia in PD are not fully known but are likely due to a combination of **chemical** and **structural** changes
- In addition to dopamine, PD affects a number of brain **chemicals** that support cognition, attention, and mood
- PD also causes **loss of and/or changes in cells** in areas of the brain that are responsible for these functions

# WHAT IS MILD COGNITIVE IMPAIRMENT?

- When cognitive problems are more than what is expected with normal aging, but not enough to significantly interfere with daily activities, they may be due to **mild cognitive impairment (MCI)**
- Those with MCI may complain of feeling **distracted** or **forgetful**, or **losing their train of thought** in conversations
- Individuals in fast-paced jobs might find it more challenging to **concentrate** or **manage** multiple projects

# MCI IN PARKINSON'S DISEASE

- Studies estimate that MCI occurs in about **20-50%** of patients with PD
- Mild cognitive changes may be present **at the time of PD diagnosis** or **early** in the course of PD
- Cognitive changes **may or may not be noticeable** to the person and may or may not affect work or activities, depending on the demands of specific tasks and work situations

# WHAT IS DEMENTIA?

- **Dementia** refers to a syndrome in which patients:
  - *Have problems in **more than one** cognitive domain*
  - *Represent a **decline** from previous levels of functioning*
  - *Have cognitive problems that are severe enough to significantly **impair** everyday life functioning (social, occupational, personal care, responsibilities)*

# PARKINSON'S DISEASE DEMENTIA

- The **core clinical features** of dementia associated with Parkinson's Disease (PDD) include:
    - *Cognitive, behavioral, and autonomic symptoms (such as sleep)*
- PDD patients have prominent impairments in **attention**, **executive**, and **visuospatial** functions, moderate impairments in **memory**, and **neuropsychiatric** symptoms including apathy and psychosis

# PARKINSON'S DISEASE DEMENTIA

- Studies following people with PD over the entire course of their illness estimate that **50-80%** of those with the disease may experience dementia
- Dementia in PD typically develops **many years after** the initial onset of PD and is more common with **advanced** disease
- Some studies have reported that the average time from onset of PD to developing dementia is about **10 years**

# DIAGNOSIS OF PDD AND DLB

- Guidelines for **diagnosing** Parkinson's Disease Dementia and Dementia with Lewy Bodies are as follows:
  - ***Parkinson's Disease Dementia:*** *When a person is originally diagnosed with PD based on symptoms related to movement and dementia symptoms do not appear until a year later or more*
  - ***Dementia with Lewy Bodies:*** *When dementia symptoms consistent with DLB either develop first; are present along with symptoms related to movement; or appear within one year after movement symptoms*

# RISK FACTORS ASSOCIATED WITH PDD

- **Advanced age**
- **Greater severity of motor symptoms**
- **Mild cognitive impairment**
- **The presence of hallucinations in a person who does not yet have other dementia symptoms**
- **Excessive daytime sleepiness**
- **Parkinson’s symptom pattern known as postural instability and gait disturbance, which includes freezing in mid-step, difficulty initiating movement, shuffling, and problems with balancing and falling**

# COGNITIVE FEATURES OF PDD

- **Attention:**
  - *Impairments in focus, sustained attention, and also fluctuations in attention*
- **Processing Speed:**
  - *Cognitive slowing*
- **Language:**
  - *The most common language problems in PD are finding the right words to say and understanding complex sentences*
  - *People with PD also tend to speak less overall, use simpler speech, and speak using a soft voice*

# COGNITIVE FEATURES OF PDD

- **Visuospatial Abilities:**
  - *Impairments in tasks requiring visuospatial orientation, perception, or construction*
- **Executive Functioning:**
  - *Impairments in planning, set shifting, abstract reasoning, and mental flexibility*

# COGNITIVE FEATURES OF PDD

- **Memory:**
  - *Memory is less impaired in PD compared to Alzheimer's Disease*
  - *Short-term memory and working memory are most commonly affected*
  - *Free recall may be impaired but may improve with cueing*
  - *Impairments in both visual and verbal memory*
  - *Long-term memory typically remains intact in PD*

# BEHAVIORAL FEATURES OF PDD

- **Apathy:** decreased spontaneity, loss of motivation, interest, and effortful behavior
- Changes in **personality** and **mood** including symptoms of depression and anxiety
- **Hallucinations:** mostly visual, usually complex formed visions of people, animals, or objects
- **Delusions:** usually paranoia
- Excessive **daytime sleepiness**

# 05

# TREATMENT

# TREATMENT - MEDICATION

- Current strategies focus on **improving symptoms**
- **Medication** can:
  - *Reduce visual hallucinations*
  - *Improve sleep disturbances*
  - *Slow changes in thinking*
  - *Improve mood symptoms related to depression and anxiety*

# TREATMENT - SURGERY

- **Deep Brain Stimulation (DBS)**:
  - *Delivers **electrical stimulation** to targeted areas in the brain that control movement*
  - *Invasive surgery where electrodes are placed in brain areas with an electrical wire and device that is usually placed in the upper chest*
  - ***Can help**: tremors, dyskinesia (movement issues), pain, sleep, urinary urgency, dystonia, and other conditions (epilepsy, obsessive-compulsive disorder)*
  - *See the **Mayo Clinic** for more information: https://www.mayoclinic.org/tests-procedures/deep-brain-stimulation/about/pac-20384562*
  - *Consult the following website for **clinical studies** on DBS: https://www.mayo.edu/research/clinical-trials/search-results?studySiteStatusesGrouped=Open/Status%20Unknown&pocId=PRC-20155103*

# NON-MEDICATION AND NON-SURGICAL TREATMENT

- The goals of these strategies are to help patients with **cognitive** tasks, **communication**, and daily **activities** as well as improve **quality of life** and address **safety** concerns
- **Cognitive Enhancement Strategies** (see handout for additional tips)**:**
  - *Pill reminders, alarm clocks, and timers*
  - *Step-by-step approaches to break down activities into simple steps*
  - *"To Do" checklists and daily planners to keep track of events and time*
  - *Cognitive Rehabilitation*
- Maintaining regular **routine** for daily activities
- **Exercise**
- **Social** contact/interaction

# COGNITIVE REHABILITATION

- **Cognitive Rehabilitation**
  - *"Physical therapy for your brain"*
  - *Skill building interventions individually tailored to target a patient's cognitive difficulties, such as memory, attention, executive functioning, visuospatial skills, organization, processing information, organization, planning, and activities of daily living*
  - *Useful for those with mild cognitive impairment and neurocognitive processes that have been damaged due to injury or illness (e.g., Parkinson's Disease, stroke, epilepsy, traumatic brain injury)*
  - *Interventions can include paper/pencil, creating and practicing strategies in vivo, and computerized/technology tasks*
  - *Offered at Brain Wellness Institute, UC Irvine, NeuroRestorative, UCLA, etc.*

# COGNITIVE REHABILITATION

- **UCLA Brain Boot Camp**
  - *An interactive, research-based training experience that provides participants with **tools** and lifestyle **tips** to keep their brains active and healthy*
  - ***Four big staples:** Brain Healthy Diet, Stress Management, Physical Exercise, and Memory Techniques*
  - *Designed for people with **mild memory concerns** or **mild cognitive impairment** who wish to **improve** or **maintain** their **memory** ability*
  - *Offered on an **individual** or **group** basis and tailored to accommodate individuals who have mild cognitive impairment*
  - ***Goals include:** Helping participants develop good memory habits to teach techniques to improve memory*

# COGNITIVE REHABILITATION

- **UCLA Brain Boot Camp includes the following:**
  - ***Didactics*** *on optimal brain health: Proper nutrition, stress management, exercise, memory training*
  - *Baseline* ***measurements*** *of memory, stress, and fitness level*
  - *Customized healthy lifestyle* ***programs***
  - ***Mentoring*** *of various techniques for learning and recalling names and faces*
  - *Improvement* ***tracking***
  - *Take home* ***strategies***, ***exercises***, *and* ***assignments*** *to continue improving memory on a daily basis*

# RESOURCES

- American Parkinson's Disease Association: www.apdaparkinson.org
- Parkinson's Foundation: www.parkinson.org
- Be Iconic with PD: www.beiconicwithpd.com
- Davis Phinney Foundation for Parkinson's (podcast): https://davisphinneyfoundation.org/the-parkinsons-podcast/
- Every Victory Counts Manual: https://davisphinneyfoundation.org/every-victory-counts-manual/
- Parkinson's Disease Blog: https://davisphinneyfoundation.org/every-victory-counts-manual/

# RESOURCES

- Parkinson's Disease Webinars: https://davisphinneyfoundation.org/webinars/
- More information on Parkinson's Disease and Cognition: https://www.parkinson.org/understanding-parkinsons/non-movement-symptoms/cognitive
- Q & A on Cognition and Parkinson's Disease: https://www.apdaparkinson.org/article/cognition-and-parkinsons-disease-qa/
- Additional Resources: https://davisphinneyfoundation.org/resources/?gclid=EAIaIQobChMI2YfYy8algQMVqkVyCh0McQLFEAAYASAAEgLzEfD_BwE

# THANK YOU!

Please feel free to email or call if you have any additional questions!

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