Using Innovative and Creative Treatments for Parkinson’s Disorders

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Disclosure

• Heather Cianci is a consultant for LSVT Global, Inc.

Session Learning Objectives

• List the common motor and non-motor symptoms of PD.
• Describe the impact non-motor symptoms have on the functional ability of individuals with Parkinson’s disease.
• List commonly used outcome measures for assessing individuals with PD based on disease stage and clinical presentation.
• Summarize recent research on neuroplasticity and the role of high-intensity exercise in individuals with PD.
• Develop motivating, creative, effective treatment plans.

Course Outline

• Anatomy and Physiology Review
• Diagnosis
• Motor Symptoms
• Non-Motor Symptoms
• Medical and Surgical Management
• BREAK – 15 min
• Evaluation & Outcome Measures
• LUNCH – 1 hour
• Neuroplasticity
• Mobility
• Gait Training
• Balance and Falls
• BREAK – 15 min
• Therapeutic Exercise
• Thinking “out of the box” - using creativity to enhance your treatments
• Community wellness
• Q&A

Quick Anatomy

Basal ganglia:

• Striatum globus pallidus
• substantia nigra
• nucleus accumbens
• subthalamic nucleus

It plays a role in:

• cognitive and automatic components of motor skill performance
• procedural motor learning, including acquiring and retaining automaticity (along with other cortical connections)
Pathophysiology

1. Progressive death of Dopaminergic neurons in the Substantia Nigra (60-80% cell death prior to sx’s appearing)
2. Presence of Lewy Bodies
   - Abnormal intraneuronal proteins (alpha-synuclein) that develop within the remaining dopaminergic neurons & in cerebral cortex

Motor Symptoms

Classic features
- Resting Tremor (~70%)
- Rigidity (invol. ↑ in muscle tone to PROM)
- Bradykinesia – slowness of movement
- Postural Instability → Falls (last to occur)

Begins on one side of the body and progresses to both

PD = Motor/Sensory Disconnect

The person with PD is unable to use their own internal feedback to recognize and regulate the size or speed of their movement, or the volume or speed of their voice.

**Bradykinesia** = Too Slow
**Hypokinesia** = Too Small

Gait and Balance

- Slowed or absent automatic movements:
  - ↓ Heel strike & Reciprocal UE Swing
  - Shortened Step/Stride Length
  - Reduced ground reaction forces for HS and TO
  - Slowed Velocity
  - Turning: Multi-step, Pivot & Cross-over
  - Freezing of Gait (FOG)
  - Slowed or absent Righting reflexes
  - Narrow BOS
  - COG anterior to BOS

A Clinical “Red Flag”

Difficulty with ambulating should be thought of as a “red flag” that indicates emerging disability.

We need to focus on treatments that deal with anticipated and/or developing gait and balance problems to delay disability and deteriorating QOL.
Falls
- 1/3 of people over 65 report falls
- 70% of PWP fall 1x/year
- 50% fall 2x or more/year
- Hip fracture & head trauma are the most common injuries
- Also increased FOG and reduced QOL
- Meta-analysis of prospective fall studies:
  - 57% of PWP with a h/o falls fell during a 3-month surveillance period...but so did 21% who had no history of falls
  

Freezing of Gait (FOG)
“Motor Block”
- Akinesia or
- Trembling in place due to fighting the freeze
- Least responsive to meds & surgery
- Commonly occurs while performing complex motor sequences - in areas where patients
- make multiple small steps and turns
- try to perform a new task in a relatively quick amount of time
- Commonly occurs with direction changes, small spaces, crowds, distraction, doorways & especially turns (360° with dual task is one of the worst)


FOG
The FOG occurs in part:
- because the PD brain cannot adjust speed or size of steps quickly enough to changing environment
- if the patient does not allow enough time for each movement in the sequence, then the movements all blend together and are performed simultaneously

“Too many plugs in the outlet cause a short-circuit”


FOG
- Occurs at all disease stages
  - 2011 study - 27% of patients in the very early stages showed FOG
- 86% of FOG - start hesitation, 71% - turn hesitation
- FOG severity & frequency are associated with reduced activity levels
- Those with FOG show more cognitive deficits


Posture

- Trunk extension strength
- Even early on in disease
- Thoracic kyphosis
- Lumbar lordosis
- Posterior pelvic tilt and ham tightness
- Self awareness
- Often declines when engaged in an activity
- Scoliosis – no correlation between laterality and curve

Micrographia

Panel: Proposed definitions of postural deformities in Parkinson's disease

- Camptocormia
  - Marked (minimum 45°) flexion in the sagittal plane originating in the thoracolumbar spine, almost complete resolution in the supine position

- Antecollis
  - Marked (minimum 45°) neck flexion (maybe partially overcome by voluntary or passive movement), unable to fully extend the neck against gravity but able to exert force against the resistance of the examiner’s hand

- Pisa syndrome
  - Marked (minimum 20°) lateral flexion that can be almost completely alleviated by passive mobilization or supine positioning

- Scoliosis
  - Lateral flexion not relieved by voluntary or passive movement plus lateral curvature of the spine of at least 10° as measured by the Cobb method and evidence of axial vertebral rotation on a radiograph

Treatment

- Practice does not make perfect
- Pt. must think about making each letter big
- Lines help, but not when removed
- Try easier flow type pens to limit the dual task of holding and pressing
- Print is better than cursive/script
**Vision**
- Retina contains dopamine
  - Central and Color Abnormalities
  - Blurriness
  - Colors are washed-out
  - Difficulty at twilight and in pain
  - Slowed scanning & anticipatory eye movements
  - Diplopia
  - Reduced blinking and tear production
  - Convergence insufficiency – challenges with reading

**Dystonia**
- Abnormal tone
  - Shoulder ext & IR, with wrist & finger flex
  - Toe curling, ankle PF & Inversion
  - Writer’s cramp
  - “Charlie horse”
  - Blepharospasm
  - Generally occur when levodopa levels are low, but can occur at peak levels

**Speech**
- Softer volume & monotone
- ↑ or ↓ speed
- ↓ facial movement
- Poor self awareness
- Occurs early in disease
Tx: Lee Silverman Voice Tx (LSVT Loud®)

**Swallowing**
- Dysphagia in later stages
- ↓ habitual swallowing + slowness + ↓ posture = drooling

**Non-Motor Symptoms (NMS)**
- Domains from NMS Scale:
  - Gastrointestinal tract
  - Urinary tract
  - Sexual function
  - Cardiovascular
  - Apathy/attention/memory
  - Hallucinations/delusions
  - Depression/anxiety/anhedonia
  - Sleep/fatigue
  - Pain (unrelated to other causes)
  - Miscellaneous (e.g., diplopia, weight loss)

**Severe NMS Predate Motor Symptoms**
- Motor symptoms are the “tip of the iceberg”
- Premotor phase of PD
  - Loss/decrease of sense of small
  - Depression/Anxiety
  - REM Behavior d/o
  - GI problems symptoms

**NMS impact Mobility**
- Urinary Frequency/Incontinence/Nocturia → difficulty with OOB & rushing to the bathroom → falls
- Orthostatic hypotension → fear of activity, falls
- Drooling → social withdraw & dec. activity
- Apathy → low motivation to be active and social
- Sleep disturbances → fatigue, low energy
- Hallucinations/delusions → fear, avoidance, arguments, behavior changes

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Sleep Disturbances
- Fragmentation
- REM Behavioral D/O – act out dreams due to loss of normal voluntary muscle atonia
- Excessive Daytime Sleepiness/“Sleep Attacks”
- Restless Leg Syndrome

Tx: Meds, good sleep hygiene, aerobic exercise, recommendations on “good napping” times and places

Pain/Parasthesia
Two types of pain:
- Nociceptive (40-90%)
  - musculoskeletal (abnormal posture, rigidity, dystonia)
  - visceral (from constipation)
- Neuropathic
  - radicular (disc damage due to kyphosis and falls) 14-34%
  - central Parkinson's pain (pain directly related to PD) – rare 4-10%, described as a burning, cramping sensation, commonly on the PD-dominant side

Pain is frequently under-recognized and often inadequately managed

Cognitive Changes
- ↓ Executive functioning
  - Identify problem
  - Planning course of action
  - Evaluate self
- MCI present early on
- Bradyphrenia
- ↑ Attention (shifting or selecting)
- ↑ Distractibility & ↓ Concentration
- STM
- Multitasking ability
- ↓ Organizational ability

Dementia
- 24 to 31% of patients with PD have dementia
  - Dementia rate is increased 4–6 times as compared to those w/o PD
  - at least 75% of those with PD who survive for >10 yrs. develop dementia

  - Longitudinal study of 233 patients (followed for 12 yrs): 60% prevalence of dementia

Depression & Mood
- Depression – 50% - 60%
- Anxiety: 40%

  - Worse during “off” times – leading to panic attacks

Apathy: 40% in those w/o dementia; up to 60% in those with dementia after 5–10 years of the disease.

Young Onset PD
- 5-10% of PWP dx before 40 y/o (YOPD)
  - Often misdiagnosed & mismanaged – shoulder/foot/back injury
  - More challenges due work & child responsibilities
  - Generally progresses slower than older onset
  - More difficulties with:
    - fatigue
    - anxiety & depression
    - cramping & dystonia

We NEED to begin tx ASAP – it is our job to “unmask the symptoms”
Medical Management

Dopaminergic

- Sinemet (Carbidopa/Levodopa)
  - Immediate Release, CR, Liquid
  - Parcopa™ (orally disintegrating tablets)
  - Orthostatic hypotension, "on/off" times, dyskinesia, hallucinations
  - High protein can interfere with absorption
  - Less effective over time
  - Less likely to be started in those with YOPD

- Rytary
  - Carbidopa/Levodopa extended release
  - FDA approved in Jan 2015
  - contains special beads designed to dissolve at different rates within the stomach and the intestines
  - NOT the same dosing as Sinemet
  - Study:
    - took less overall dosages (3.6 vs. 5 doses per day) but took more total pills.
    - daily "off-time" improved by over an hour each day

- Precautions:
  - Falling asleep during ADLs
  - Hallucinations/Psychosis
  - Dyskinesia
  - Impulse control/Compulsive behaviors
  - HTN with certain antidepressants

Dopamine Agonists

- Mirapex & ER, Requip & XL, Parlodel
  - Brain thinks there is more dopamine & sandpapers the receptors
  - Delays need for Sinemet, ↑ use for YOPD
  - Edema, obsessional problems

- Neupro (Rotigotine Transdermal System)
  - 24 hr. patch
  - Contains sulfites – those with asthma are more sensitive to
  - Skin irritation, drowsiness, can worsen psychotic-like behavior

Anticholinergics

- Artane, Cogentin
  - ↓ the ↑ amt. of acetylcholine
  - Control tremor early on
  - Dry mouth, sedation, confusion, urinary retention

Apokyn

- Injection pen
  - Immediate release (10 min.) – last up to 45-60 min.
  - Used for severe "off" times
  - Need an anti-nausea medication with this

MAO-B Inhibitors

- Selegiline (Eldepryl)
  - Blocks this enzyme that breaks down dopamine
  - Orthostatic hypotension, insomnia

- Azilect (Rasagiline)
  - Delays need for Sinemet in early dx pts
  - Less "off" time for pts who fluctuate
  - May be neuro-protective
  - Once daily dose
Medical Management

COMT Inhibitors
- **Comtan**: Blocks this enzyme that inactivates dopamine, prolongs Sinemet time
  - Side effects similar to Sinemet
- **Stalevo**: Combo of Sinemet & Comtan
  - ↓ end-of-dose "wearing off"
  - ↑ control of body movements
  - Side effects similar to Sinemet

Antiviral
- **Amantadine**: Helps rigidity & bradykinesia
  - Low doses smooth fluctuations
  - High doses suppress dyskinesia
  - Edema & purple blotches, insomnia

Dementia
- **Exelon**: Treatment of dementia in PD
  - Nausea, vomiting, loss of appetite, weight loss
  - Anorexia
  - Possible improvements in attention
  - Nausea, sleepiness, and slowing heart rate

Deep Brain Stimulation (DBS)
- Electrodes in Subthalamic Nucleus (STN) or Globus Pallidus Interna (GPi)
  - Connected to neurostimulator (~pacemaker) under the clavicle area
  - Can reduce +/- control rigidity, bradykinesia/akinesia, tremor & dyskinesia
  - Pt. can only return to their best "on time"
  - Can reduce amount of meds needed (~30%)
  - STN can lead to depression, apathy, impulsivity, worsened verbal fluency, & executive dysfunction
  - Not as effective on gait & balance

Falls & FOF with DBS
- 2013 survey by the Parkinson Alliance
  - 334 with DBS (STN), 819 without
  - 50 states were represented
  - Younger group - 50-69; Older group – 70+
  - DBS (controlling for age & disease duration):
    - Increased FOF
    - 2.52 times the risk of falling
    - Greater frequency of falls with inc. time of PD
  - Self reports of more difficulty with mobility, speech, & stigma

Implications of study
“individuals with DBS therapy may have extra ability to move without functional impairment, but lack the feedback and control to do so safely”

“individuals may be more confident or capable to increase engagement in activities due to the reduced motor symptoms, but may neglect to attend to or take into account the continued difficulties related to PD (such as poor balance). Moreover, even though DBS therapy benefits some motor functions, the body/functional capability may still be constrained by other factors that may result in increased falls.”

Atypical Parkinsonisms

**Alpha-synucleinopathies & Tauopathies**

**Alpha-synuclein**: is the primary structural component of Lewy bodies, as seen in:
- PD, MSA & Lewy Body Dementia

**Tau**: proteins help support and stabilize the “skeleton” of brain cells in the CNS
- When there is a defect in the tau, they accumulate abnormally and produce neurofibrillary tangles, as seen in:
  - PSP, Alzheimer’s, CBD & FTD
Progressive Supranuclear Palsy (PSP)

Remember "FIGS" to help with differentiating PSP from PD

F = Frequent, sudden falls early in disease course
• generally posteriorly…Rocket sign

I = Ineffective Medication
• anti-PD medications are not particularly helpful

G = Gaze Palsy
• vertical loss (downward first)

S = Speech & Swallow Changes

Lewy Body Dementia

• Progressive cognitive decline within 12 months of onset of parkinsonism

• Two of the core features
  • Fluctuating cognition
  • Visual hallucinations

• Parkinsonism
  • One core and one suggestive feature

• Often with rapid progression of posture changes – generally trunk flexion and/or lateral flexion

There is no cure but...

• Despite new drugs and new and refined surgical approaches to treat PD…no pharmacological or surgical approach has been shown to cure PD or definitely modify disease progression.

• The new avenue that has gained prominence:

Disease Modification

Neuroprotection:
• Changes in vulnerable or compromised neurons that spares, rejuvenates or slows their degeneration.

Neuroplasticity:
• Changes in synaptic or neuronal function that restores or compensates for lost function.

How does the typical patient with Parkinson's disease get referred to physical therapy?

How Care Model Should Look

• Diagnosed with PD and immediately sent for therapy

• Begin program for prevention and restoration

• Tailor tx to patient’s needs

• Increase focus on new ways to support exercise adherence
  • Group classes
  • Phone and web visits/chats

• Schedule regular follow-up reassessments

People with PD NEED continuous monitoring and intervention over the course of their disease.
When you work with someone with PD, you’re not just their PT.

Your role may be to assess the patient’s function,
BUT…you are also a little bit of a:

- Psychologist
- Marriage & Family Counselor
- Building Inspector/General Contractor
- Medical Equipment Specialist
- Spiritual Advisor
- Coach
- Cheerleader
- Nutritionist
- Medical Manager

**History Taking:**

*The first step to a successful evaluation*

**Look**

- Non-verbal communication
- How patient fills out paperwork
- How patient takes off coat, reaches into purse, answers the phone, etc.
- Home set-up
- Hygiene
- Are they self-correcting posture?
- Are they trying to hide symptoms?
- Does patient look to care partner to answer questions?
- PMHx
- How do co-morbidities affect PD & vice versa?
- Social Hx
- Include home, leisure, work
- Description of their support system
- Description of home/work/leisure environment
- Any withdraw from recreational and leisure activities?

**Listen**

- Overall level of physical activity
- Any involvement in exercise or leisure?
- Daily routine:
- ADLs and IADLs
- The patient’s goals
- Interactions with partner/child/friend/staff
- Any signs of denial?
- Are there discrepancies among answers?
- Do they self-correct voice?
- PMHx
- how do co-morbidities affect PD & vice versa?
- Social Hx
- Include home, leisure, work
- Description of their support system
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- Any withdraw from recreational and leisure activities?

**Feel**

- Social interactions
- Motivation/Self-efficacy
- Emotional status
- Coping strategies
- Beliefs
- Anxiety
- Depression
- Fear
- Quality of Life

“*What do you do for fun???” “What brings you joy???””
**Important Questions to Remember**

- Side of onset of symptoms
- Hand dominance
- Initial presentation
- Time to diagnosis
- Who is primary PD-care practitioner?
  - PCP, Neurologist, Movement D/O Specialist, CRNP, PA
- Prior therapy
- Knowledge of PD
- Where do they find their information?
- Support Group involvement
- Medications/schedule
- Sleep
- Non-motor symptom involvement
  - “What activities are you having difficulty with?”
  - “What activities have you given up because of PD that you would like to return to doing again?”

**PD Rating Scales**

**Hoehn & Yahr (stages)**

1. Unilateral
2. Bilateral, ∅ balance prob.
3. Bilateral, balance prob, mild to mod disability
4. Severe disability, but can walk unassisted
5. W/C or bedridden

**MDS-UPDRS**

The Movt D/O Society sponsored revision of the UPDRS
- Non-motor & motor (pt & partner) completion
- Valid in PD

**UPDRS**

Unified PD Rating Scale
- Measure the progression of PD
- Commonly used in research

**PD Evaluation Template**

- PMHx
- Home/work enviro
- Medications/Schedule
- Cognition
- Quality of Life
- Motivation/Self-efficacy
- Sleep
- Other N-M symptoms
- Knowledge of PD
- Pain
- Cardiovascular
- Skin/Sensation
- posture
- ROM/Strength
- Bed Mobility
- Transfers
- Gait
- Falls
- Hype/bradykinesia
- Need for additional services
- OT, SLP, Psych, Support Group

**PD related Outcome Measurement Tools... so many to choose from, so little time**

- 5TSTS
- Lindup
- Gait Velocity
- TUG, with motor & prog
- Tread
- Berg
- BESTest
- Mini BESTest
- Brief-BESTest
- DGI
- FGA
- ABC
- Timer
- 6MWT
- 10 meter walk
- Push & Release
- 9 hole peg test
- Functional Reach
- Push & Release

**PD EDGE (Evidence Database to Guide Effectiveness)**

Highly Res Measure Body Structure and Function
- MDS-UPDRS revision - part 3
- MDS-UPDRS - part 1
- Montreal Cognitive Assessment
  - 5 minute walk
  - 10 meter walk
  - Mini BESTest
  - MDS-UPDRS - part 2
  - Functional Gait Assessment
  - 5TSTS
  - 9 hole peg test

Participation
- PDQ 8 or PDQ 39
- Freezing of Gait questionnaire
- Freezing of Gait questionnaire
- Parkinson’s Fatigue Scale
- Fear of falling
- ABC scale
- Dual Task
- Timed Up and Go (cognitive)
Completematerialsareavailablehttp://www.neuropt.org/professional-resources/neurology-section-outcome-measures-recommendations/parkinson-disease

Evaluation - Musculoskeletal

ROM/ Flexibility

- Typically see ↑ tightness at flexors & rotators
- “Hot spots” - chest wall, shoulders, hamstrings, gastroc, neck, trunk, hand/wrist

Common Positions:

- Hand – closed (fist or just flexion at MCPs)
- Elbow – flexed
- Shoulder – IR
- Loss of ROM on affected side due to ↓ use from overuse of other UE and ↓ reciprocal swing
- Neck – flexed (down-gaze)
- Trunk – flexed
- Knees – flexed
- Increased sedentary lifestyle and too much sitting add to the problem

Strength

Pt.’s often mistake bradykinesia & ↓ fine motor coordination as weakness

Muscle strength =FORCE generated by muscle contraction
Bradykinesia = SLOWNESS of movement speed
POWER = FORCE x SPEED (velocity)

- Weakness typically found at trunk extension, abdominals, knee/hip/elbow extensors – even early on
- Inability to generate adequate power: poor STS, reduced toe-off, slowed gait, inc. falls

Coordination

RAMs - what are we testing with this in the UE?

- Finger tap, hand flips (UPDRS)
- Heel: Toe to Knee
- Foot tapping

Alignment

- Scapula – Asymmetries due to unilateral rigidity
- Ankle – pronation, hallux valgus

Posture

- Measurements
  - Distance of occiput to wall
  - Photos
Transfers

Not just sit to stand:
• eccentric control of stand to sit
• various surfaces & heights
• walking to chair & then turning to sit
• getting into/out of a chair at a desk or table (commonly see FOG here)
• Chair
• Toilet
• Tub bench/shower chair
• Car
• Wheelchair
• Floor to stand

STS in Older adults - often keep COG posterior to their ankle joint for the majority of the transfer

STS with PD -
• Reduced concentric muscle strength in hip & knee extensors (hip extension strength is correlated with STS time)
• Poor control of how far and how fast to lean their COG

Many PWP are independent, but use poor or unsafe techniques

Describe the technique:
"Pt. reaches for chair before turning to sit, + freeze, & lands on edge of chair"
"Pt. blocks L.E. against bed to stand"
"Pt. failed to lean anterior and fell back into chair"

Time the technique:

5 Times Sit to Stand (FTSTS)

• Distinguish balance dysfunction older adults.
  16.9 inch chair
  • 13.4 sec. on average
  • 10 sec. for those < 60 y/o
  • 14.2 sec. for those > 60 y/o

• Distinguish who falls with PD: ~17 inch chair
• Easy to reassess change and make a progressively challenging exercise

Remember to ask for:
• Height of bed
• Side they sleep on
• Bed/sleep routine
• "map" of bed to bathroom
• video of bed mob at home if able

Lindop Parkinson's Assessment Scale (LPAS)

• Bed Mobility sections
  "Sit to lie (56 cm bed)"
  • Unaided with ease (≤ 5 sec)
  • Unaided with effort (6+ sec)
  • Help of 1
  • Help of 2/unable

Gait

Skilled Observation - Description
• Reciprocal UE Swing → Trunk Rotation
• Stride/Step Length
• Heel Strike
• Head Position & Eye Direction
• Posture
• BOS
• Any freezing?
  • How regions – initiation, doorways, turns, small spaces, etc. and if able to correct now with effort
• Use of device
• Catch patient unaware

Bed Mobility

Assess each sub-task:
• How do they approach the bed?
  • Crawl in or back up to sit?
  • If they sit, is it too high or low?
• How do they actually get in to position in the bed?
  • Scooting up & down
  • Rolling
  • Managing sheets/blankets
  • OOB

Describe the technique - why is it not safe or energy efficient?

Measure the technique: time the task
Pt. often test well in clinic but report poor performance at home due to difference in environment and med schedule

Many PWP are independent, but use poor or unsafe techniques

Describe the technique:
"Pt. reaches for chair before turning to sit, + freeze, & lands on edge of chair"
"Pt. blocks L.E. against bed to stand"
"Pt. failed to lean anterior and fell back into chair"
**Timed Up & Go (TUG)**

- Can trigger FOG with the pressure of being timed, at initiation of gait, and with turns
- Good for reassessment – is the patient using appropriate techniques for freeze-prevention/break and turns?
- In YOPD especially - perform TUG with a simultaneous task
  - Cognitive: naming items in a group (animals, cars, desserts, etc.), serial subtraction
  - Motor: carrying a glass of water, moving change from hand to hand, buttoning a coat, etc.
  - Cognitive/Motor: dialing a mobile phone

These are ALL FUNCTIONAL TASKS

- >13.5 sec. = higher fall risk; Reliable in PD
  - MDC = 3.5 secs

The more time taken, the more dependent in ADLs

- TUG cognitive (counting backwards by 3’s)
  - Better at discriminating fallers than just TUG
  - PD-specific norms:
    - TUG = 12 sec
    - TUG cognitive = 14.7 sec
    - TUG manual (carrying glass of water)= 13.2 sec
  - Vance et al. Phys Ther. Published online August 21, 2014

**Dual Tasking (DT) & TUG**

- Performing manual or cognitive dual tasks while walking typically alters gait, especially in those with PD.
- Does the type of secondary task matter in dual task interference during the TUG?
- What is the relationship of the attention requirements from diff types of secondary tasks and the demands on walking straight or with turns?

McIsaac and Porciuncula (WPC Poster 2013)

- TUG under single task and 5 dual tasks:
  - Serial- 3 subtractions
  - Carrying a cup of water filled to .5 cm of rim
  - Buttoning/unbuttoning a coat
  - Dialing a cell phone
  - Combined water and subtraction tasks

The rate of buttoning sustained the greatest cost among the tasks.

- No diff between water, dialing or subtracting

**Tinetti Balance & Gait**

- Reliable and valid for PD
  - 19-24/28 = mod risk, <19/28 = high risk

Assesses tasks that reportedly most often lead to falls in PWP
- Turning, Initiating Gait, Slowing to sit down

**FOG questionnaire (FOG-Q)**

- Assesses FOG severity
- Reliable and valid for PD

**10-Meter Walk Test (32.8 ft)**

- Walk WITHOUT assistance 10 meters - time is measured for the middle 6 meters (19.7 feet) (allows for acceleration and deceleration) - preferred or fastest speed

- Normal walking = 1.2 to 1.4 meters per second
- 30 seconds = household ambulator
- 17 - 23 seconds = limited community ambulator
- 10 - 12.5 seconds = community ambulator
- ≤ 7 sec = ability to cross a street.

2014 study shows that:
- comfortable & fastest gait speed test are strongly assoc with 6MWT, miniBEST, ABC, FOG, and QoL

**Six Minute Walk Test**

- High test-retest reliability in PD
  - MDC = 82 meters (269 feet) in community-dwelling older adults with PD

**Gait Speed**

- in community-dwelling older adults with PD
  - MDC:
    - Comfortable gait speed: 0.18 m/s
    - Fastest gait speed: 0.25 m/s

2014 study shows that:
- comfortable & fastest gait speed test are strongly assoc with 6MWT, miniBEST, ABC, FOG, and QoL
• **Dynamic Gait Index**
  • Assesses ability to modify gait in response to changing tasks
  • <19 = greater than 2 1/2 times more likely to fall
  • Reliable in mild PD

• **Functional Gait Assessment**
  • FGA includes tasks that require sensory integration during dynamic mobility (turning the head, walking with EC, and walking backwards.) These tasks can help to unmask deficits common to PD.
  • 22/30 predict falls in community-dwelling older adults
  • Valid & Reliable in PD

**Turning**

Present outcome measures (Berg, Tinetti, ABC vs. iTUG) are not capturing difficulties with turning in mildly impaired pts. without balance deficits.

- **Test turns:**
  - Wide open & small, crowded spaces
  - Walking to a chair, turning to sit
  - From a static position (at sink)
  - On command
  - With dual tasking
  - Around objects

**Mean 180 turns:**

- Mild PD = 2.5 sec., # of steps = 4.5; Severe PD = 3.2 sec., # of steps = 5.6

**Freezer or non-freezer:** Clinical assessment of FOG

No current gold standard classification of “freezer” vs “non-freezer”

2012 study looking at which simple clinical test would be the most sensitive to provoke FOG objectively.

Most effective way to provoke FOG:

- Pt perf 360 turns as rapidly as possible from standstill in narrow quarters, at self-selected speed, with two left turns to and two right turns, in random order.

**Balance Measures**

- **BESTest (36 items)**

- **Mini BESTest (14 items)**
  - Identifies subtle balance deficits – even in mild PD

- **Brief BESTest (8 items)**
  - As reliable as BEST and comparable to Mini

**Other Focus Areas**

- **Stairs**
  - Curbs
  - Ramps

- **Type of Footwear**
  - Falls
    - Where - When - What activity?
    - “On or off”
    - Look for patterns – can you reproduce?

- **Fall Journal**

**BESTest**

- “sensitive, quantitative balance assessment that identify[s] subtle deficits and changes with therapy?”

**Mini BESTest**

- Better sensitivity/specificity then the Berg to identify people with abnormal postural responses

- ≥ 21 is a suggested cut-off point to differentiate those with and without postural response deficits

**Brief BESTest**

- Good prospective fall prediction accuracy over 6 months
Fullerton Advanced Balance Scale
- 10 items
  - Step up and over, Jumping
  - \( \leq 23/40 = \) high fall risk

Berg
- Ceiling effect in PD - In early stages of PD it isn’t sensitive enough to assess postural instability
  - \( \leq 25/40 = \) high fall risk
  - \( 41-56 = \) low fall risk, \( 21-40 = \) medium, \( 0-20 = \) high


Functional Reach
- \( < 12.5 \) fall risk for PD


Push & Release Test
- 0 = Recover independently with 1 step of normal length and width
  - 1 = Two to three small steps backward, but stands independently
  - 2 = Four or more steps backward, but stands independently
  - 3 = Steps but needs to be assisted to prevent a fall
  - 4 = Falls without attempting a step or unable to stand without assistance
  - more accurate in predicting falls then Pull test when “On”


FGA (compared to UPDRS Pull test and TUG) – better ability to detect differences between fallers and non-fallers during on/off times.

BESTest, Mini-BESTest, Berg, and FGA – effective at predicting falls at 6 months, but not at 12 months. Suggests fall-risk testing should occur biannually.

The Take Home Message is...
- Multiple tests are better than just one at predicting falls (DGI, FRT, Berg, TUG) & test at least every 6 mths.


PD Fall Risk Prediction Tool

Other Measurements
- Rating Fear of Falling:
  - Activities-Specific Balance Confidence Scale (ABC)
  - \(< 67\% = \) fall risk; Min detectable change in PD = 3

Quality of Life:
  - PD Questionnaire-39 (PDQ-39)

Disability:
  - Self-Reported Disability Scale in Patients with PD
  - Schwab & England ADL Scale

Cognitive Measurements
- MoCA – Montreal Cognitive Assessment
  - Better at discriminating subtle cognitive changes in PD than the MMSE
  - Visuospatial, executive, naming, memory, language, abstraction, delayed recall, orientation
  - Add 1 point for an individual who has 12 yrs or < of formal education, for a possible maximum of 30 points. \( \geq 26 \) is considered normal.

Controls MCI Alzheimer’s

MoCA Average 27.4 22.1 16.2

10/21/16
Outcome Tools
Rehabilitation Measures Database
“The Rehabilitation Clinician’s Place to Find the Best Instruments to Screen Patients and Monitor Their Progress”

www.rehabmeasures.org

Gives information on description, use, norms, min detectable change, bibliography, etc.

Documentation
Remember….
Another PT with no knowledge of your patient should be able to read your note and know exactly what your patient’s needs are, what their program consists of, and what their goals are.

Neuro documentation is very different from ortho …

FUNCTION, FUNCTION, FUNCTION!!!

Documentation Example
Pt with R lumbar radiculopathy and PD

Gait:
“Independent amb but slow secondary to PD.”

Devotions:
“Down gaze/visual dependence increased.”

Balance:
“Seated/Standing-Grossly WNL.”

Goals:
“Be able to lift grandchild and return to exercise.”
“Improve lumbar ROM with less apprehension.”

Wording Examples
Gait description:
“Independent amb on carpet with FOG at initiation & with turns 2/5 trials over 100 ft. Req. min A to correct LOB with freeze during turn #2. No evidence of freeze-break tech.”

Goals:
• “Pt. indep. demo use of self-cues to ↑ RLE HS/step length”
• “Pt. indep. demo. ability to use attentional cues to prevent FOG with initiation of gait.”
• “Pt. indep. performing new turning tech. to prevent FOG during turn.”
• “Spouse indep. with use of external cues to A pt. with breaking freeze and restarting amb.”

…..but there is more….

Remember the “WHY”
Always state the WHY of your goals

1. WHY should this pt. be I with HEP?
2. WHY does the gait pattern need to be changed?
3. WHY does this balance measure need to improve?
4. To prevent (or limit episodes of) LOB/Falls
5. To prevent (or limit) functional decline
6. To reduce caregiver stress and risk of injury
7. To improve QOL and community involvement
8. To prevent likelihood of transfer into A-living, SNF, etc.

“Pt. indep. demo. use of self-cues to ↑ RLE HS/step length to prevent (or limit episodes of) LOB/Falls”
Treatment Strategies

Advances in neuroscience – Animal Model

Studies suggest that exercise may slow, halt, or reverse the progression of PD

• by protecting the remaining “viable” DA neurons
• by restoring compromised signaling pathways
• by reducing reliance on underaged systems
• by increasing efficiency of available DA
• by creating more DA receptors
• by shutting in synapse longer (fewer DA transporters)
• by increasing neurotrophic factor ("feed" the cells & help with neurotransmitter transmission)
• doesn’t increase the amount of DA, but increases its release


Neuroplasticity in Humans

• Aerobic exercise leads to an enhanced brain-derived neurotrophic factor (BDNF) response & release
• BDNF is a protein that:
  • maintains the growth, health, and survival of nerve cells
  • promotes the growth and development of new neurons and synapses
  • helps with memory formation, learning and behavior, synaptic plasticity & neuronal connectivity
• This in turn may lead to functional, cognitive, and mood improvements in humans


Principles of Neuroplasticity

1. Use it or Lose it – inactivity is pro-degenerative
2. Use it & Improve it - skilled training facilitates plasticity
3. Specificity – task specific training: train to the deficit
4. Repetition Matters – the key to permanent change in brain and behavior; add novel movements
5. Intensity Matters – push/challenge your patient! more reps, longer duration & frequency, HR, BORG scale


6. Time Matters – better earlier, but can occur at any point
7. Salience Matters – must be important to the patient
8. Age Matters
9. Transference – changes in one area can promote concurrent or subsequent changes elsewhere
10. Interference – learning compensatory strategies first may lead to plasticity that needs to be overcome

*prefrontal cognitive circuits are critically involved in early phases of motor learning, so cognitive engagement should also be a part of any PD-related exercise


Mobility Guidelines

Teach Thoughtful Movement ASAP

• Review the “Motor-Sensory Disconnect”
• “Think before you move”
• Move with larger movements
• Finish one part completely before the next (ex. – getting into a chair)
• Break task into parts

“PWP are like run-on sentences - we must teach them to put in the commas”
Transfer Training
- Task-specific training
- Teach sequencing
  - “Don’t reach before turning”
- Practice the most difficult portion 1st
- Use incline wedge for theater seats
- Go from high to low seats (keep measurements)
- DO NOT FORGET to practice:
  - getting in & out of chair at table/desk
  - Tape on floor where feet should be

Bed Mobility
- Break task into smaller steps/movements
- Awareness: “Thoughtfulness of Movement”
  - Warm-up with rocking
  - Large movement with UEs
  - Turn head in direction to move
  - Tape on floor where feet should be
  - Adaptive Equipment
    - Handrails, Risers, Satin sheet in middle of bed, Blanket Support
    - Firm mattress

Gait Training
- In PD THE ABILITY TO MOVE IS NOT LOST; THERE IS AN ACTIVATION
  PROBLEM (Meg Morris)
- Patient first must understand the motor-sensory disconnect
  - Video analysis helps here
- We can teach patients good quality movement that prevents LOB/Falls
  through motor learning and conscious movement training
- Cuing- countless studies showing that external cues help improve gait
  quality (carryover is limited when cue removed)
Cueing Strategies

**“Attentional Cues”**

- In PD there is ↓ BG input going to the SMA/Primary motor cortex
- Override this by ↑ use of frontal-cortical control (Premotor cortex) by thinking about the movement

**Attentional Cues**

- Tape lines on floor
- Lasers
- Metronomes
- Imagination (stepping over something)
- Tactile (tapping the frozen foot)
- RAS - Rhythmic Auditory Stimulation
  - using the physiological effects of rhythm/music to facilitate rhythmicity in gait.

After cue is removed - effects can last up to 8 weeks after training but then fade

Mobilaser™

Device can be attached to any walker and projects a straight line to step to, or over to help combat FOG

www.mobilaser.org

Gait Training

- Walking with large amplitude movements
- Get that arm swinging & that foot landing on the heel “kick”
- Have patient tell you what they will do first
- Practice weight shifting & stepping
- Practice in open and small areas
- Practice stopping, starting, and turning
  - at an object
  - with a cue
Gait Training

- Practice in functional settings
  - Elevators, revolving doors, etc.
  - Crowds
  - Obstacle courses
  - Unfamiliar places
- Dual taking
  - Motor & Cognitive
  - Caring others
  - Stairs or turns on steps
  - Are they safe to do this?
- May need to avoid dual tasks
- Force a freeze & have patient correct
- Reduce the # of steps in a certain distance

Plyometrics and Agility

- Skipping – in place and in a hallway
  - Excellent for large amp recip UE movements
- “Puddle jumps”
- Agility ladder
- Aerobie Pro discs
- Jumping
  - Front to front to back
  - Side to side
  - Vertical
  - Zigzag
  - Opening UEs/LEs
- Over or on

Early Stage

- Address amplitude and symmetry
- Add in dual tasking with cognitive & motor loads
- Vary the environment and exercise
- Push them hard!

Mid Stage:

- May now be dealing with motor fluctuations
- Need strategies for “on” and “off” times
- Begin addressing estimation and retropulsion, LOB

Mid-Late Stage:

- FOG
- Increasing Falls
- Increased “off” times
- More need for cues and care partner assistance

FOG Strategies

Understand/identify triggers
- Weight displacement on feet
- Stress/Anger/Pain
- Anticipatory FOG
- Turn technique/Turn to sit
- Cognition/Attention/Distraction
- Crowds
- Environment
  - Small spaces
  - Sudden changes in flooring type or pattern
  - Doorways
  - Thresholds
- Approaching people, furniture, objects

Never fight the freeze!!!

- Stop, breathe, start again (use an attentional cue)
- 4 S’s
  1. Stop
  2. Stand tall
  3. Shift weight
  4. Step big

- The key is to unweight 1 foot & make the next step a big step

Areas in home (Doorways, around furniture)

- Tc: Destination Estimation
  - May not work for those with trouble multi-tasking
- Tc: Look through door to wall ahead
- Tc: Stop and step over threshold

Crowds – elevator, escalator, church, concerts, trains/buses

- Tc: Allow others to go first, move to the side

Turns

- New Techniques

Maria Walde-Douglas, PT, Struther's Parkinson Center, MN
Cognitive Contributions to Freezing of Gait in Parkinson Disease: Implications for Physical Rehabilitation


- FOG affects 26% with mild PD, 80% with more advanced PD – leading cause of falls
- Compensatory strategies such as external cues have been the long-standing treatment choice
- Effect is lost when cue is removed
- Relies on the patient’s cognitive ability to retrieve and apply the cue
- We know now that FOG is not just due to sensorimotor deficits, but also executive function, attention, and visuospatial deficits

Deficits that contribute to FOG

Attention:
- divided – dual tasking
- switching – changing focus quickly: coordinating stepping down a curb and being aware of the surroundings

Executive function:
- shifting – similar to “attention shifting” as above
- inhibition – “go-nogo” – need to inhibit the desire to cross at the green light when a car is turning in to your path

Visuospatial function

Testing Methods

1. Divided attention: TUG x 3
2. Switching or Shifting attention:
3. Inhibition: Stroop task
4. Visuospatial: Clock Drawing Test - “ten past eleven”

<table>
<thead>
<tr>
<th>Cognitive Domain</th>
<th>Cognitive Tests</th>
<th>Integration into Exercise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attention</td>
<td>Dual tasks</td>
<td>Dual-task walking任务</td>
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<tr>
<td></td>
<td>Shifting tasks</td>
<td>Shifting focus between tasks</td>
</tr>
<tr>
<td></td>
<td>Inhibition task</td>
<td>Visual auditory cue condition</td>
</tr>
</tbody>
</table>

Example of task prioritization during agility training. The patient completes a secondary cognitive task during agility training and is instructed to switch prioritization between the mobility/stepping component (left) and the cognitive component (right).

Example of visual-auditory cue conflict during boxing. Simultaneously, the instructor visually cues for a left punch and verbally cues for a right punch. For this trial, the patient is instructed to respond to the visual cue only and ignore the auditory cue.
Cognitive & Mobility Training

**Agility/Obstacle Courses**
- Use FOG triggers
- Doorways, crowds, smaller spaces, flooring changes, etc.
- Add in dual cognitive tasks
  - Walking on colored agility dots or river stones – “name the color you are on, step on each stone but name the next color stone, name items that are normally that color”
- Add in dual motor tasks
  - “Get you phone out of your pocket”
  - Tossing and catching a ball
  - Singing a song

**Turning**
- Keep body and feet moving in same direction, especially with:
  - Use of walker
  - Return to sit
  - From static pose to turn & reach
- Use of walker
  - RR/LL turn, Clock turn– smaller space
  - Marching turn – smaller space
  - & to get out of a freeze
- Sideways Arc – to avoid back steps

---

**Walkers, Canes, & Poles**
- Avoid Aluminum Straight-Wheeled Walkers! – pt. must lift to turn
- Avoid QC’s – multi-tasking and tripping on legs
- 4 wheeled RW with brakes & seat tend to work best
- Trekking poles work well with YOPD - bilateral support, facilitates UE reciprocal motion, trunk rotation, & symmetry
- Laser Cane

---

**TM Guidelines**
- No consensus on optimal frequency & duration
- Harness only recommended for those with need to prevent LOB/ falls
- Use during “On” time
- Work on ground gait after
- Establish a post-tx regimen for patient
- Work at a moderately intense level
- Get that HR up!
  - Up to 6 on effort scale of 10
**Balance & Falls**

*Add cognitive challenge as patient improves...with newly dx YOPD begin immediately!*

**Once falls begin:**
- Continue balance exercises
- Determine cause – treat cause
- Freezing, Festination, Turns, 1 Safety Recall, Multi-tasking
- Fall Diary
- Education for pt. and care partner
- Protective gear (knee pads)
- ADs
- Some pts will continue to fall no matter what and truly need constant supervision

**Exercise Examples**
- Sit to stand on uneven surfaces, UE activities while on uneven surfaces
- Obstacle courses
- Step-overs – vary heights, surfaces & speed
- SLS – touch 1 foot to stool; objects at various heights and distances; with UE activities

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**Balance & Falls**

**Prevention**
- COG over BOS at all times (especially with reaching)
- Closets, refrigerator, oven, picking up objects from table
- Environmental modifications at home & office
- Energy conservation
- Sit to dress, dry off, prepare meals
- Avoid multi-tasking (in late-mid & later stages)

The lit. shows ex & move to be effective tools in improving balance - but does not show which are best at which stage of the disease.

**Highly Challenging Balance Program Reduces Fall Rate in Parkinson Disease**
- 23 subjects, 90 min 2x/ week for 3 months
- change in fall rate, Mini-BESTest, & FOF (Falls Efficacy Scale-International [FES-I])

*“incorporated the most salient features from prior work (eg, theory-driven, highly challenging, progressive, goal oriented, balance plus strengthening exercises, and high dose)”*

**Outcomes:**
- 37% decline in fall rate
- Improvements in both Mini-BESTest & FES-I

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- 37% decline in fall rate
- Improvements in both Mini-BESTest & FES-I
Multi-dimensional balance training programme improves balance and gait performance in people with Parkinson's disease: A pragmatic randomized controlled trial with 12-month follow-up.

Wong-Yu I, Mak MK. Parkinsonism Relat Disord. 2015; 21(6): 615-621.

Group of 6-8 subjects for 4 weeks indoor activity:
• Postural re-education
• Flexibility exercise
• Strength training with functional tasks
• Balance Dance
• Modified Wing Chun (traditional Chinese martial arts modified it into 9 forms to focus on rapid postural changes and voluntary stepping)
• Square Stepping Exercise (eight special patterns with progressive difficulty levels aiming at multi-directional balance and gait skills)

Then 4 weeks at outdoor parks and in the community:
• Same activities on uneven ground, perturbation-based training under different terrains and situations, and fall-prone functional tasks (i.e. pulling or pushing doors, exiting or entering escalator or elevator, fast walking).

Examples of the square-stepping exercise patterns in Elementary 1 & 2, Intermediate 1, and Advanced 3 categories.

Outcomes
“The training exposed the participants to challenging real-life situations so that they could learn to heighten their postural stability in coping with these daily tasks. The improved dual-task gait performance implies reduced attentional demands and increased automaticity for more challenging postural tasks, especially in the outdoor environment.

...context-specific training...”

significantly greater increases in BESTest total and subsection scores, gait speed, and a greater reduction dual-task TUG time from baseline. Sustained most at 6 mth f/u, and BESTest total at 12 mths.

Retropulsion
Retropulsion: backward balance loss with reduced step size and increased cadence; underscaled stepping response

Triggers:
• Reaching up
• Opening doors (cabinet, stove, etc.)
• Stepping back to get out of the way of something or someone (sudden movement)
• Backing in to a chair

Prevention:
• Stand sideways to open doors
• Sideways arc
• Power stance

Prevention:
• Stand to side of oven, dishwasher, fridge & doors to open
• Teach “Power Stance” and performing activities within LOS
• Steady self with one hand
• Walk sideways
Incorrect Tech.
Correct Tech.

Festination

Festination: gait with increased step cadence, “runaway train”

Triggers:
• Reaching too far forward
• Increasingly flexed posture
• Being told to “hurry up”
• Reaching for the chair before turning to sit
• Not focusing on quality of steps
• Letting the rollator control them, rather than controlling the rollator (being in a freeze and moving the rollator rather than the feet)

Prevention:
• “Large feet under the seat” – bigger steps
• No reaching
• Training in big steps and focus on constant HS
• Visual cues on rollator
• Reverse-braking system rollator

In more severe cases:
• Towel rolls under arms
• Velcro-release strap attached to rollator around patient’s waist or hips
• Metronome

Festination Prevention:
• Exercise type
• Time of implementation
• Frequency
• Duration
• Intensity
• Practicality
• Cost-effectiveness
• Environment
• Adherence

Exercise – What is Considered Best-practice”???

“5 physical therapy treatments you probably don’t need”

• The APTA joined the Choosing Wisely campaign through the ABIM Foundation (Advancing Medical Professionalism to Improve Health Care) & Consumer Reports
• The APTA “recently identified five treatments physical therapists sometimes offer that usually don’t help, are often a waste of time and money, and in some cases can even delay your recovery or pose risks.”
• HP/CP…CPMs…Bed rest for blood clots (when pt on anti-coag. med)…Whirlpool for wounds…AND…

The exercises prescribed by physical therapists, especially for older people are sometimes too easy, using much lighter weights or fewer repetitions than you can handle. That’s a mistake, since to make gains you have to tax yourself, and the best way to do that is under the supervision of the a trained physical therapist.

• What to do instead: The therapist should match the program to your abilities, and add weight, repetitions, or new exercises whenever the task gets too easy. If you think you can handle more, say so.”
Exercise Adherence in PD
Self-efficacy, not disability is strongly associated with whether people with PD exercise regularly
Perceived barriers to exercise:
✓ Low outcome expectation – no benefit to exercising
✓ Lack of time
✓ Fear of falling

Perceived barriers to exercise:

Levels and Patterns of Physical Activity and Sedentary Behavior in Elderly People With Mild to Moderate Parkinson Disease
• 53 men, 42 women (mean age=73.4 years)
• Mild to moderate idiopathic PD.
• Measured time spent in physical activity and sedentary behaviors for 1 week with accelerometers.
• Mean daily step counts - 4,765
• 589 minutes in sedentary behaviors
• 141 minutes in low-intensity activities
• 30 minutes in mod-intensity lifestyle activities
• 16 minutes in mod to vigorous-intensity ambulatory activities.
• No differences were found between weekdays and weekend days.
• Peak activity in AM with gradual decline

Practical Implications: Integration of Exercise into Everyday Life
WPC 2016 - Gammon M. Earhart, PhD, PT
✓ Expect more from exercise
✓ Believe in yourself
✓ Seek professional input to get started
✓ Put “exercise” on your calendar and set reminders
✓ Break it up into smaller chunks to fit it in
✓ Exercise with a partner or, better yet, with a group
✓ Remember, technology is your friend
✓ Make it fun!

Early, Intensive Exercise
• 40 newly dx PWP followed for 2 years:
  • 1 group – rasagiline & intensive ex
  • 28-day multidisciplinary intensive rehabilitation treatments (at 1 year intervals)
  • 1 group – rasagiline
• Assessed at baseline, 6 mos., 1 yr., 18 mos., & 2 yrs.
  • UPDRS II & III, 6MWT, TUG, PD Disability Scale (PDDS), & need for more meds
• Results:
  • no changes in med-only group… & they needed more meds
• High intensity defined
  • "Vigorous exercise" –
    *aerobic physical activity sufficient to increase heart rate and the need for oxygen… cardiovascular fitness…”
  • Sustained for at least 20-30 minutes
  • Ongoing
  • Evidenced by relatively high oxygen uptake at peak exercise (VO2)
  • Intensity also relates to motor difficulty
Mission

• “To develop and implement worldwide access to cutting edge Parkinson disease-specific neuroplasticity principled exercise programs that hold promise to slow disease progression, improve symptoms, restore function, and increase longevity and quality of life.”

Scarf Flicks

LSVT® BIG

• Based on principles of LSVT® LOUD (Lee Silverman Voice Tx - “Think Loud”)
• Evidence-based protocol of 1 hour sessions, 4x/week for 4 weeks
• Must be certified to provide this treatment
• www.LSVTglobal.com
Tx Session Overview

Maximal Daily Exercises
1. Floor to Ceiling
2. Side to Side
3. Forward step
4. Backward step
5. Forward Rock and Reach
6. Sideways Rock and Reach

Walking BIG
Duration time may vary

Hierarchy Tasks

Functional Component Tasks
5 EVERYDAY TASKS
• Sit-to-Stand
• Pulling keys out of pocket

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Duration time may vary

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Building Complexity across 4 weeks of treatment towards long-term goal

BSVT BIG Research

The Berlin BIG Study
• 60 randomized subjects (2 drop outs)
• 20 BIG
• 10 Nordic walking
• 19 Home program

All performed 4x/week for 4 weeks, except for walking - this was 2x/week for 8 weeks (fly is the norm for this)

UPDRS improved for BIG, worsened in others
• BIG was superior to others in TUG & 10 Meter walk


BIG vs. short protocol (5x/week for 2 weeks)
• 42 subjects

Motor performance the same but BIG was more effective to obtain patient-perceived benefits


Delaying Mobility Disability in People With PD Using a Sensorimotor Agility Exercise Program

Now known as Agility Boot Camp (ABC)
• Mov’t principles from tai chi, kayaking, boxing, lunges, agility training, and Pilates exercises

• Easily laid out to follow from simple to more complex activities
• help the “individual achieve large flexible, reciprocal movement, in multiple directions, with upright posture that requires awareness, planning, and pacing.”

“systematically progressed from beginning to intermediate to advanced levels by challenging:
(1) sensory integration (altering vision and/or surface conditions)
(2) adding a secondary, cognitive task
(3) limiting external cues
(4) increasing speed and resistance.

Cool-down activities at the completion of the circuit included adapted floor Pilates: stretching of flexors and rotators, strengthening of extensors, and practice of transitional activities such as rising from a chair, getting onto the floor, rolling, and coming to stand from the floor.”

King LA, et al. Parkinson’s Disease Volume 2013 (2013), Article ID 572134, 9 pages

Constraint Impact on Mobility & Ex Principles

Rigidity Flexed posture, Poor trunk rotation, Decreased ROM
Bradykinesia Slow, small movements Narrow步 Narrow foot

Trunk rotation, Rhythmic movements, Reciprocal movements

CoM Control Large movements

Exercise Actions Progressions
Kayaking: trunk rotation, segmental coordination, speed
Kayaking stroke: diagonal rotation, with reciprocal forward arm extension and backward arm retraction
Speed, surface, resistance, dual task

Level Surface Vision Resistance Dual Task
1 Sit on a chair Normal, well-lit room Holding pole Counting
2 Sit on a Dyna Disc Sunglasses 3lb pole Verbal: make a list
3 Stand on a Firm Surface No-body glasses 6lb pole Verbal/cognitive: math

Pre-Pilates
• kayaking to improve biomechanical constraints on joint flexibility, muscle strength, and postural alignment
• tai chi to improve kinesthesia and increase functional limits of stability
• boxing to improve anticipatory postural adjustments prior to stepping in multiple directions
• lunges to improve the speed and size of automatic stepping for postural correction
• agility course to improve stability and coordination during gait challenged by quick changes in direction, avoiding or overcoming obstacles and simultaneously performing a secondary cognitive or motor task.

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Do cognitive measures and brain circuitry predict outcomes of exercise in Parkinson Disease: a randomized clinical trial

“adapted the ABC program to incorporate additional cognitive, particularly executive function…”

“The purpose of this study is to:
1) determine if people with PD can improve mobility and/or cognition after partaking in the ABC-C program compared to a control intervention of education and
2) determine if cognition and postural, cognitive, and brain posture/locomotor circuitry deficits predict responsiveness to the cognitively challenging Agility Boot Camp (ABC-C) rehabilitation.”


“Stations: 1) Gait training, 2) PWR Moves ©, 3) Agility course, 4) Lunges, 5) Boxing & 6) Tai Chi.
   …multi-directional movements, dynamic postural transitions, axial mobility, big movements and whole body motor sequencing.

• 10–20 min. with rest in between stations
• Each station is progressed by challenging:
  • divided attention with secondary cognitive tasks
  • response inhibition
  • limiting external sensory cues
  • increasing speed and resistance.”

• Outcomes: gait, balance, cognitive domains, and imaging.

1. Tai Chi
   - balance, strength, & gait – up to 3 months later

2. Boxing
   - 6 clients, 24–36 sessions, 90 min, 12 weeks
   - balance, gait, ADLs, & QOL – up to 36 months later

Boxing group vs. Traditional ex group
   - Traditional = stretching, resistance ex, aerobic, & balance
   - 24–36 sessions, 90 min, 12 weeks
   - Both improved with Berg, TUG, Dual-task TUG, & QOL
   - Only Boxing improved with velocity and 6MWT
   - Traditional improved in ABC (perception of their balance)

Research-Based Options

1. Tai Chi

2. Boxing
3. Dancing
• Argentine Tango, Intense Tango
  ○ Balance & gait – up to 1 month later
• Partnered
• Non-partnered
• Contact Improvisation
  2013 study:
  1 hr class, 2x/week for 12 weeks = increased activity participation (leisure, instrumental, & social)

Research-Based Options

3. Dancing
• Argentine Tango, Intense Tango
  ○ Balance & gait – up to 1 month later
• Partnered
• Non-partnered
• Contact Improvisation
  2013 study:
  1 hr class, 2x/week for 12 weeks = increased activity participation (leisure, instrumental, & social)

Dance for PD®
“Dance for PD® offers internationally-acclaimed dance classes for people with Parkinson's disease in Brooklyn, New York and, through our network of partners and associates, in more than 100 other communities in 13 countries around the world. In Dance for PD® classes, participants are empowered to explore movement and music in ways that are refreshing, enjoyable, stimulating and creative.”

www.danceforparkinsons.org

4. Nordic Walking
• Protocol: warm-up, stride length, gait pattern & variability
• 10 meter walk, 6MWT, TUG & PDQ-39

“American Nordic Walking System” www.skiwalking.com
• Provide instructor certification

5. Nintendo Wii™
• Significant improvements in rigidity, movement, fine motor skills and energy levels, as well as lowering depression

Unpublished pilot study

Wii Fit with balance board was an effective HEP for improving static & dynamic balance, mobility, and function.

“Okay Glass, walk with me…”
Movingthroughglass.org

TM Training with Virtual Reality
3x/week for 6 weeks, 45 min sessions
Fall frequency:
6 months before training: TM only = 19.23; TM & VR = 18.26
6 months after training: TM only = 16.48; TM & VR = 8.06
V-Time

MusicandMemory.org
Alive inside: The Power of Music and Memory
Photo credit: Michael Rossato-Bennett, 2012

Push them Hard!!!
15 subjects - moderate PD
16 weeks of high-intensity resistance training with interval training
- Simultaneously challenge strength, power, endurance, balance and mobility function – 40 minute sessions
- 3 sets of 8-12 reps of a variety of strength training exercises (leg or overhead presses) with a 1 min. interval between sets for high-repetition, bodyweight exercises, such as lunges or pushups
- Kept HR high throughout program
- Improved total body strength, leg power, SLS, STS, 6MWT PDQ-39, UPDRS total & motor, & and fatigue severity

The John Argue Method www.johnargue.com

MusicandMemory.org
off meds. The order of scan sessions was randomized across three conditions: 1) off meds, 2) on meds, and 3) after FE while images and a set of fMRI scans. Subjects were scanned under (MRI) protocol including whole brain T1-weighted anatomic of the long-term study, using a magnetic resonance imaging studied in nine mild-to-moderate patients with PD, not part FE Improves Cortical and Subcortical Activation antiparkinsonian medication on the pattern and level of cor-
tical and subcortical activation in PD patients. The mechanism responsible for these changes in motor control intervention ended but also 4 wk after exercise cessation, and in CNS function. Further support for a change in CNS func-
tion after FE is that improvement in the control and coor-
dination of grasping forces is strong evidence for a change measures, the fundamental change in the motor control strat-
t cannot be determined solely through biomechanical tremor motor function after a lower extremity exercise inter-
rodents forced to exercise at high rates demonstrated im-
provement in center of pressure (COP) than VE. Forced exercise: Tandem Biking • Increased pedaling rate (80-90 rpms) • 65-80% target HR • 3x/week x 8 weeks – 1 hour sessions UPDRS motor section scores improved -41% in rigidity, 38% in tremor, and 28% in bradykinesia (even 4 weeks post intervention) Conclusion – FE results in global improvements in motor function for those with PD by possibly triggering the release of neurotrophic factors and possibly dopamine.

Stage Guidelines

In all stages, keep the focus on large quality movements & thoughtfulness of movement

YOPD: high level balance, aerobic, agility and plyometrics; increase the challenge with dual cog & motor loads, keep posture & extension strong

Early Stages (I&II): Probabilities – start before there is a deficit/problem; incorporate functional moves into ex, drive reciprocal arm swing and movements; highlight need to focus on quality of movements not just when ex, but also while “living your life.”

*YOPD and HAY I/II often similar in re approaches

Tandem Biking
In 2003 Jay Alberts PhD of the Cleveland Clinic was raising money for PD research by tandem biking 400 miles across Iowa with an individual with PD. After one full day of biking the individual’s symptoms were all reduced – and her tremor had diminished enough that she was able to write clearly.

“...It is not about the bike, it is about the pedaling”

It is not about the bike, it is about the pedaling

Stage Guidelines

Mid-Stage (III/IV): functional, function, function: training to keep amplitude of movement large t/o all ADLs & gait; motivate to keep exercise at priority; training care-partners proper ways to cue and assist, fall prevention

“EXERCISE = MEDICINE”

Late-Stage (IV/V): training care-partners proper ways to cue and assist, fall prevention, maximizing safe mobility; increased focus on external cues and compensatory strategies; expect greater bradykinesia, delayed processing and answering, “dIT” times and FOG episodes
Take Home Message

• Start therapy/exercise as soon as possible!
• Prehabilitation
• Educate on the sensory – motor disconnect
• Increase the intensity
• Incorporate functional tasks
• Work toward dual tasking
• Focus on large amplitude movements
• Make it important to the patient
• Work the extensors
• Weight shifting and directional changes
• Look for (or create) programs for continued exercise options once therapy ends

One Last Thought...Adults “Work Out” - Children “Play”

How do children stay fit?

Constant Movement
• Running
• Jumping
• Skipping
• Dancing
• Singing
• Laughing
• Imagination

Create ways to make ex enjoyable, functional, and long-lasting.

Resources

• National Parkinson Foundation
  www.parkinson.org (Allied Team Training for PD)

• Parkinson’s Disease Foundation
  www.pdf.org (webinars)

• American PD Association
  www.apdaparkinson.org (Rehab resource link)

• European Parkinson’s Disease Association
  www.epda.eu.com/copingStrategies/

• Email me at: Heather.Cianci@uphs.upenn.edu

Institute for Music & Neurologic Function
musictherapy.imnf.org

LSVT BIG
www.lsvtglobal.com

Parkinson Wellness Recovery
www.pwrlife.org

Rock Steady Boxing
www.rocksteadyboxing.org

Davis Phinney Found. & Michael J. Fox Found.

CurePSP (Atypical Parkinsonisms)  www.curepssp.org

Mother Teresa

I alone cannot change the world.
But I can cast a stone across the water to create many ripples.

Thank you for your time!