

Movement Disorders – Clinical Presentation and Rehabilitation Considerations

Goals and Objectives

Course Description

"Movement Disorders" is an online recorded video of a previously presented live CE webinar for physical therapists and physical therapist assistants that presents contemporary information about conditions associated with extrapyramidal dysfunction. Topics include ataxia and various dyskinesias, including Parkinson's disease and Huntington's disease. This course includes discussion of pathogenesis, clinical presentation, and therapeutic considerations for patients with these conditions.

Course Rationale

The purpose of this course is to provide participants with contemporary information about extrapyramidal movement disorders. Physical therapists and physical therapist assistants can use this foundational information to modify and implement rehabilitation programs specifically addressing the needs and limitations of individuals with affected by these conditions.

Course Goals and Objectives

Upon completion of this course, participants will be able to:

1. Define the classifications of movement disorders.
2. Distinguish movement patterns associated with extrapyramidal system dysfunction.
3. Identify the pathogenesis for specific movement disorders.
4. Recognize the clinical presentation of specific movement disorders.
5. Identify disease specific assessment tools.
6. Identify therapeutic considerations for patients with movement disorders.
7. Recognize the role of exercise in managing movement disorders.
8. Distinguish Parkinson's disease and parkinsonism conditions.
9. Identify cognitive and sensory cueing strategies to enhance motor planning.
10. Identify surgical procedures to manage Parkinson's disease.

Course Provider – Innovative Educational Services

Provider Contact Information – information@cheapceus.com

Course Instructor – Jodi Gootkin, PT, Med, CEAS

Financial/Non-financial Disclosure - Neither the Provider nor the Instructor have any financial or non-financial conflict of interest related to the presentation of this CE program.

Target Audience – Physical Therapists, Physical Therapist Assistants

Course Educational Level – This course is applicable for introductory learners.

Course Prerequisites – None

Instructional Method – Distance Learning – Independent; Asynchronous online video-based home study

Location - Cheapceus.com

Date – Continuously available on-demand

PD Activity Completion Requirements / Criteria for Issuance of CE Credits – Completion of viewing of 3 hour recorded video, and a score of 70% correct or greater on the course post-test.

Continuing Education Credits – Three (3) contact hours

Course Fee - \$34.95

Registration Information – No pre-registration required; available on-demand at Cheapceus.com.

Special Needs Requests – Email: information@cheapceus.com or phone: 954-663-4101

Cancellation by the Learner – Learners may cancel their participation at any time and receive a full refund of all paid fees.

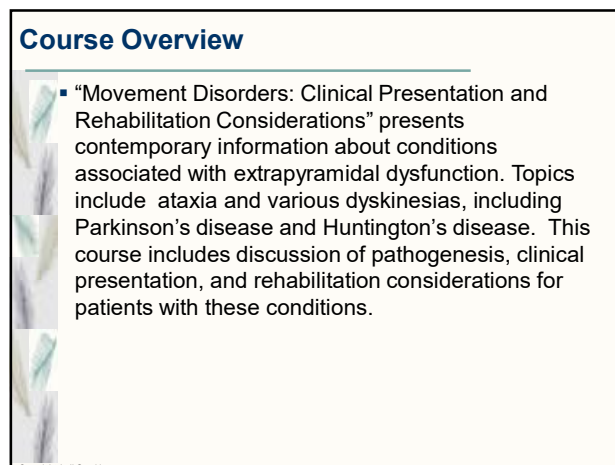
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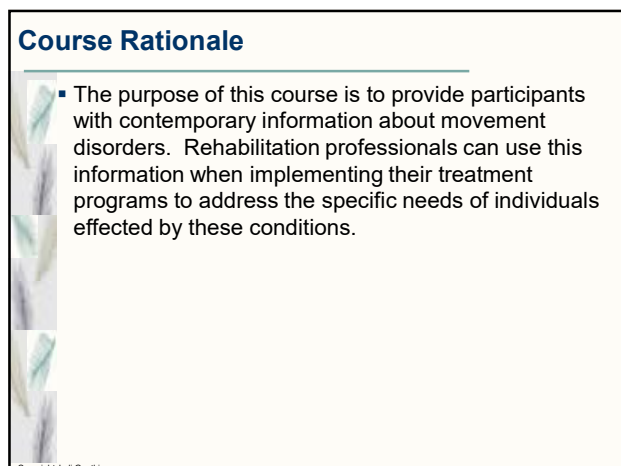
Refund Policy - Unrestricted 100% refund upon request. The request for a refund by the learner shall be honored in full without penalty or other consideration of any kind. The request for a refund may be made by the learner at any time without limitations before, during, or after course participation.



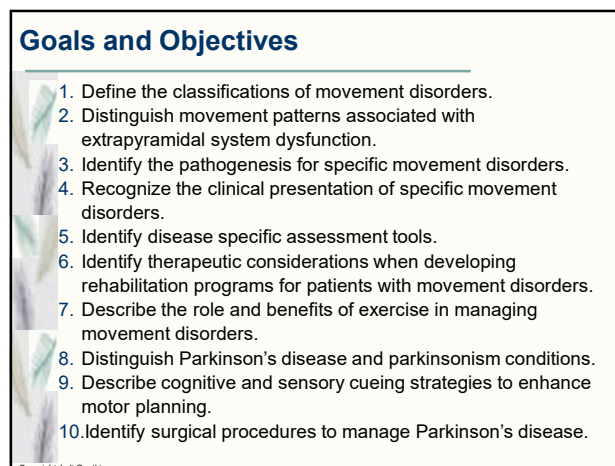
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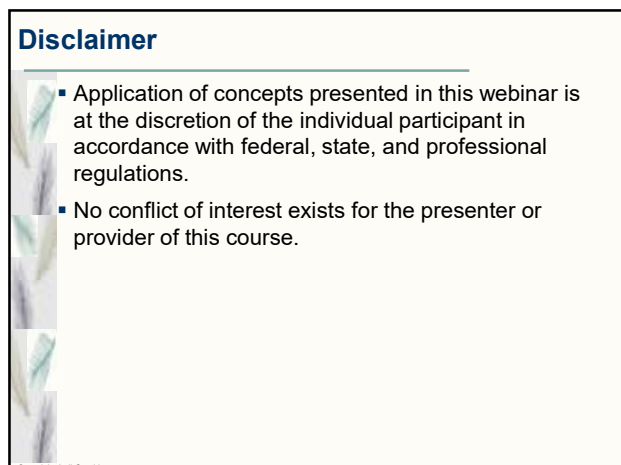
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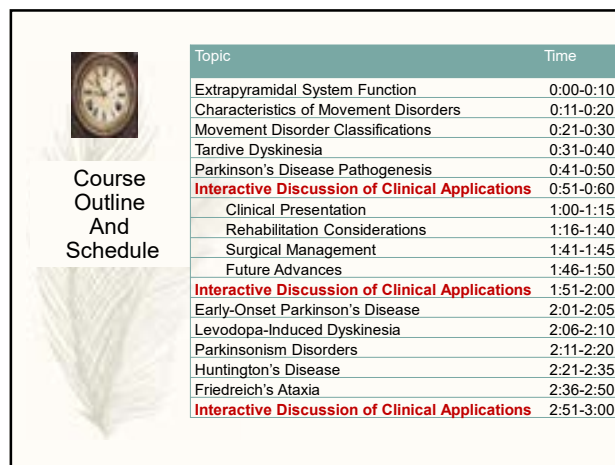
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How To Obtain CEUs For This Course

- Course review and summary for post test at the end of the webinar.
- After watching the video go to **cheapceus.com**
- Complete the post test with score of at least 70%
 - May be retaken multiple times
- Submit online payment for course
- Print certificate



7

Course Post Test

- Slides with "Consider This" icon in bottom right corner will be helpful in completing the post-test.



8

Control of Movement

- Movement is regulated through complex relationships in the pyramidal and extrapyramidal systems.
- The pyramidal system controls voluntary movement.
- The extrapyramidal system controls automatic movement.

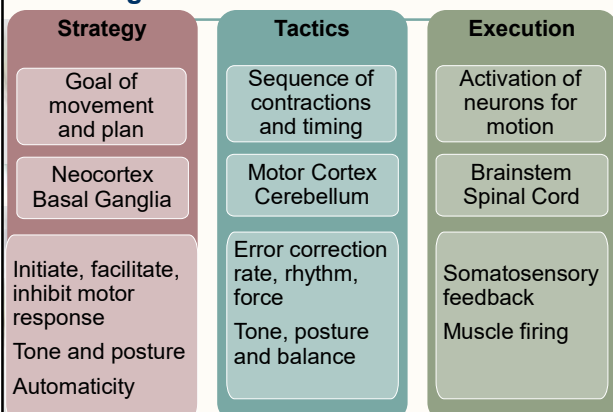
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Extrapyramidal System

- Composed of the basal ganglia, substantia nigra, thalamus and red nucleus with synaptic connections to the brainstem, cerebellum and pyramidal system.
- Regulates involuntary and automatic movements.

10

Executing Movement



11

Emerging Functions

- In addition to their role in motor function, contemporary research recognizes the role of the cerebellum and basal ganglia in cognition and emotion.
- Dysmetria of thought
- Emotion recognition
- Decision-making
- Working memory
- Spatial attention
- Reward- and error-based learning

Pierce, J. E., & Péron, J. (2020). The basal ganglia and the cerebellum in human emotion. *Social Cognitive and Affective Neuroscience*, 15(5), 599-613.

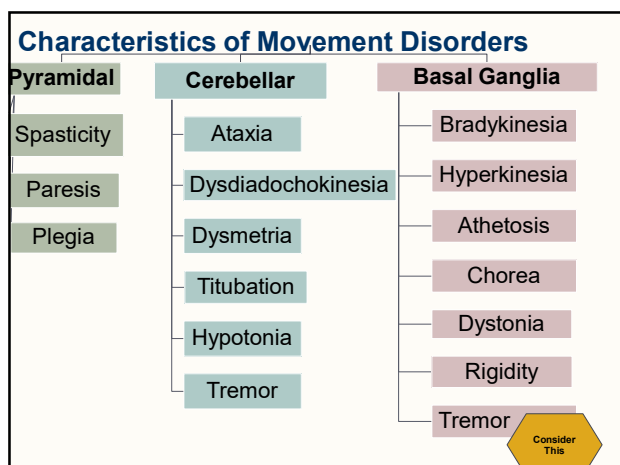
Habas, C. (2021). Functional Connectivity of the Cognitive Cerebellum. *Frontiers in Systems Neuroscience*, 15, 27. Mitoma, H., Manto, M., & Gandini, J. (2020). Recent advances in the treatment of cerebellar disorders. *Brain Sciences*, 10(11), 11.

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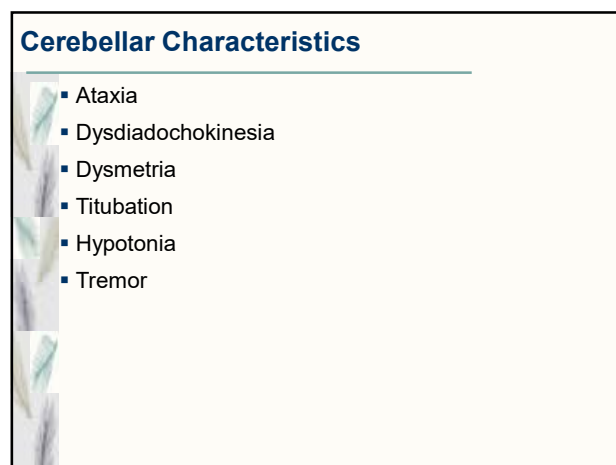
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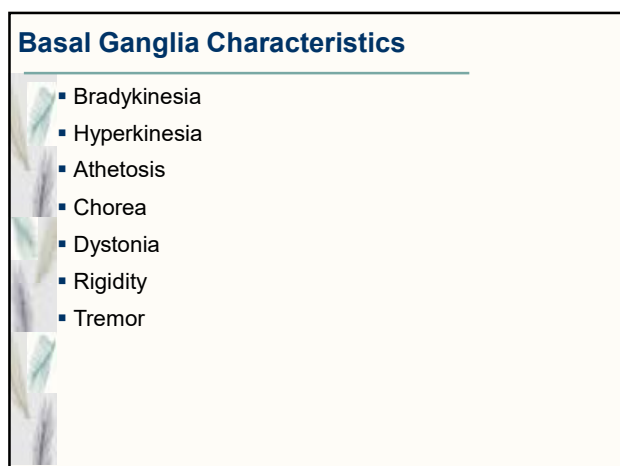
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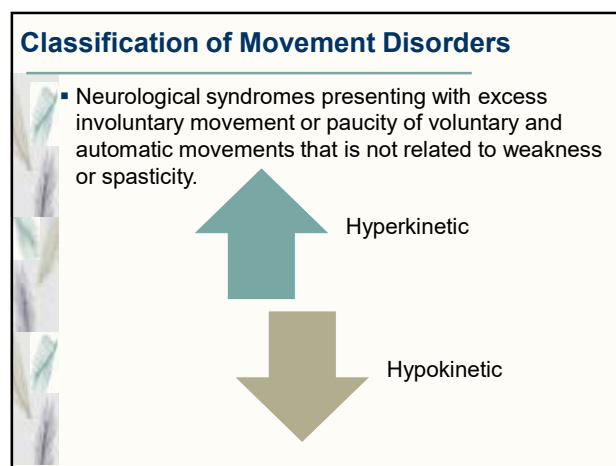
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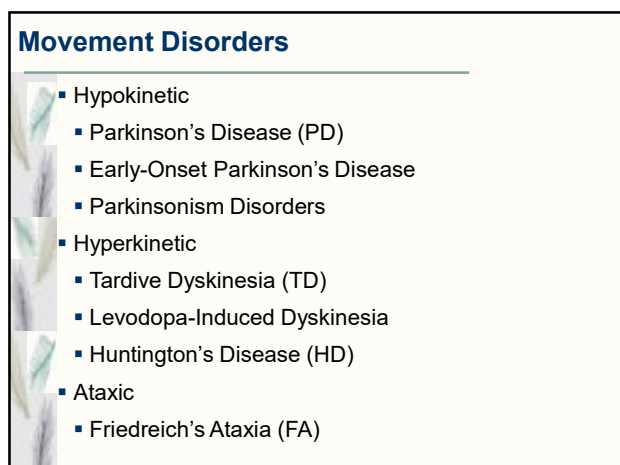
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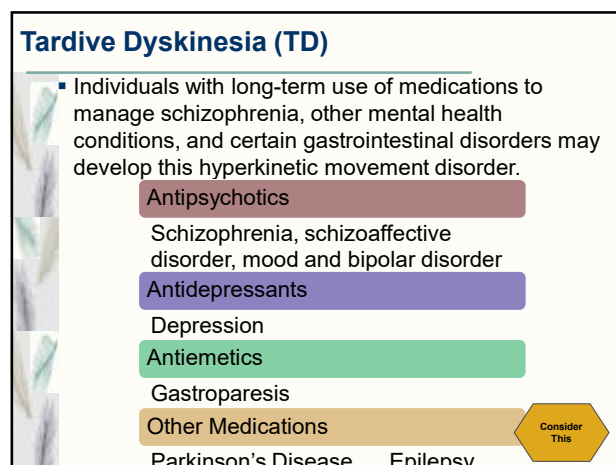
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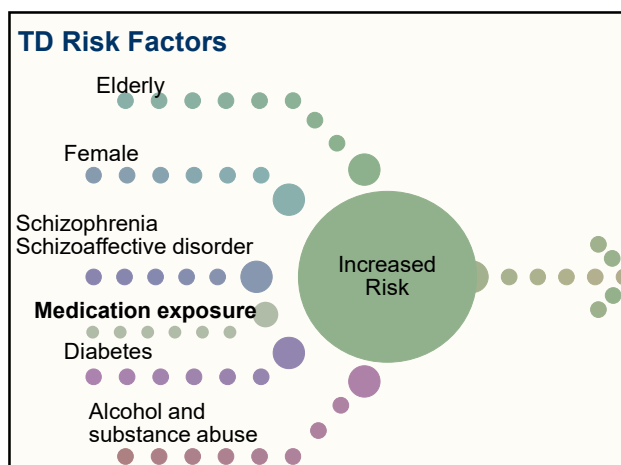


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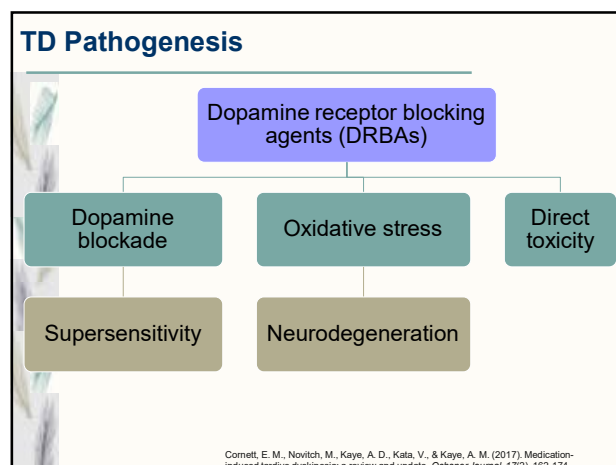
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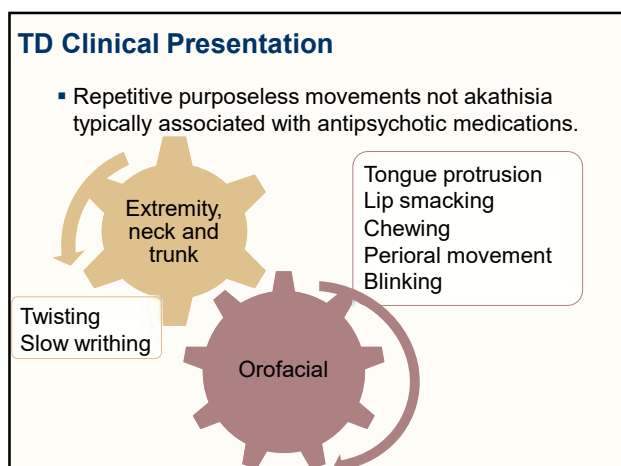
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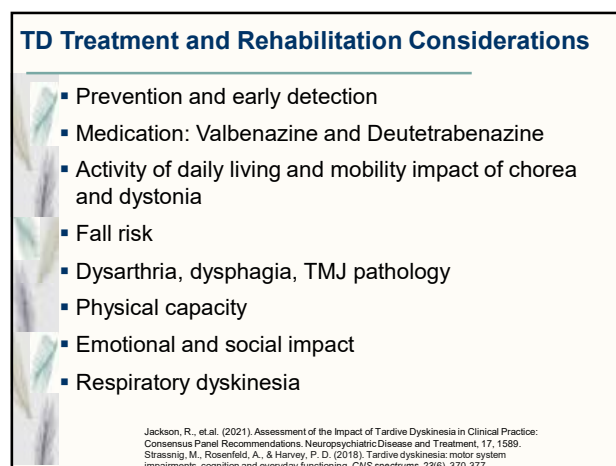
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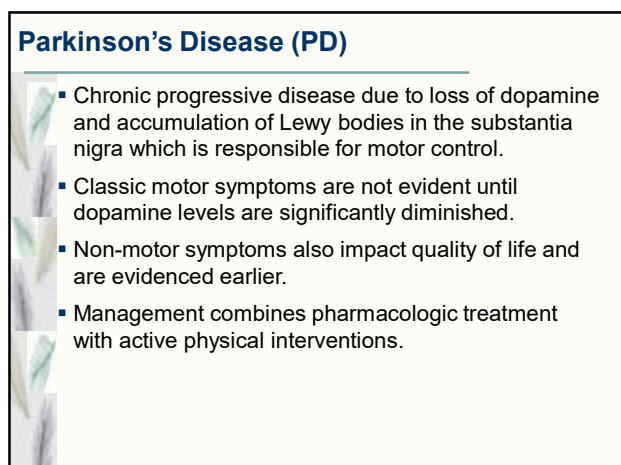
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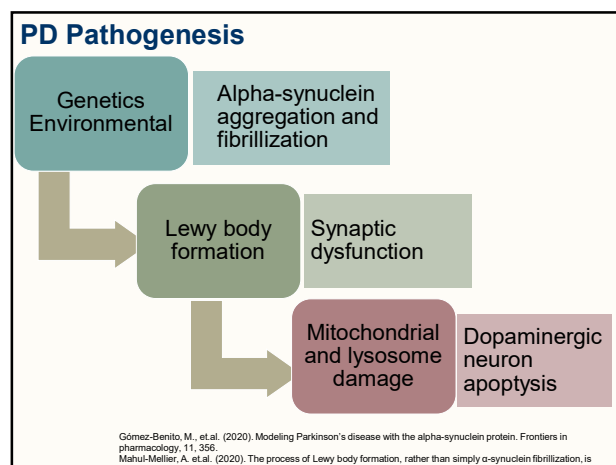
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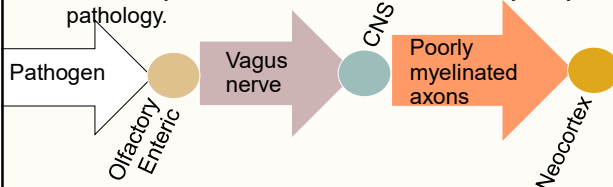
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Braak's Hypothesis

- Theory proposing the olfactory bulb and enteric nervous system are the initial location of Lewy body pathology.



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Braak, H., & Del Tredici, K. (2017). Neuropathological staging of brain pathology in sporadic Parkinson's disease: separating the wheat from the chaff. *Journal of Parkinson's disease*, 7(3), 571-585.

25

PD Clinical Presentation

- Bradykinesia - sialorrhea
- Hypokinesia – micrographia
- Rigidity
- Resting tremor
- Facial masking
- Festinating
- Freezing of gait (FOG)
- Hypophonia, dysarthria, dysphagia
- Non-motor features

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DaTscan

- Assists in distinguishing PD from essential tremor.
- Loss of nigrostriatal dopaminergic projections results in reduced uptake of radiotracer which is evident on SPECT scanning.

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PD Hoehn and Yahr Scale

- 1 Unilateral involvement only
- 1.5 Unilateral and axial involvement
- 2 Bilateral involvement without impairment of balance
- 2.5 Mild bilateral disease with recovery on pull test
- 3 Mild to moderate bilateral disease; some postural instability; physically independent
- 4 Severe disability; still able to walk or stand unassisted
- 5 Bedridden or wheelchair bound unless assisted

Consider This

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PD Non-motor Features

Gastrointestinal	Constipation
Sensory	Hyposmia, decreased kinesthetic awareness, pain
Cognition Behavior	Dementia, depression, reward signaling, memory, decision making
Sleep	Somnolence, insomnia, fatigue
Cardiovascular	Orthostatic hypotension, blunted exercise response
Vision	Contrast, color, emotional recognition, hallucinations
Urogenital	Urinary urgency, frequency, nocturia
Autonomic	Hyperhidrosis

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PD Assessment Tools

- Timed Up and Go (TUG) Cognitive and Motor
- Movement Disorders Society - Modified Unified Parkinson's Disease Rating Scale (MDS-UPDRS)
- Parkinson's Disease Questionnaire (PDQ-39)
- Montreal Cognitive Assessment (MoCA)
- Motor Assessment Technology

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Movement Disorders Society - Modified Unified Parkinson's Disease Rating Scale (MDS-UPDRS)

- Part I: Non-Motor Experiences of Daily Living
- Part II: Motor Experiences of Daily Living
- Part III: Motor Examination
- Part IV: Motor Complications
- Part V: Modified Hoehn and Yahr Staging
- Part VI: Modified Schwab and England Activities on Daily Living Scale

Consider This

31

Parkinson's Disease Questionnaire (PDQ-39)

- Assesses frequency of difficulties with activities of daily living.

Mobility

ADL

Emotional well-being

Stigma

Social support

Cognition

Communication

Bodily discomfort

32

Montreal Cognitive Assessment (MoCA)

- A rapid screening instrument for mild cognitive impairment.

Cognitive Domains

- Visuospatial/executive function
- Naming
- Memory
- Attention
- Language
- Abstraction
- Delayed recall
- Orientation

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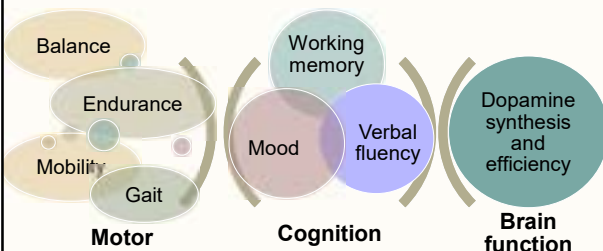
Motor Assessment Technology

- Wearable devices are emerging to assess activities of daily living performance and mobility outside the clinic.

Device	Outcome
APDM Mobility Lab	Correlated to UPDRS postural instability and gait disability
Physilog GaitUp	High gait accuracy and specificity detecting posture
Axivity AX3	Sensitive to asymmetry and gait variability

34

PD Exercise Benefits



35

PD Specific Interventions

- Aerobic conditioning – moderate to high intensity
- Resistance training – progressive
- Balance training – traditional, technology and aquatic
- Gait training – Body Weight Support Treadmill Training (BWSTT)
- Task-Specific training
- Community based training

Intervention	Outcome
Resistance training with and without instability	Instability group decreased TUG and UPDRS-III score, improved cognition and QoL scores.

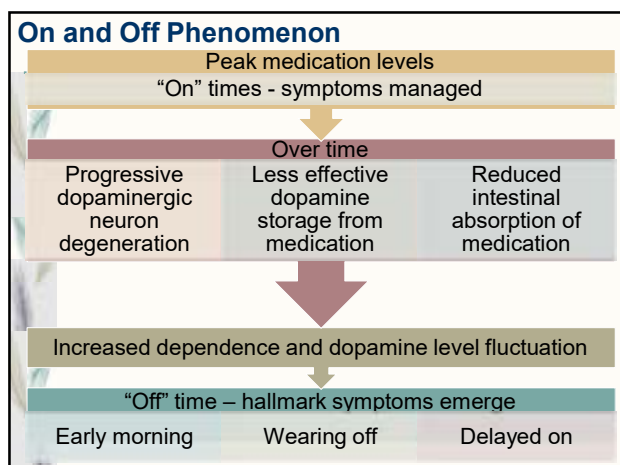
Silva-Ballegaard, C., et al. (2016). Resistance training with instability for patients with Parkinson's disease. *Med Sci Sports Exerc*, 48(9), 1678-1687.
Berra, E., et al. (2019). Body Weight Support Combined With Treadmill in the Rehabilitation of Parkinsonian Gait: A Review of Literature and New Data From a Controlled Study. *Frontiers in neurology*, 9, 1066.

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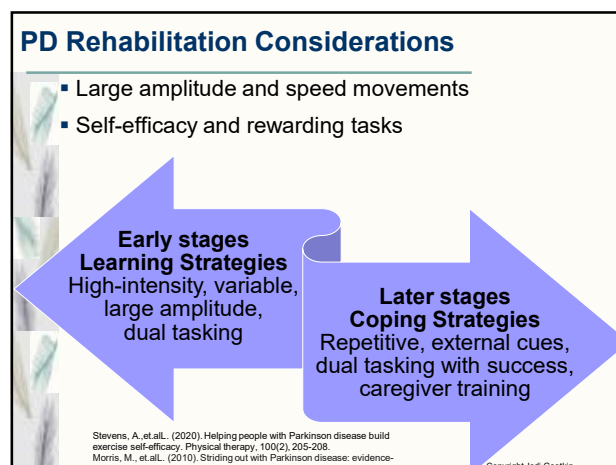
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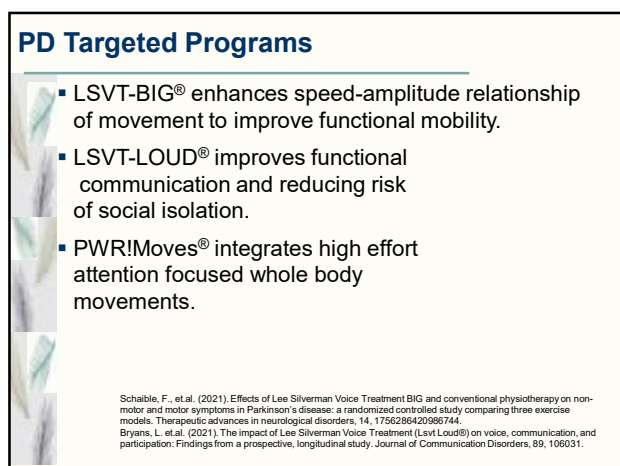
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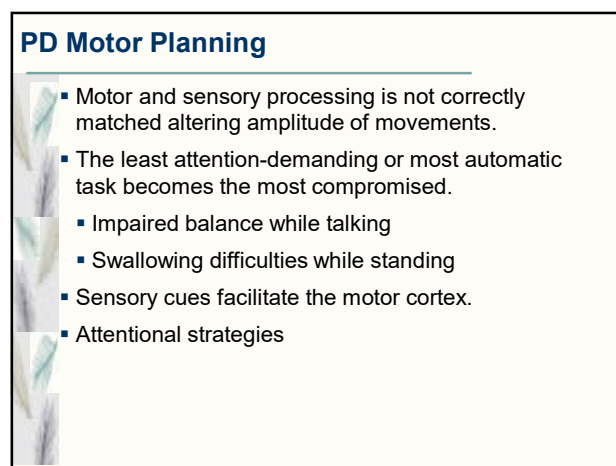
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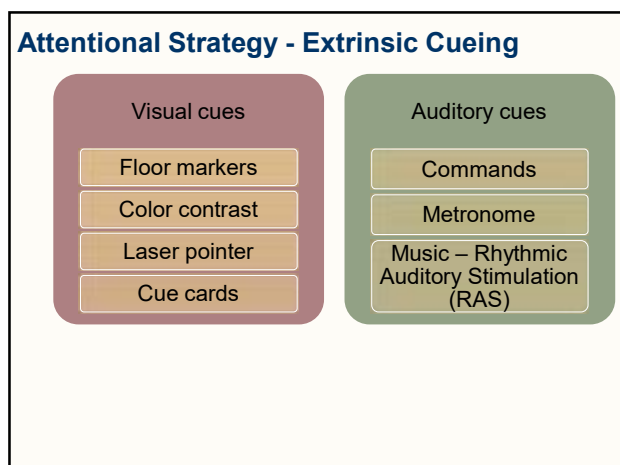
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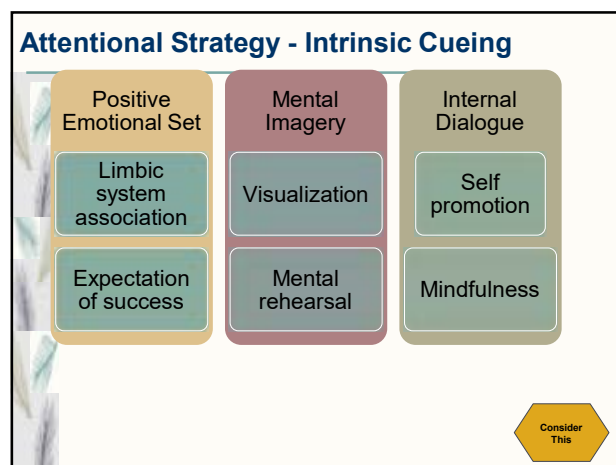
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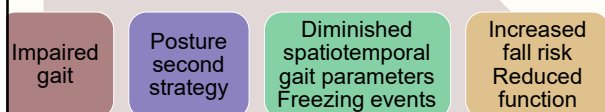
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Dual Task Performance

- Simultaneous performance of two tasks with distinct goals challenges cognitive resources influencing performance.
- Individuals with PD tend to adopt a "posture second" strategy contributing to risk of falls.



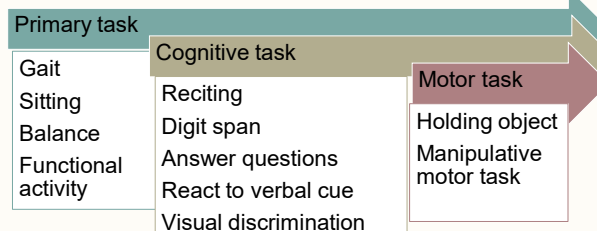
Bloem, B. et al. (2006). The "posture second" strategy: a review of wrong priorities in Parkinson's disease. *Journal of the neurological sciences*, 249(1-2), 196-204.
Strouwen, C., et al. (2015). Dual tasking in Parkinson's disease: should we train hazardous behavior? *Expert review of neurotherapeutics*, 15(9), 1031-1039.

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Dual Task Training

- Integrated or consecutive activities.
- Decreasing dual task requirements may facilitate performance of certain functional activities.



Geroi, C., et al. (2018). Does dual-task training improve spatiotemporal gait parameters in Parkinson's disease? *Parkinsonism & related disorders*, 55, 86-91.
Strouwen, C., et al. (2017). Training dual tasks together or apart in Parkinson's disease: results from the DUALITY trial. *Movement Disorders*, 32(8), 1201-1210.

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PD Freezing of Gait (FOG)

- Inability to progress forward despite the intention to walk.
- Occurs more frequently when initiating gait, during gait transitions, with increased anxiety and dual tasking.
- New Freezing of Gait Questionnaire (N-FOGQ)



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FOG Interventions

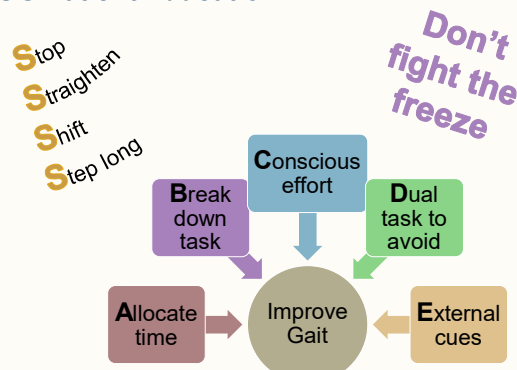
- Cueing: laser pointer, metronome, music
- Resistance training with instability: greater middle/inferior temporal gyrus activation and amplitude of anticipatory postural adjustments
- Equipment: Laser and sound cueing assistive devices, wearable on-demand cueing devices



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FOG Patient Education



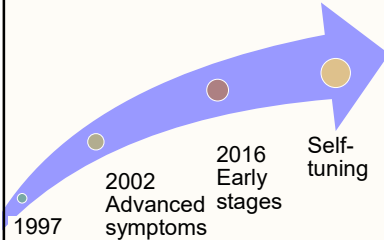
International Parkinson and movement Disorder Society. Gait disturbances and freezing in Parkinson's disease. <https://www.movementdisorders.org/MDS/Resources/Patient-Education/Gait-Disturbances-and-Freezing-in-Parkinsons-Disease.htm>

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Deep Brain Stimulation (DBS)

- Goal is to change firing pattern to reduce motor symptoms not slow progression of neurodegeneration or manage cognitive decline.
- Most individuals can reduce medication use.



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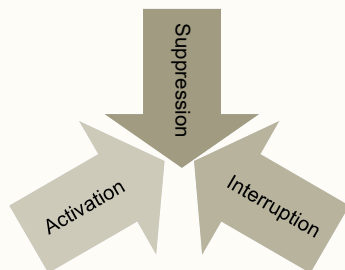
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DBS Mechanism of Action

- Subthalamic nucleus may provide more medication reduction.
- Globus Pallidus may be safer for language and cognition.



Muthuraman, M., et al. (2018). Deep brain stimulation and L-DOPA therapy: concepts of action and clinical applications in Parkinson's disease. *Frontiers in neurology*, 9, 711.

49

Levodopa-Carbidopa Intestinal Gel

- Intrajejunal administration through a percutaneous pump allowing constant plasma level of levodopa.

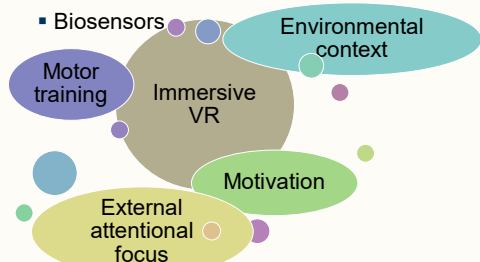
Intervention	Outcome
Intrajejunal vs. oral medications	Intrajejunal improved motor/non-motor symptoms, less dyskinesia and "on/off"

Popa, L., et al. (2020). Intrajejunal vs oral levodopa-carbidopa therapy in Parkinson disease: A retrospective cohort study. *Medicine*, 99(46).

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PD Future Technology

- 3D gait analysis correlation to MDS-UPDRS
- Virtual reality games
- Biosensors



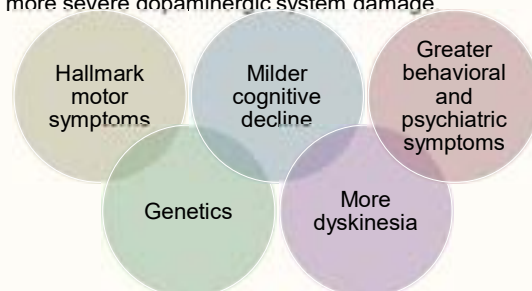
Lu, M., et al. (2020, October). Vision-based Estimation of MDS-UPDRS Gait Scores for Assessing Parkinson's Disease Motor Severity. In *International Conference on Medical Image Computing and Computer-Assisted Intervention* (pp. 637-647). Springer, Cham.

Finley, J., et al. (2021). Design and Development of a Virtual Reality-Based Mobility Training Game for People With Parkinson's Disease. *Frontiers in neurology*, 11, 577213.

51

Early Onset Parkinson's Disease (EOPD)

- Compared to later onset PD, slower disease progression and more severe dopaminergic system damage

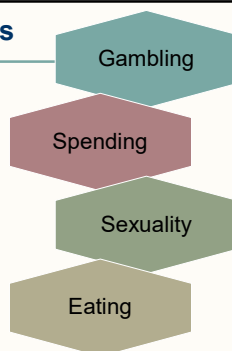


Yue, Y., Jiang, Y., Shen, T., Pu, J., Lai, H. Y., & Zhang, B. (2020). ALFF and ReHo Mapping Reveals Different Functional Patterns in Early- and Late-Onset Parkinson's Disease. *Frontiers in Neuroscience*, 14, 141.

52

Impulse Control Behaviors

- Individuals with EOPD may demonstrate greater challenges with impulse control compared to those with later onset PD
- Risk of development is increased with use of dopamine agonists.

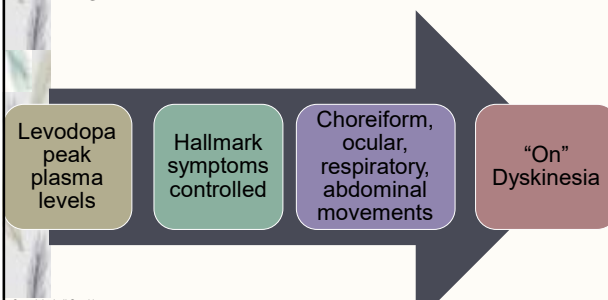


Vela, L., Castrillo, J. M., Ruiz, P. G., Gasca-Salas, C., Macias, Y. M., Fernández, E. P., ... & Mata, M. (2016). The high prevalence of impulse control behaviors in patients with early-onset Parkinson's disease: a cross-sectional multicenter study. *Journal of the Neurological Sciences*, 368, 150-154.

53

Levodopa Induced Dyskinesia (LID)

- Common side effect from long-term treatment with levodopa.
- NOT the same as "off" time.



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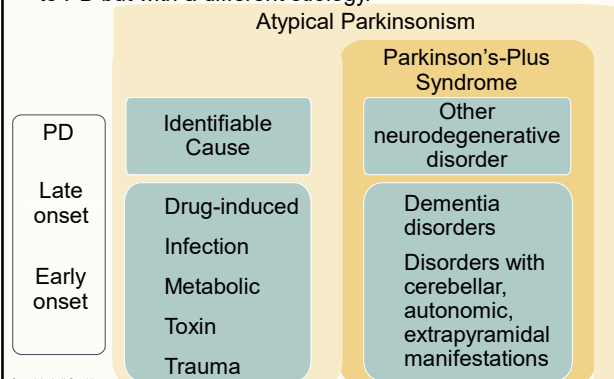
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Parkinsonism

- Conditions presenting with similar motor symptoms to PD but with a different etiology.



55

Atypical Parkinsonism – Identifiable Cause

- Drug Induced Parkinsonism (DIP)**
 - Certain neuroleptics, antiemetics, antihypertensives
 - NOT the same as Tardive Dyskinesia
- Trauma**
 - Repeated brain injury
- Metabolic disease**
 - Wilson's Disease
- Toxins**
 - Certain pesticides, manganese, MPTP

56

Atypical Parkinsonism Clinical Presentation

- Hallmark PD bradykinesia
- No tremor
- Symmetrical symptoms
- Lack of response to anti-Parkinson's medications
- Deep brain stimulation of no value

Consider This

57

Parkinson's-Plus Syndrome

- Atypical Parkinsonism presentation and other symptoms.

Dementia with Lewy Bodies (DLB)

Early cognitive difficulties and visual hallucinations

Multiple System Atrophy (MSA)

Rapid symptom progression, earlier postural changes, dysphagia and dysarthria, more severe autonomic changes

Progressive Supranuclear Palsy (PSP)

Impaired ocular motion, early balance deficits and falls, prominent facial folds

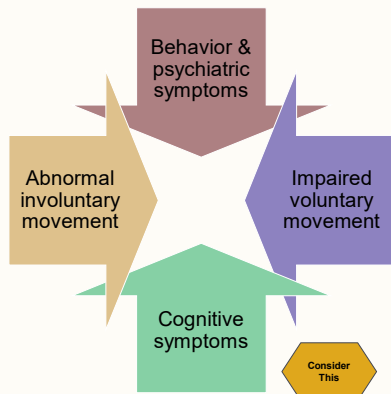
Corticobasal Ganglionic Degeneration (CBGD)

Asymmetrical dystonia, myoclonus, and apraxia

58

Huntington's Disease (HD)

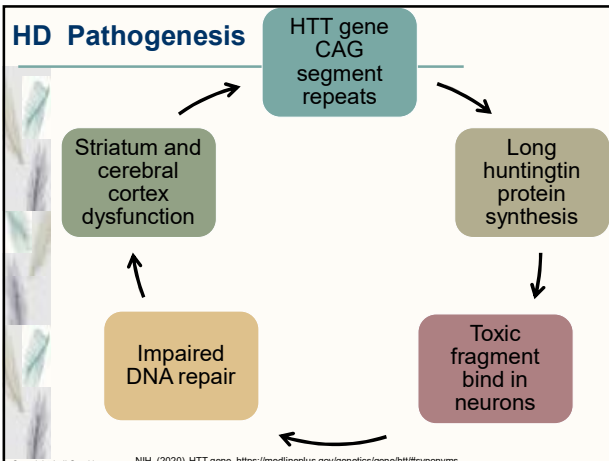
- Autosomal dominant neurodegenerative condition causing progressive neuron degeneration in the brain.
- Symptoms typically present in mid-life or for the rare juvenile form before age 20.



Consider This

59

HD Pathogenesis



60

HD Clinical Presentation

- Motor
 - Choreiform movements, incoordination, dysarthria, dysphagia, rigidity, bradykinesia
 - Juvenile – dystonia, tremors, myoclonus, rigidity
- Cognitive
 - Impaired attention and visuospatial functions, slowed processing speed, anosognosia, memory
 - Juvenile – impaired thinking and reasoning, seizures
- Behavioral and Psychiatric
 - Depression, anxiety, aggression, apathy, anger, fear, irritability
 - Juvenile – aggressive behavior

Stahl, C. M., & Feigin, A. (2020). Medical, Surgical, and Genetic Treatment of Huntington Disease. *Neurologic Clinics*, 38(2), 367-378.

61

HD Emotional Processing and Social Cognition

- Theory of Mind (ToM) is the ability to make inferences about other's emotions, beliefs, feelings and perspectives of others.
- Ability to interact effectively in social situations may be impaired due to
 - Compromised empathy ability
 - Difficulty discriminating social emotional stimuli out of context
 - Limited negative emotion recognition
- Makes it difficult to recognize socially appropriate behavior

Snowden, J. S. (2017). The neuropsychology of Huntington's disease. *Archives of Clinical Neuropsychology*, 32(7), 876-887.
Pick, E., Kleinbub, J. R., Mannarini, S., & Palmieri, A. (2019). Empathy in Neurodegenerative Diseases: A Systematic Review. *Neuropsychiatric disease and treatment*, 15, 3297-3304.

Consider This

62

HD Assessment Tool

Unified Huntington's Disease Rating Scale (UHDRSTM)

- 1 Motor high score
- 2 Cognitive high score
- 3 Behavioral high score
- 4 Independence Scale
- 5 Functional Assessment
- 6 Total Functional Capacity

Mestre, T., et al. (2018). Rating scales and performance-based measures for assessment of functional ability in Huntington's disease: critique and recommendations. *Movement disorders clinical practice*, 5(4), 361-372.

63

HD Clinical Course and Interventions

- | | |
|--------------|--|
| Late Stage | <ul style="list-style-type: none"> • Rigidity, bradykinesia, severe chorea, anarthria • Caregiver training, supportive equipment |
| Middle Stage | <ul style="list-style-type: none"> • Dystonia, chorea, weakness, dysarthria, dysphagia, thinking and memory impairment • Gait training, balance, fall management, ADLs, adaptive equipment, positioning, seating, respiratory training |
| Early Stage | <ul style="list-style-type: none"> • Chorea, bradykinesia, balance, depression • Aerobic exercise, strengthening, postural control, work restructuring, task specific training |

Quinn, L., et al. (2020). Clinical recommendations to guide physical therapy practice for Huntington disease. *Neurology*, 94(5), 217-228.
Fritz, N., et al. (2017). Physical Therapy and Exercise Interventions in Huntington's Disease: A Mixed Methods Systematic Review. *Journal of Huntington's disease*, 6(3), 217-235.

64

HD Rehabilitation Considerations

- Therapy and exercise participation can promote self-confidence and independence, socialization and relationships.
- Wheelchair evaluation, seating, mobility training
- Attentional strategies and sensory stimulation
- Dual-task training and chaining
- Challenges with motivation, mood, memory and socially appropriate behavior

Fritz, N., et al. (2017). Physical Therapy and Exercise Interventions in Huntington's Disease: A Mixed Methods Systematic Review. *Journal of Huntington's disease*, 6(3), 217-235.

65

Friedreich Ataxia (FRDA)

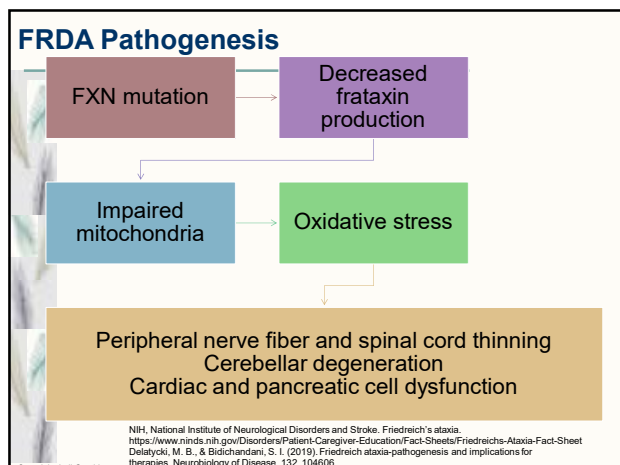
- Autosomal recessive disease causing progressive neurodegeneration and impaired muscle coordination.
- Begins in early childhood worsening with age and shortening life expectancy.

66

Movement Disorders: Clinical Presentation and Rehabilitation Considerations

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67

FRDA Clinical Presentation

- Ataxia
- Dysarthria, dysphagia, scanning speech
- Spasticity, weakness, sensory impairment, decreased reflexes, scoliosis, foot deformities
- Heart disease and diabetes
- Hearing and vision deficits

Consider This

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68

FRDA Assessment Tool

- Friedreich Ataxia Rating Scale (FARS)
- Functional staging of ataxia
- Activities of daily living
- Neurological examination
- Instrumental testing

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FRDA Rehabilitation Considerations

- Prolong independence, reduce falls, address fatigue
- Low-intensity and Frenkel's exercise
- Wheelchair prescription, orthotics, foot deformity surgery
- Vestibular, vision, and auditory testing
- School, work, home, and activities of daily living modifications, socialization, support system

Oleszek, J and Wyrwa, J. (2019) Friedreich's ataxia. *PM&R Now* <https://now.aspmr.org/friedreichs-ataxia/>
 Maudoux, A., et al. (2020). Vestibular impact of Friedreich ataxia in early onset patients. *Cerebellum & Ataxia*, 7, 1-12.

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70

Conclusion

- Reviewing contemporary research on disease pathogenesis, clinical presentation, and progression prepares the clinician to develop comprehensive rehabilitation programs to address the diverse needs of individuals with movement disorders.

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71

1. Which of the following is not a characteristic of cerebellar damage?

- Ataxia
- Dysmetria
- Dysdiadochokinesia
- Spasticity

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72

2. Long-term use of antipsychotic medications may lead to the development of what hyperkinetic movement disorder?

- A. Tardive dyskinesia
- B. Lewy body disease
- C. Friedreich's ataxia
- D. Medication induced chorea

73

3. An individual with Parkinson's disease who is physically independent, demonstrates postural instability and mild bilateral disease would be classified at what Hoehn and Yahr stage?

- A. Stage 5
- B. Stage 3
- C. Stage 2.5
- D. Stage 1

74

4. Which of the following is not part of the Movement Disorders Society Modified Unified Parkinson's Disease Rating Scale (MDS-UPDRS)?

- A. Motor complications
- B. Nutritional status
- C. Non-motor experiences of daily living
- D. Motor experiences of daily living

75

5. Which of the following is an example of an intrinsic cueing technique to reduce reliance on dysfunctional learned movement systems?

- A. Cue cards
- B. Metronome
- C. Emotional set
- D. Floor markers

76

6. What is the desired surgical outcome of a deep brain stimulator for an individual with Parkinson's disease?

- A. Eliminate need for medication
- B. Slow neurodegeneration
- C. Reverse cognitive decline
- D. Reduce motor symptoms

77

7. An individual presenting with bradykinesia, symmetrical symptoms, and lack of response to levodopa would be evaluated for what condition?

- A. Parkinson's disease
- B. Huntington's disease
- C. Atypical Parkinsonism
- D. Friedrich's ataxia

78

8. What neurodegenerative condition initially evidenced in midlife is characterized by involuntary dance-like movement patterns and impaired voluntary movement?

- A. Huntington's disease
- B. Early-onset Parkinson's disease
- C. Myoclonus dystonia
- D. Mixed mode dyskinesia disorder

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79

9. How does Theory of Mind (ToM) impairment affect individuals with neurodegenerative disease?

- A. More frequent hyperkinetic movements
- B. Difficulty recognizing socially appropriate behavior
- C. Slow motor planning
- D. Prolonged episodes of sleep disturbance

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80

10. Which of the following is NOT part of the clinical presentation for an individual with Friedreich's ataxia?

- A. Dysarthria
- B. Scanning speech
- C. Dysphasia
- D. Dysphagia

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81

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