

BOXING TRAINING AND PARKINSON'S DISEASE

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WHAT IS PARKINSONS DISEASE?^{1,2}

- Chronic progressive neurological disorder causing degeneration of the Basal Ganglia
- Degeneration of Basal Ganglia → decreased dopamine production
- Signs and symptoms of PD become apparent once 80% depletion of dopamine occurs
- Motor and non-motor impairments present that influence mobility

SIGNS AND SYMPTOMS OF PD^{1-4,}

• NONMOTOR CHARACTERISTICS

- Sleep disorder
- Depression/anxiety
- Cognitive changes
- constipation

• MOTOR CHARACTERISTICS: 'TRAP'

- Tremor at rest
- Rigidity= increased resistance to passive movement
- Akinesia (Bradykinesia)= no/slowness of voluntary movements
- Postural instability

COMMON SYMPTOMS OF PD INFLUENCE ON MOBILITY^{4,5}

• Rigidity

- Increased agonist/antagonist co-contractions
- High axial tone; decreased trunk rotation
- Flexed posture
- Decreased weight shift

• Bradykinesia

- Slow/ weak postural responses to perturbations and anticipatory postural adjustments
- Decreased reaction to limits of stability; especially in backwards and lateral direction
- Weak push-off, decreased swing limb knee flexion, decreased stride length, decreased arm swing

• Sequential incoordination

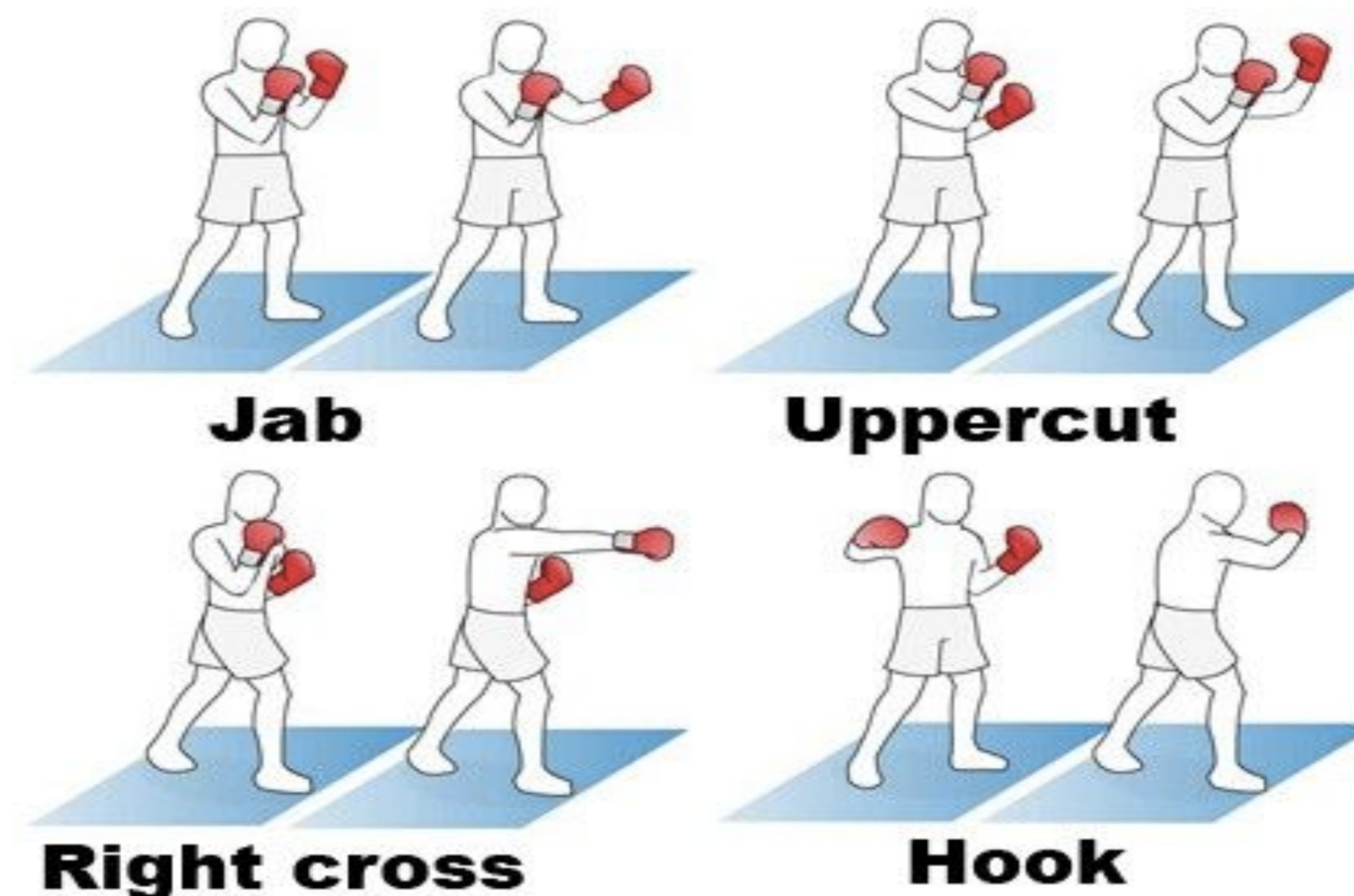
- Delay between anticipatory postural adjustments and voluntary movement
- Difficulty sequencing motor actions
- Difficulty switching motor programs

• Reduced executive function and attention (cognition)

- Slowed reaction time and movement production
- Decreased attention and working memory to select appropriate reactions

WHAT IS BOXING TRAINING?⁵⁻⁸

- Nontraditional agility exercise training requiring upper and lower extremity movements and coordination
- High amplitude of movements
- Dual Task
- Various movements:
 - **Jab**= short, straight punch from shoulder
 - **Cross**= power punch, trunk rotation, cross midline
 - **Hook**= short lateral punch, trunk rotation



PROGRESSIONS OF BOXING TRAINING^{5,9}

- Reduce the participants base of support
- Challenge the level of stability: forward/backward walking; turns
- Increase the amplitude/speed of movements
- Addition of cognitive dual tasks

BOXING TRAINING INFLUENCE ON COMMON SYMPTOMS⁴⁻⁸

• Rigidity

- Rhythmic and reciprocal movements
- Increased trunk rotation with punches crossing midline
- Erect posture

• Bradykinesia

- Fast and large steps and punches
- Increase amplitude of movements → increased speed of movements

• Sequential incoordination

- Strategies to plan task in advance
- Challenge through quick changes in strategies required to complete task

• Reduced executive function and attention

- Address gait and balance impairments while focusing on boxing training
- Dual task through recall of combinations and vocalizing recalled combinations while performing



OUTCOME MEASURES TO USE?⁷⁻⁸

• Berg Balance Scale (BBS)

- BBS were maintained or continued to improve for all participants in a 12-week boxing program at the end of the intervention, 24-week follow up, and 36-week follow up (all but one). Those with moderate-severe PD reached the MDC of 5 point improvement by 36-week testing. Indicating improvements in balance through the intervention and continuous carryover for improved balance after the intervention subsided.

• Activities-Specific Balance Confidence Scale (ABC)

- The majority of the patients maintained or improved their ABC scores at 24 and 36 week testing. Those with moderate to severe PD consistently improved ABC scores throughout the intervention and follow-up. Note that those with mild PD showed less significant changes in balance confidence compared to those with moderate to severe PD.

• Timed Up and Go (TUG)

- TUG times following 12-weeks of boxing training decreased along with at 24-week testing and 36 week testing with all participants exceeding the MDC during at least one of the measurement periods. Greater improvements in TUG time were seen immediately following interventions for those with mild PD while those with moderate to severe PD demonstrated improvements during further follow-up testing. Indicating improvement in gait and mobility for the population.

• 6- minute Walk Test (6MWT)

- Following a 12-week intervention, all patients significantly improved walking distance on a 6MWT at 36-week follow up testing. The majority of participants exceeded the MDC of 82 meters. Patients of all severity of PD showed improvements in walking distance and those with mild PD improved walking distance by greater than 17% compared to baseline at 24-week testing.

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