FITNESS INSTRUCTOR TRAINING FOR PARKINSONS DISEASE

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OBJECTIVES

- Overview of PD
- Overview of treatments (brief)
- Movement strategies
- Exercise research
- Guidelines for designing fitness programs for PD

An Introduction to Parkinson's Disease

Demographics

Is Parkinson's is not Rare

- Involves 1% of population over age 65
- Increases with age
- By age 70: the disease occurs 120 patients per 100,000 population
- Average age of onset 62 y.o.
- Approximately up to 10% are early onset (Dx before the age of 40.)
- PD prevalence: expected to double by 2030!

What causes Parkinson's Disease?

Parkinson's Disease

- Majority of Parkinson's Disease is idiopathic. (unknown cause) Primary PD
- Parkinson's Gene: Present in 3-5% of PD. Having gene makes you more susceptible for PD but does not guarantee PD.
- Secondary PD: infection, toxins, head trauma, etc.
- Parkinson Plus syndromes- not responsive to traditional PD drug therapies.

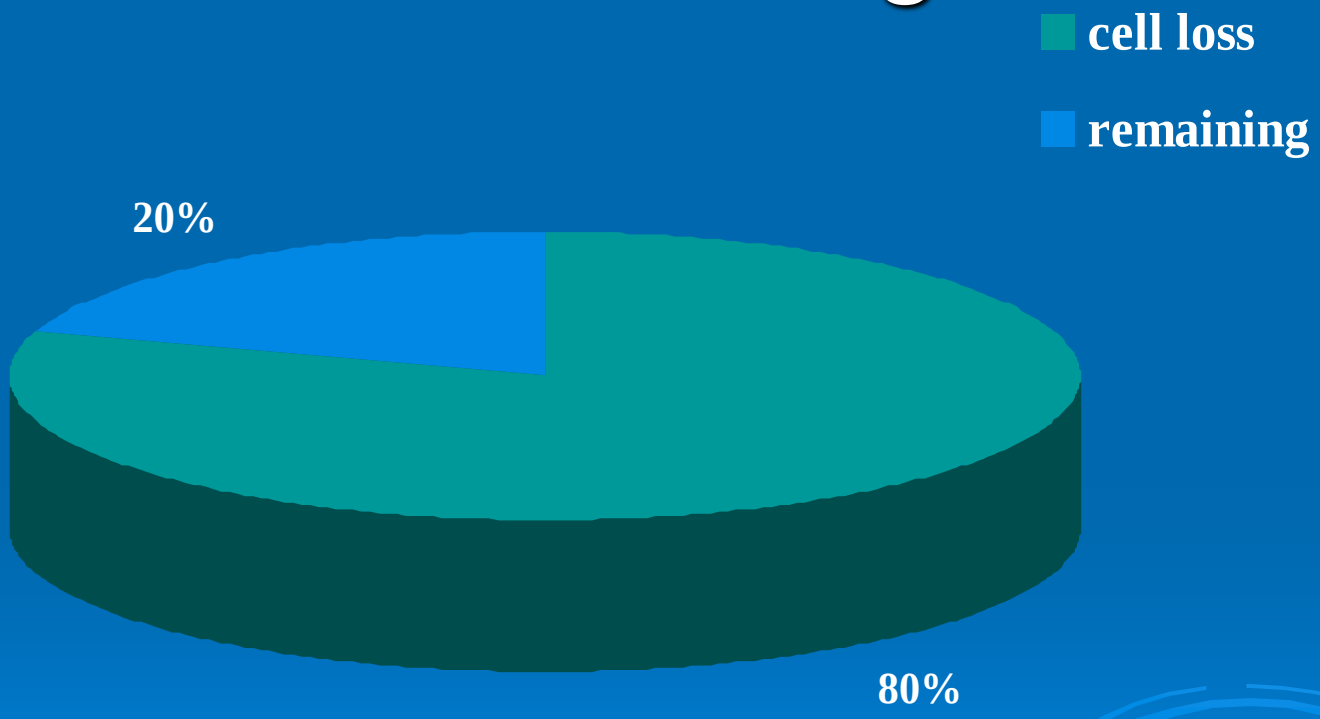
PD Risk Factors

* Exposure to pesticides & herbicides
 * MPTP (methl-phenyl tetrahydopyridine)
    -synthetic narcotic related to heroin
 * Chronic use of neurolyptic drugs
 * Repetitive head trauma
 * Rural Living
 * Well Water
 * Less risk in Smokers and coffee drinkers

How is diagnosis made?

- No specific standard tests readily available to diagnose. DATScan
- Symptomatic & Differential Diagnosis
- Rule out other Parkinson's like symptoms including essential tremors, progressive supranuclear paly, multi-system atrophy, Dementia with Lewy bodies, etc.
- Disease advanced by time of diagnosis / motor symptoms

Symptomatic Parkinson's occurs with loss of 80% of Substantia Nigra



Non-motor Complication- Early symptoms that progress

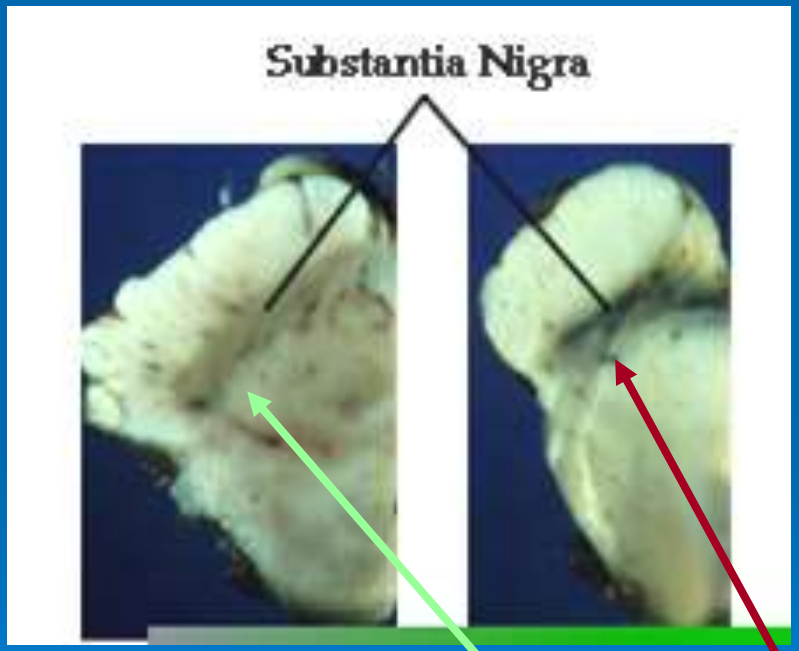
- Autonomic
  - postural hypotension
  - urinary frequency/ incontinence
  - Thermal dysregulation
  - Constipation and other GI problems
  - Sialorrhea
  - Loss of taste & smell
- Pain
- Sleep problem
  - Insomnia
  - REM behavior
  - Excessive sleepiness (side effects of meds)
- Psychiatric
  - Depression
  - Hallucination
  - Dementia (6 x more likely)

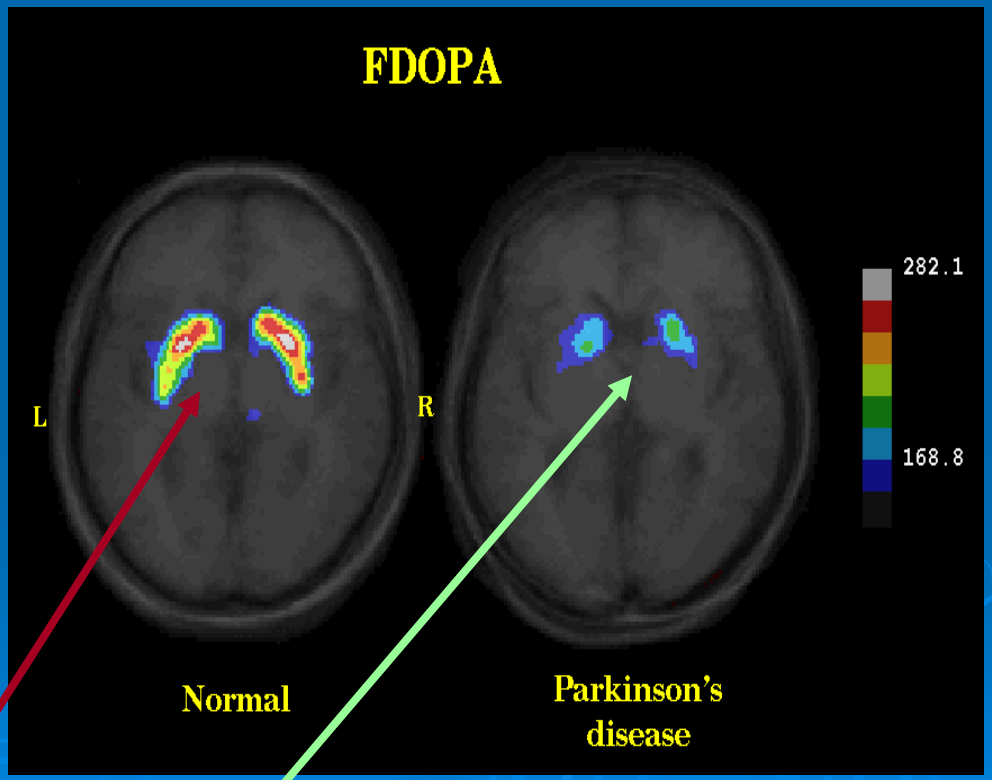
WHAT IS PARKINSON'S DISEASE

What is Parkinson's Disease

- It is a progressive neurodegenerative disease.
- Characterized by movement disorder due to changes in the midbrain (Substnatia nigra)
- Automatic motor responses impaired.

Substantia Nigra damage causes loss of dopamine in brain



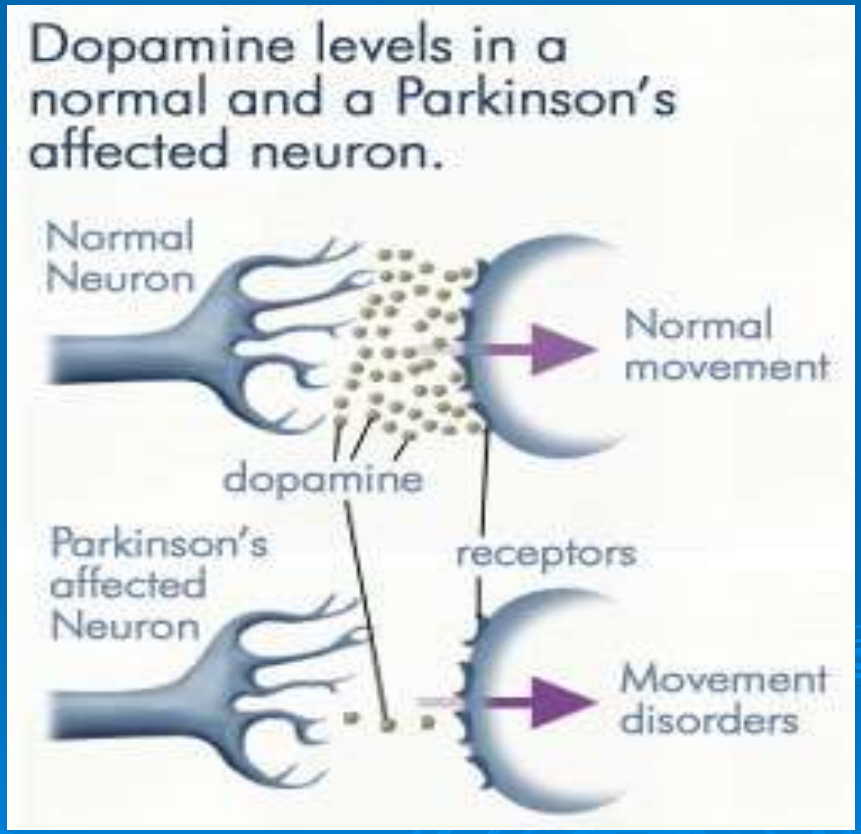


normal

abnormal

Definition: Dopamine

- An important neurotransmitter (messenger) in the brain
- Parkinson's disease is believed to be related to low levels of dopamine in certain parts of the brain.



Neuro-transmitters

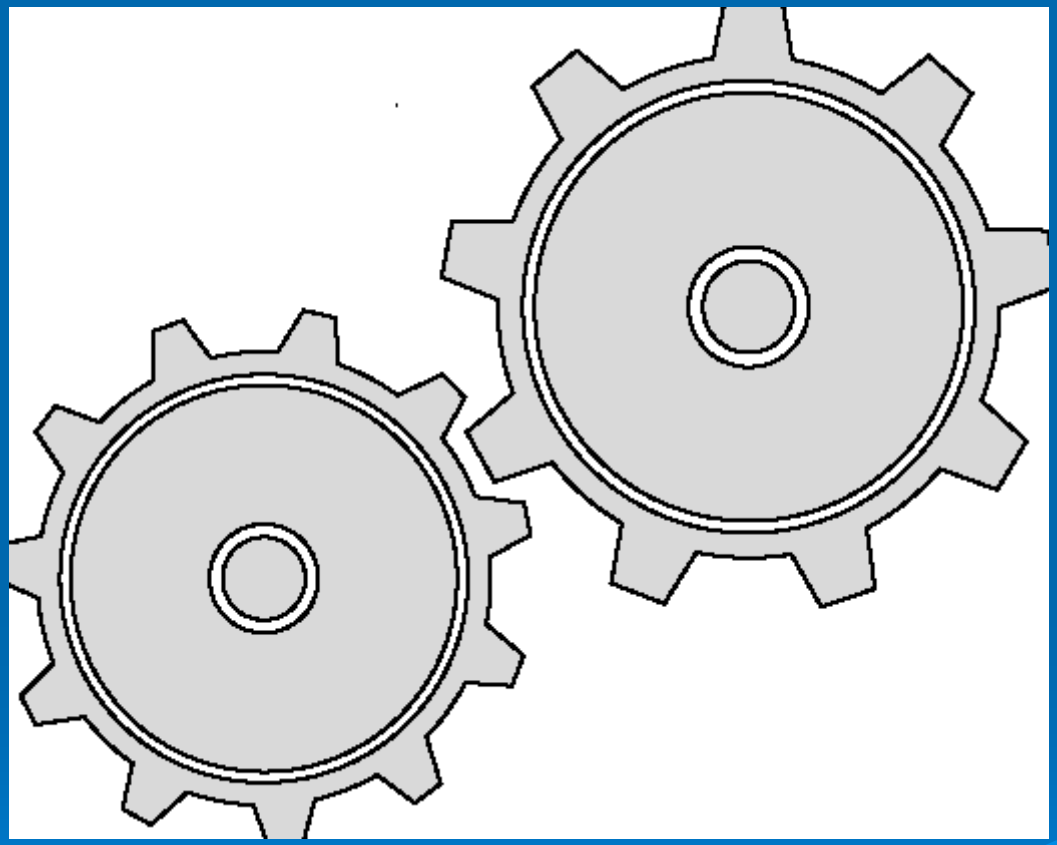
- Primary symptoms of PD are excessive muscle contraction resulting in rigidity (rigidity vs. spasticity).
- Acetylcholine primarily stimulates muscle contraction.
- Dopamine primarily reduces (dampens) muscle contraction.

Parkinson's Disease is not for sissies!

Hallmark of Parkinson's Disease

- Cogwheel rigidity
- Bradykinesia/Akinesia
- Abnormality of posture and gait
- Tremor
- Other: Dyskinesia, Falls

Cogwheel rigidity



Cogwheel rigidity

- Rigidity with superimposed tremor
- Ratchet-like feel
- Felt as tightness or stiffness
- Very different properties than seen in spasticity (upper motor neuron syndromes)

Bradykinesia

Bradykinesia

- Several Theories

  1.) Difficulty in maximizing movement speed when motor output is driven by internal control.

  2.) Unable to generate adequate power/force

  (power= work x distance/time)

  3.) Difficulty in changing motor set (motor plans in readiness.)

Gait Abnormality

- Loss of arm swing
- Stiff legged gait
- Leads with head and shoulders
- Festination (difficulty with initiation and termination. Shuffling style gait)

Gait

Postural Instability

- Emerges later on
- Least responsive to dopaminergic drugs
- Not usually improved following DBS
- Loss of protective reactions: cut tree falling

Retropulsion

- Tendency to fall backwards

- Strategies

  * One hand support when reaching overhead

  * Lower cabinets and close bars (closet)

  * Tai Chi stance for improve BOS (saggital plane)

Tremors

- Resting tremors
- 70% of PD cases
- Will start with one body part like toe or finger.
- Pill rolling
- Tremors reduced with purposeful activity.

FREEZING (Akinesia)

- ‘Episodic’ gait disorders- symptoms are intermittent (e.g.,freezing of gait)
  - very incapacitating because individuals cannot easily adjust to the unpredictable gait problem
- Freezing of gait is associated with a high risk of falls and injuries
- Freezing of gait is independently associated with a decreased quality of life

Freezing Environmental Triggers

- Turning
- Confined Spaces
- Doorways/thresholds
- Perceived obstacles
- Floor surface changes
- Elevators
- Escalators

Turning in Parkinson's Disease

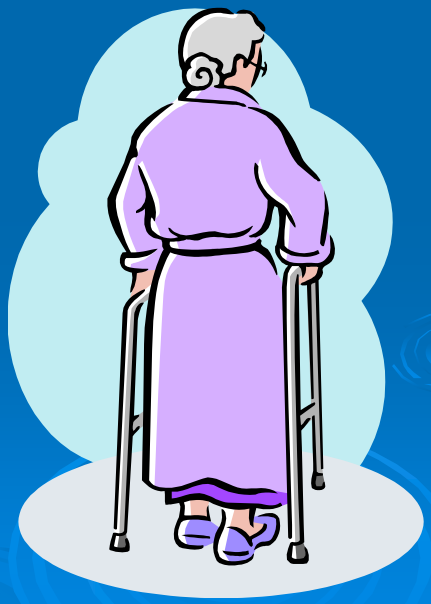
- Individuals with PD often have difficulty turning in bed and while standing
- Turning problems may result from trouble in maintaining an interlimb connection and axial (trunk) rigidity.
  - 'En bloc' turning
  - Levodopa does not seem to decrease turning problems

Definition: Dyskinesia

- Difficulty or distortion in performing voluntary movements.
- Dyskinesia can occur as a side effect of certain medications such as L-dopa and the antipsychotics.
- The word dyskinesia (dis-ki-ne´ze-a) is logically derived from two Greek roots: dys-, trouble + kinesis, movement = trouble moving.

Epidemiology of falls in Parkinson's Disease

- It is estimated that up to 70% of Parkinson's Disease patients fall annually
- 13% fall more than once weekly

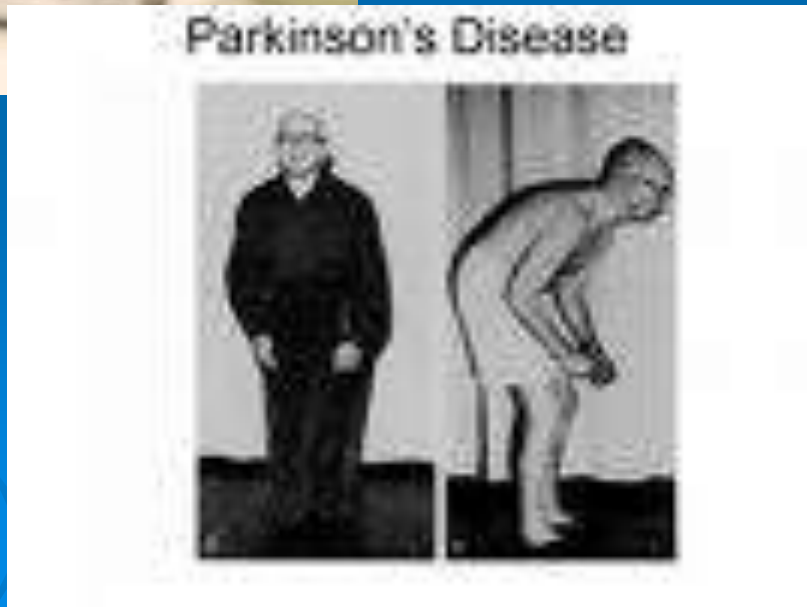


Fractures in Parkinson's patients

- Individuals with Parkinsonism (from any cause) have a more than two-fold increased risk of sustaining a fall-related fracture

Risk Factors for Falls in Parkinson's Disease

- Dyskinesias and sleep disturbances associated with dopaminergic medications
- Orthostatic hypotension
- Freezing
- Compromised posture and postural stability



Other Motor Signs & Symptoms

- Micrographia
- Masked Face
- Decreased eye blinking
- Hypophonia

Broad Categories

- Tremor predominant (best functional prognosis)
- Bradykinesia/akinesia/postural instability/Gait difficulty
- Mixed/combo

Today's Treatments (symptomatic)

- Medication
- Deep Brain Stimulation vs. Ablative (thalamotomy, pallidotomy)
- Future Therapies: Stem Cell, Gene Therapy, experimental drugs, supplements (creatine)
- Physical Therapy & Exercise

Medication side-effects

- Hallucinations
- Orthostatic hypotension
- Sexual dysfunction
- Sleep Disturbances
- Dyskinesia
- Depression
- Impulse control
  - Hyper sexuality
  - Gambling

Medication

On & Off Time

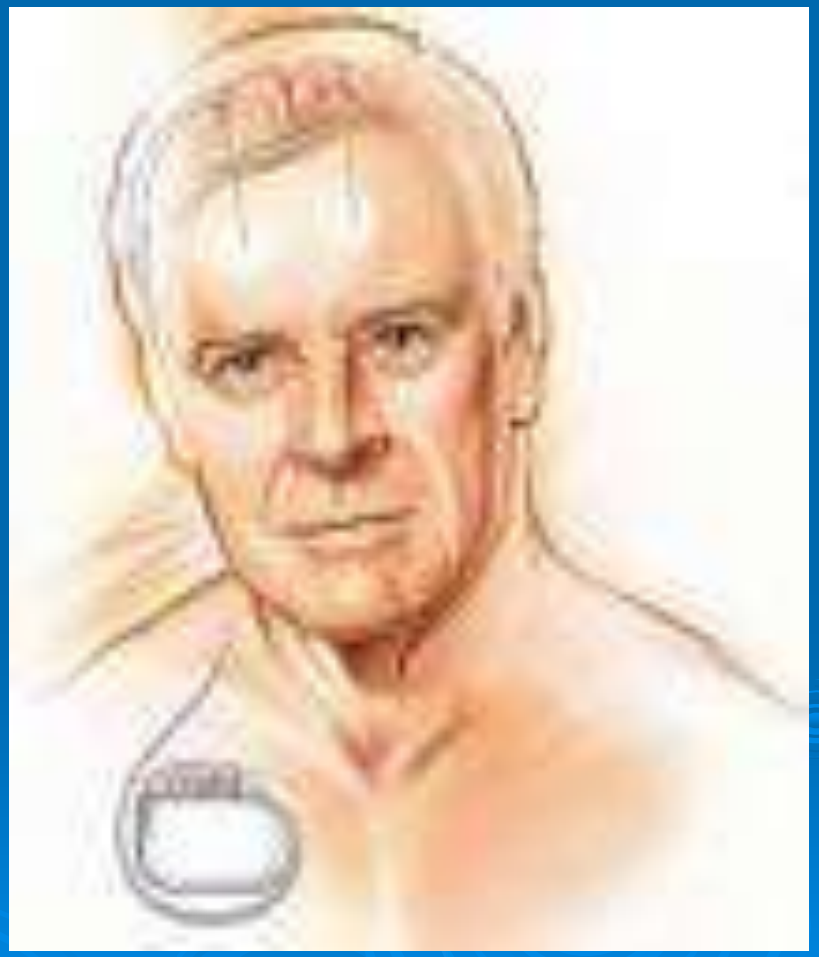
Surgical Options

- Thalamotomy &Pallidotomy
  - Neuroblatin procedures
  - Permanent- non-reversible
  - Unilateral only

- DBS: Replaced above options
  - reversible
  - can be bilateral

- Other: Gene therapy, stem-cell,etc.
  - experimental

DBS



DBS Therapy: When Pharmacotherapy isn't Enough

- As Parkinson's disease progresses, medications may fail to provide consistent and adequate symptom control
- Medications used at levels required for symptom control may produce adverse effects
  - Motor complications, such as dyskinesia
  - Cognitive and psychiatric problems
  - Nausea, hypotension, and other systemic effects

Non-pharmacological treatment

- Physical Activity & Exercise

PHYSICAL ACTIVITY

- Early Intervention should always be the focus.
- Rationale for exercise

  - Education on Movement Strategies
  - Increase ROM
  - Improve co-ordination of movement
  - Improve/maintain posture and functional abilities.
  - To prevent secondary sequelae
  - TO MINIMIZE FALLS!

Movement Strategies

- No more automatic pilot/ Purposeful movement
- Conscious posture/darn that gravity
- Blending/sequential movement
- Freezing/external cues/anti-freezing techniques
- Festination (PD gait)/walking strategies

No more automatic pilot

- Prior to PD you did not have to think to move.
- The automatic pilot does not always work especially during wearing off (off periods) of medications.
- During off periods, you need to turn off the faulty automatic pilot and fly the plane manually!

Purposeful Movement

- Ability to move is not lost
- Basal Ganglia is responsible for automatic motion in learned motor tasks
- Bypass the depleted basal ganglia and use fronto-corticol pathways instead (requires conscious thought)

No more automatic pilot/ Purposeful movement

- ***Visualize***
- ***Plan***
- ***Sequence (one step at a time)***
- ***Complete***

Blending Movements

No More Multi-Tasking

STAY IN THE MOMENT

Turn your patient's into mental surfers

Blending movement

Sequential movement

One step at a time. Complete each step.

Manual flying applied to walking

- Focus on a target down the road.
- Keep stringing targets together to avoid stopping/freezing.

POSTURE

"Your back will tell you that Sister Anne Marie was right."

Conscious posture/darn that gravity

- POSTURE,POSTURE,POSTURE,POSTURE,POSTURE,POSTURE,POSTURE,POSTURE,POSTURE,POSTURE, POSTURE POSTURE,POSTURE,POSTURE,POSTURE,POSTURE,POSTURE,POSTURE,POSTURE,POST

Poor Posture=Poor Function

- Sit posture drill (decrease ADLs)
  (Dressing, etc.)
- Promotes freezing/festination
  (COG in front of base of support)
- promotes retropulsion (Inclines, reaching overhead)
- Need to learn to manually manage one's own COG

Typical PD Posture

Freezing/external cues/anti-freezing techniques

- Initiating Movement (poor man's hula)

External Cues

- Attention- conscious movement
- Auditory- Rhythm
- Visual- Marker/target
- Tactile- Sensory Stimulation

External cues

- Visual: Imaginary Line, tape, laser
- Auditory: Talking to self,counting,)
- Focus on a target/destination
- External focus vs. Internal focus (study)

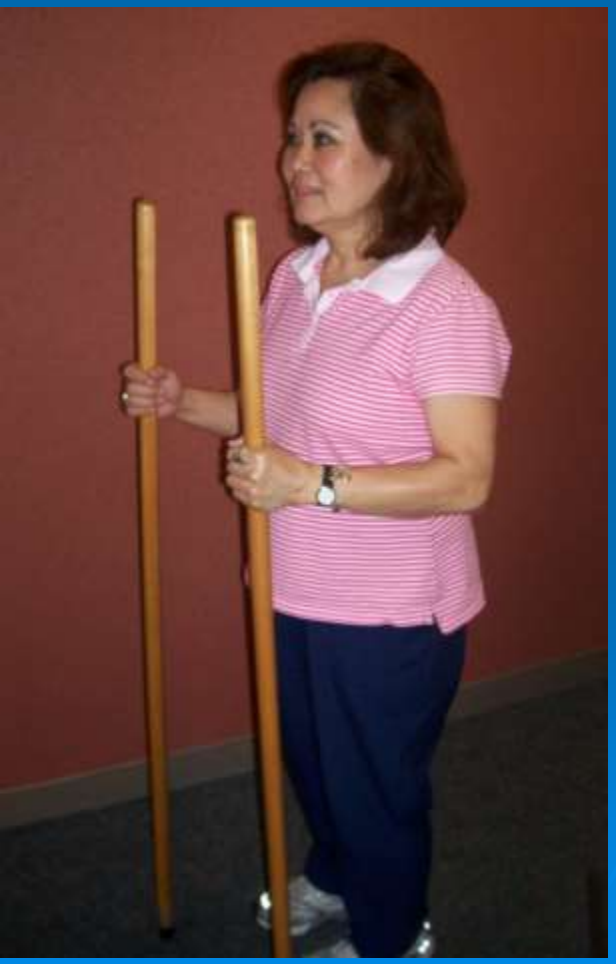


Anti- Freezing Strategies

- **Stop when freezing occurs. Do not attempt to move through it as it often leads to loss of balance.**
- **Restart movement with a purposeful step (*See Poor Man's Hula*).**
- **Visualize stepping over an imaginary object.**
- **If doorways and elevators are a problem, try to look past the threshold focusing on where you want to go to versus the threshold itself.**
- **See what tricks work for you and practice these strategies. Having done this may decrease anxiety lessening the "freezing affect".**

Walking Strategies

- Four Point Gait



Walking Strategies

- “The British Soldier”

Walking Strategies

- Heel First

Assistive Devices

- Balance & Posture vs. Off-loading
- Stability vs. Mobility

Specialty Devices

- U-Step Walker (Laser)

Specialty Devices

- Next Step Cane

Captain Cheapo

Walking Poles

- Nordic poles or wooden sticks

Functional Mobility

- Coming to standing

Coming to standing

- Sit to stand




Exercise!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!


NEW VISIONS. IT'S ONE'S OWN FAULT
IF HIS ENTHUSIASM IS GONE. HE HAS
FAILED TO FEED IT. IF YOU WANT TO
TURN HOURS INTO MINUTES, RENEW YOUR

WHY

- Animal studies show that exercise has shown trends of being neuro-protective.

- Human Studies generally indicate that more physical activity is associated with lower PD risk and/or improved management of PD motor symptoms.

Animal Studies

- •At Rhodes University in Memphis, TN, Dr. Gerecke et al. report that exercise can protect mice against toxic exposure (MPTP).
- Dr. gerecke showed that 3 months of exercise provided complete protection against MPTP-induced neurotoxicity in mice.
- Daily, sustained exercise was necessary for full protection.

Benefits of Exercise (Zigmond et al)

- Aerobic exercise showed increased blood vessels in the brain. (Causing increased waste removal)
- Balance exercise showed increase synapses.
- Aerobic and (questionably) balance activities showed increase brain cell survival factors (neurotrophic factors)

Other Exercise & PD Research

- Forced Exercise- Dr Alberts, theracycle
- Wash U-St. Louis (Tango)

  -Compared Tango, Waltz, Tai Chi, no intervention.

  - All exercise groups improved on balance, distance walked & disease severity ratings

  - Only Tango improved on quality of life, and backward walking.

Benefits of Exercise: Unanswered Questions??????????????????

- How much is needed (Ex Volume)?
- What type is most beneficial for staving off symptoms?
- What type is most beneficial for preventive measures?
- What intensity is required for good results?

Exercise Types

- Yoga, Weight Training, Tai Chi, Boxing, Cycling, Spin Class, Aqua, Walking, Swimming, Gardening, etc, etc.
- It's All Good!
- Find Something you like to do and do it!
- Do it daily if can or at least something physically active 3 x a week as a minimum.

Types of Exercise

- Resistance training such as lifting weights
  - A small number of trials suggest that resistance training is effective for increasing muscle strength, endurance, motor speed, and equilibrium
  - Should target postural muscles (rows, pulleys, hip extension, etc.)
  - Focus on speed for power

Types of Exercise

- Aerobic exercise such as walking, swimming
  - More intense aerobic exercise (body supported treadmill) associated with improved motor function, including walking speed, and step length compared to low intensity or no exercise.
  - "forced" exercise may result bigger improvements than self paced exercise (Clevend Clinic- J. Alberts)

Types of Exercise

- Flexibility training such as stretching, yoga, and tai chi
  - Tai chi has been reported to improve balance and mobility in patients with PD (2008)

EXERCISE SAFETY CONSIDERATIONS

- Low blood pressure/orthostatic hypotension: Go slow after transitions from lying to sitting and sitting to standing
- Fall Risk/Postural Instability: standing with chair/walker, sitting vs. standing, partner/assist, Tai Chi /Stability pose
- Co-morbidities due to age
- EVERY ACTIVITY CAN BE MODIFIED

Exercise Guidelines for PD

- Big Posture, Big Movements, Big Voice
- Purposeful Movements/Manually Manage COG Tai Chi pose for stability in stance
- Rotation/Functional Movements
- Intensity- incorporate intervals of intensity
- Have Fun

EXAMPLES

THE END

QUESTIONS

??????????????

??????????????

??????????????