Parkinson's Disease and Boxing Training

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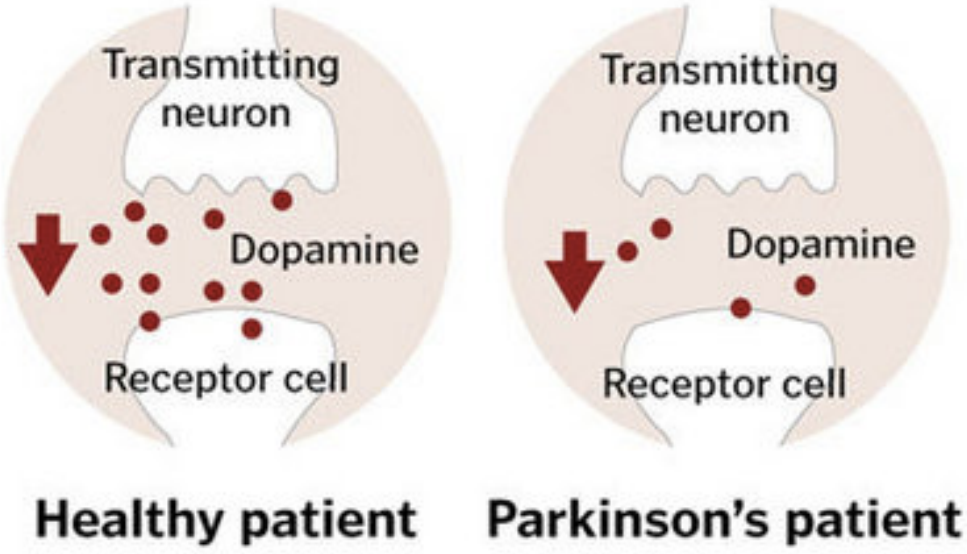
Capstone Project

Objectives

- Describe Parkinson's disease and the symptoms commonly seen following diagnosis.
- Discuss the effects these symptoms have on mobility and how they may present in a clinical setting.
- Summarize the evidence available regarding the use of boxing training to treat the symptoms of PD.
- Discuss the components of the training which are beneficial to patients.
- Review modifications that could be made to a program to allow for clinical use through reviewing the case of patient 'M.I.'

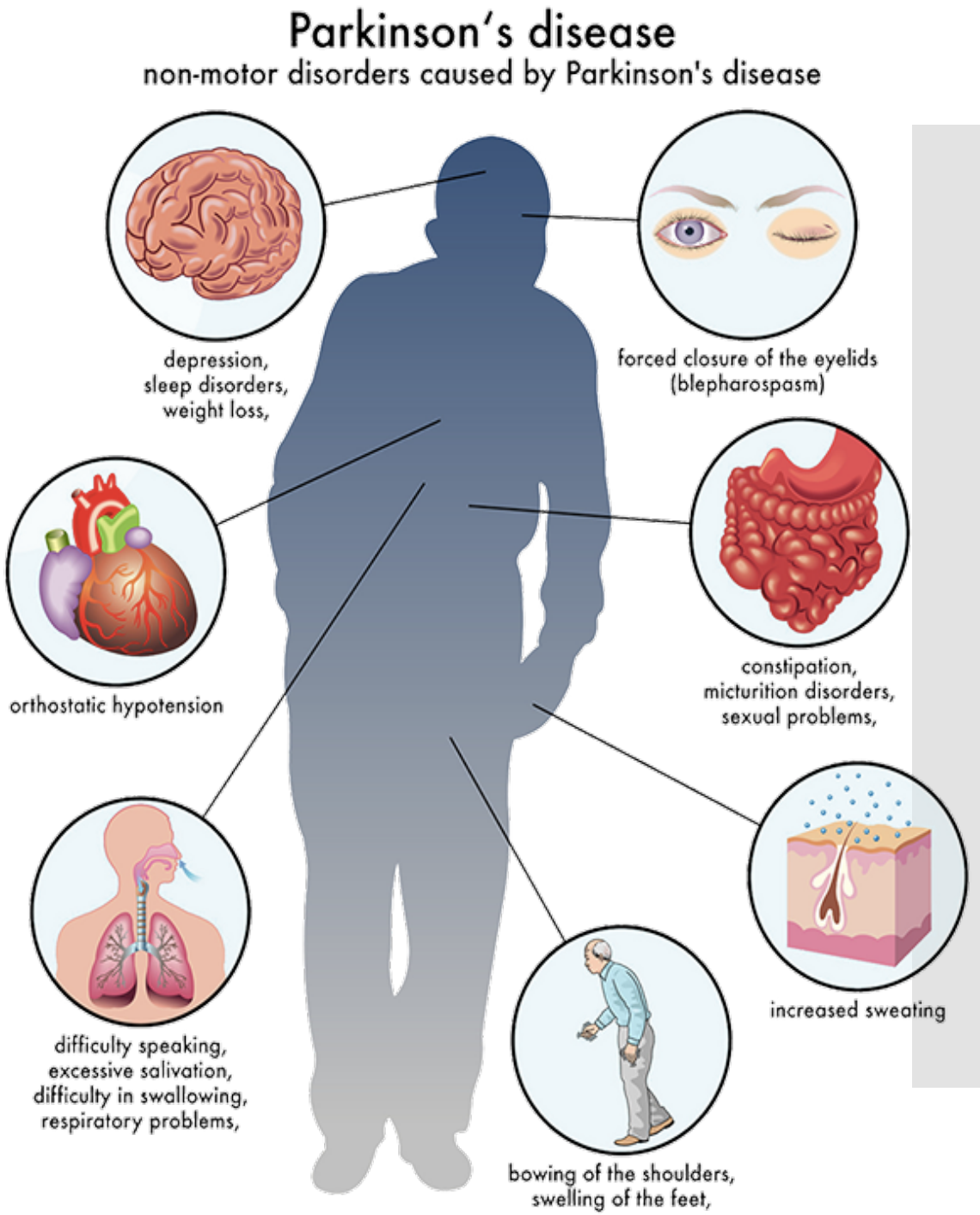
What is PD?[1-3]

- Chronic, progressive neurodegenerative disease
- Motor and non-motor characteristics
- Basal ganglia degeneration
- Mean onset age= 60; can start in 30s/40s
- 3:2 Males: Females
- Worldwide prevalence per 100,000: 425 ages 65-74; 1900 age > 80



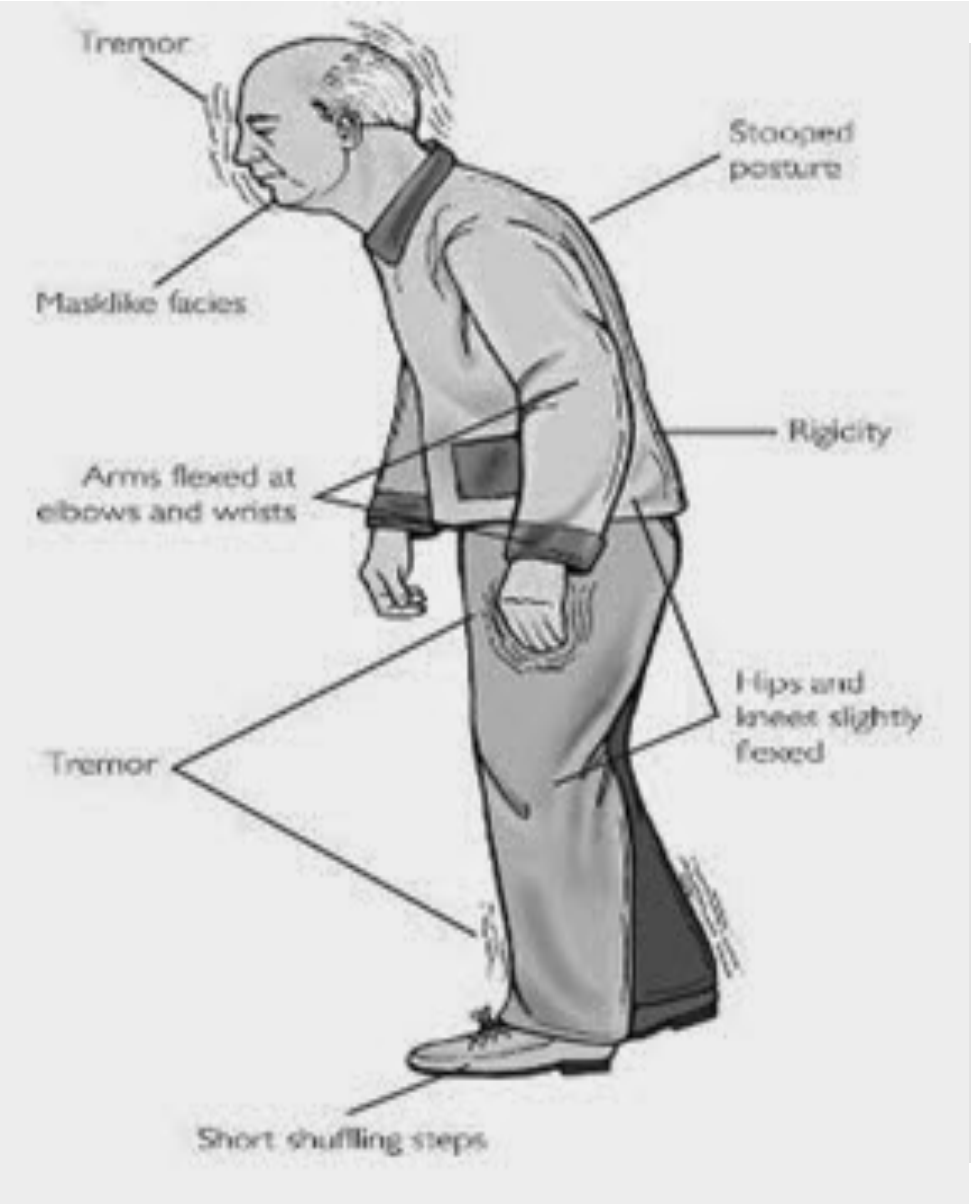
Non-motor features of PD[1,4]

- **Cognitive changes**
- **Decreased BP**

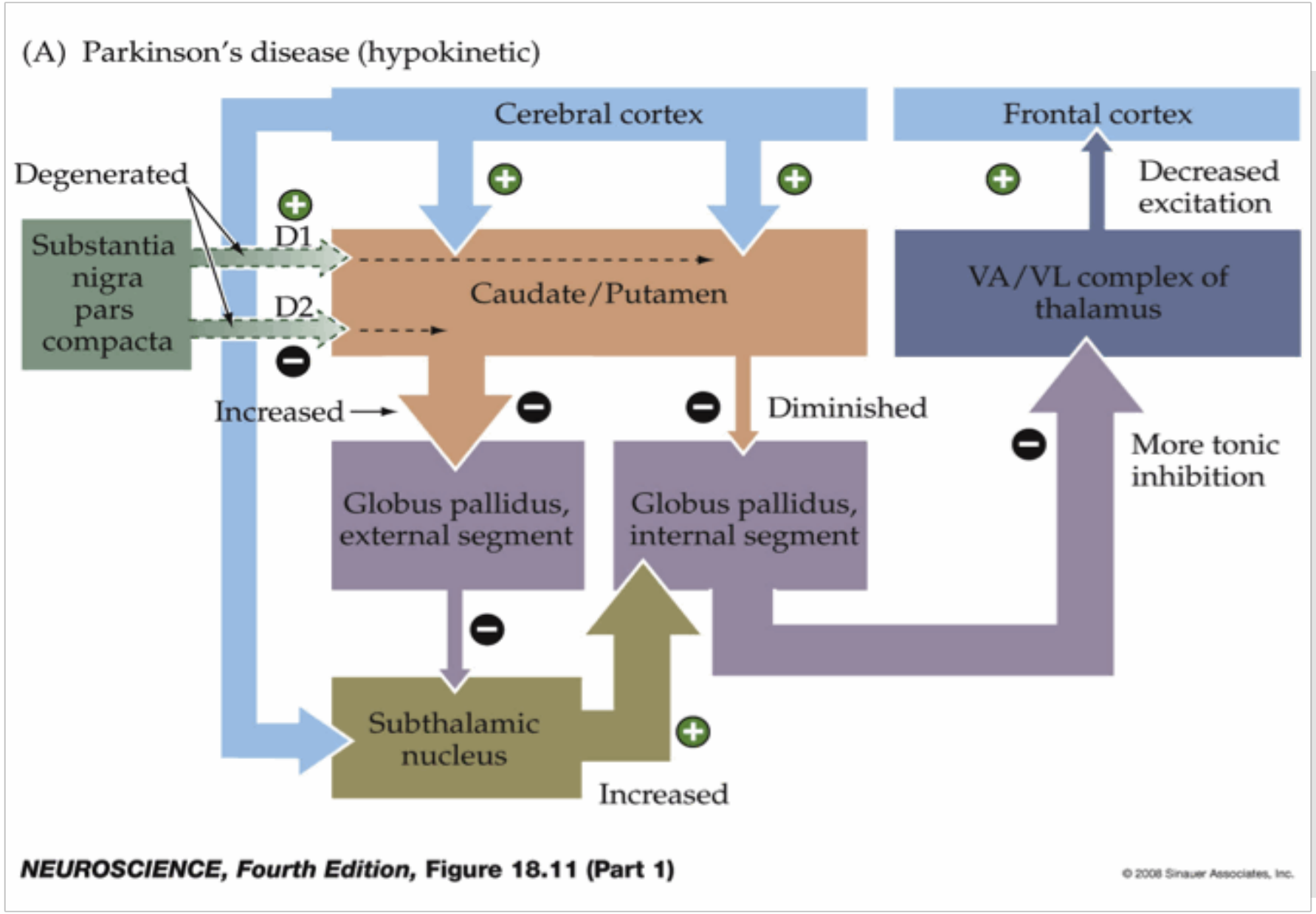


Motor Features of PD[1,2,5]

- **"Classical Triad"**
  - **Bradykinesia**
  - **Rigidity**
  - Resting Tremor* (most commonly seen first)
- **Postural Instability**



Basal Ganglia and PD[6]



Basal Ganglia[1,7]

- **Impaired motor function: balance and gait**
- **Speed of changing motor programs impaired** (Bradykinesia)
- **Decrease self-initiated gait and postural transitions** (Freezing/Rigidity)
- **Sequencing actions impaired**
- Inability to use proprioceptive information for coordination and kinesthesia

PD Constraints on Mobility [7]

- **Rigidity**
- **Bradykinesia**
- Freezing
- **Sequential incoordination**
- Impaired sensory integration
- **Reduced executive function and attention (cognition)**

Rigidity[8-9]

- Increased resistance to passive movement
- Flexed posture, decreased trunk rotation, decreased joint ROM during postural transitions and gait
- High tonic background activity especially flexors and co-contraction of axial mm during movement
- Lack of flexibility
- High axial tone (stiffness)
- Decreased ability to weight shift

Bradykinesia[1-2,8]

- Slowness of voluntary movement
- Slow/weak postural responses to perturbations and anticipatory postural adjustments
- Reduced voluntary and reactive limits of stability esp in backwards direction
- Decreased lateral postural stability
- Causes slowed rate of increase and decrease of muscle activation patterns, reduced strength

Program Selection/ Sequential Coordination[8,10]

- Difficulty with switching motor programs
- Difficulty sequencing motor actions
- Delay between anticipatory postural adjustments and voluntary movement

Executive Function and Attention [8,10-11]

- Dual Task
  - https://www.youtube.com/watch?v=oUpNZfkuQ6k
  - Addition of cognitive tasks increases postural sway and risk of falls
- Increased difficulty with decision making, reinforcing learning, attention, working memory
- Slowed reaction time and movement production

Nontraditional Training 12-16

- Traditional training
  - Treadmill training
- Non-traditional training
  - Tai chi
  - Dance
  - Boxing
  - Kayaking

LSVT BIG[17-18]

- Larger movements create faster movements
- Larger amplitude resulted in faster limb movements and decreased bradykinesia
- High amplitude movements at a high intensity and multiple repetitions.
- Address sequencing coordination and program selection
- Goal= restore normal movement amplitude through recalibration of individual's perception of movement execution

LSVT LOUD[19]

- Targets vocal loudness
- Helps cue individual and direct attention to activity
- Improve speech production
- Increase movement amplitude of rib cage and respiratory system

Agility Boot Camp and Mobility/ Balance [13]

- Investigated outcome measures sensitivity to exercise interventions and the effects of an Agility boot camp compared to a TT for improving mobility with PD.
- Agility Boot Camp= circuit training 10 minutes each:
  - Pre-Pilates
  - Kayaking
  - Tai chi
  - Boxing
  - Lunges
  - Agility
- TT= 30-45 minutes of fast walking; intensity beginning at 80% of participants natural gait speed and increased to 90% at week 2

ABC and Mobility/Balance (cont.)[13]

- Improvements seen in gait and turning (TUG) after either of the interventions implemented.
- Greater decrease in postural sway after ABC over TT.

Community Group Boxing Training [20]

- Boxing Training for Patients with Parkinson Disease: A Case Series
- Purpose: **"To describe the effects of disease severity and duration of boxing training on changes in balance, mobility, and QofL for patients with mild to moderate to severe PD."**
- N=6
- Participants attended **24-36 boxing sessions for 12 weeks; 90 minutes each**

Community Group Boxing Training (cont.)[20]

- Warm up= breathing and stretching (20 minutes)
- Circuit training= function, endurance, and punching activities (45-60 minutes; 3 minutes training, 1 minute rest)
- Cool down= stretching, strengthening, and breathing (15-20 minutes)
- Results=
  - **Balance improvements seen across all severities (FRT, Berg, ABC) with greater improvements seen with increased severity of PD**
  - **Greater gait improvements seen with mild PD (TUG, 6MWT); yet improvements seen across severities.**
  - **Improvements in balance, mobility, endurance, and QofL were seen immediately and in long term after boxing training with individuals with PD.**

Boxing Training vs. Traditional Exercise [12]

- Compared boxing training to traditional exercise on function and QofL for PD after 12 week intervention
- Traditional exercise group= greater balance confidence (ABC)
- Boxing group exercise= increased walking distance and velocity (6MWT)
- High drop out rate
- Traditional group more familiar with activities being tested during balance tests
- Improved endurance with boxing group possibly secondary to intensity of intervention

Intervention Setting[21]

- Best setting to implement agility exercise program for the population with PD
- **Individual setting**:
  - only group to improve in Physical Performance Test outcome measure
  - greatest improvements in functional measures
- **Group setting**:
  - Improvements seen in gait measures
- **Home setting**:
  - Typically considered the standard of care and least improvements in mobility seen overall in this setting

Characteristics of Boxing Training related to PD Tx[8,17,19,22]

- Amplitude
- Dual Task
- Movements

Movements[8]

- Jab
  - short, straight punch from shoulder
- Cross
  - power punch; trunk rotation; arm crosses midline
- Hook
  - short lateral punch; trunk rotation; elbow bent and wrist in inward position

Video of Movements[23]

- https://www.youtube.com/watch?v=onT82XjeFiQ

Progressions[8]

- Reduce BOS
- Challenge LOS
- Increase amplitude/speed
- Add cognitive dual tasks

‘M.I.’ in the Clinic: Initial Movements

‘M.I.’ in the Clinic: Crossing Midline

‘M.I.’ in the Clinic: Combination Directions

‘M.I.’ in the Clinic: Combos, Crossing Midline, and Dual Task

Rock Steady Boxing[24]

- https://www.youtube.com/watch?v=EfDHGbuvqiw&t=47s

Questions???


TITLE


ROCK STEADY BOXING
FIGHTING BACK
AGAINST PARKINSON'S

Resources

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