THE IMPORTANCE OF MOVEMENT WITH PARKINSON'S SYNDROME

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Presentation Outline

- Diagnosis of Parkinson's Syndrome
  - Motor & Non-motor symptoms
  - Symptoms that can precede the diagnosis
- Treatment of Parkinson's Disease
  - Oral Medications and Surgical Management
- Parkinsonism & Physical Exercise
- Parkinson's Disease and Rehabilitation
- Online video exercises for Parkinson's.
- Presentation Take-Home Points

Prevalence Of Parkinson Syndrome

- 1-2% of individuals over age 60.
- 0.3% of the population (industrialized countries).
- Incidence of Parkinson's increases with age, but 5-10% of people with PD are diagnosed before age 60.
- Men > Women 1.5 : 1

(Cuccurullo et al. 2010, Frazzitta et al. 2013, La Jolla Institute 2022)

Cardinal Motor Signs

- Motor Symptoms in Parkinsons Syndrome- **TRAP**
- **T**remor- at rest, circular motion
- **R**igidity- stiff with movement
- **A**kinesia/Bradykinesia- slow or no movement
- **P**ostural Instability- lose balance when upright
- PD Diagnosis:
  - Akinesia/Bradykinesia
  - AND 1 of (T,R, or P).

Hughes et al. 1993

Non-Motor Symptoms

- Sleep: Insomnia, somnolence, & fatigue.
  - Restless Leg Syndrome (RLS).
  - REM sleep behavior disorder (RBD).

- Autonomic:
  - Cardiovascular: Orthostatic hypotension
  - GI: Constipation, gastroparesis, dysphagia
  - GU: Urge incontinence, frequency, nocturia, sexual dysfunction.
  - Diaphoresis: Drenching sweats at night.

Non-Motor Symptoms

- Neuropsychiatric/Cognitive:
  - Mood.
  - Apathy.
  - Hallucinations /Delusions.
  - Cognitive Impairment.
  - Memory historically has been believed to be okay early on.

Symptoms That Often Precede The Diagnosis

- REM Behavior Disorder- acting out dreams.
- Smelling deficits- can cause weight loss.
- Hand and foot deformities- flexion in fingers, extension at big toe, flexion at others.
- Worsening depression.
- Slowed response time/thinking.

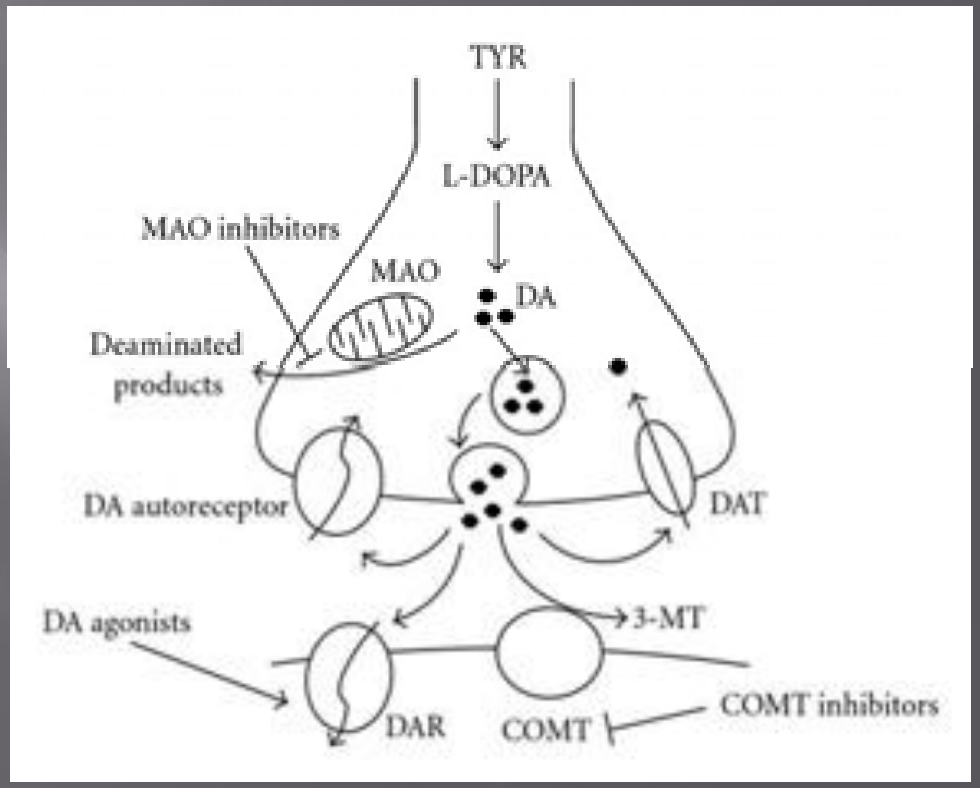
Fig. 1: Left side striatal toe

Treatment Of Parkinsons Syndrome

- Oral Medications .
- Surgical Management.
- Physical Exercise.
- Mental Exercise.

Oral Treatment Of Motor Symptoms

- Levadopa/Carbidopa
- DA agonists
- Amantadine
- Anticholinergics
- MAO-B Inhibitors
- COMT Inhibitors



Carbidopa/Levadopa (Sinemet)

- Levodopa → Dopamine
- Carbidopa added to prevent peripheral conversion to dopamine.
- May start 25/100 tab 3x/day and titrate up.
- 1000-1200 mg/day of Levadopa can be used.
- Levadopa side effects:
  - Nausea, drowsiness, orthostatic hypotension, hallucinations, dyskinesias (extra movements).

Sinemet Trial

- Objective assessment
  - Typically prescribed by PM&R physician and done by physical therapy 1 week apart with no other intervention.
- What does it consist of?
  - Several standardized cognitive and physical tests pre and post medication treatment.
- Objectivity- helps us determine if meds might work and can help differentiate Parkinsons Disease from Atypical Parkinsons.

Example Patient

- 70 year old woman referred to me for evaluation of back pain.
- Gait: slightly stooped gait with flexed forward posture shortened stride length and unsteadiness of gait with some history of orthostasis, and a slight dyskinetic head tremor.
- Family history: positive for Essential Tremor and Parkinson Disease.
- Referral to Neurology came up with initial diagnosis of Essential Tremor.
- She was started on Primidone and then Propranolol with limited improvements.

Sinemet Trial

Test	Prescore	Postscore	Change
MOCA	25/30	29/30	+4
BERG Balance	25/56 ,with assistive device (AD)- single point cane.	51/56, No AD needed.	+ 26pt change (+ no AD needed)
10meter walk (avg 3trials)	25 seconds. With AD	6.3 seconds. No AD needed.	+.82m/sec improvement (+ no AD needed)
TUG	55.25 seconds. With AD.	9.6 seconds. No AD needed.	45.66 seconds quicker. (+ no AD needed)

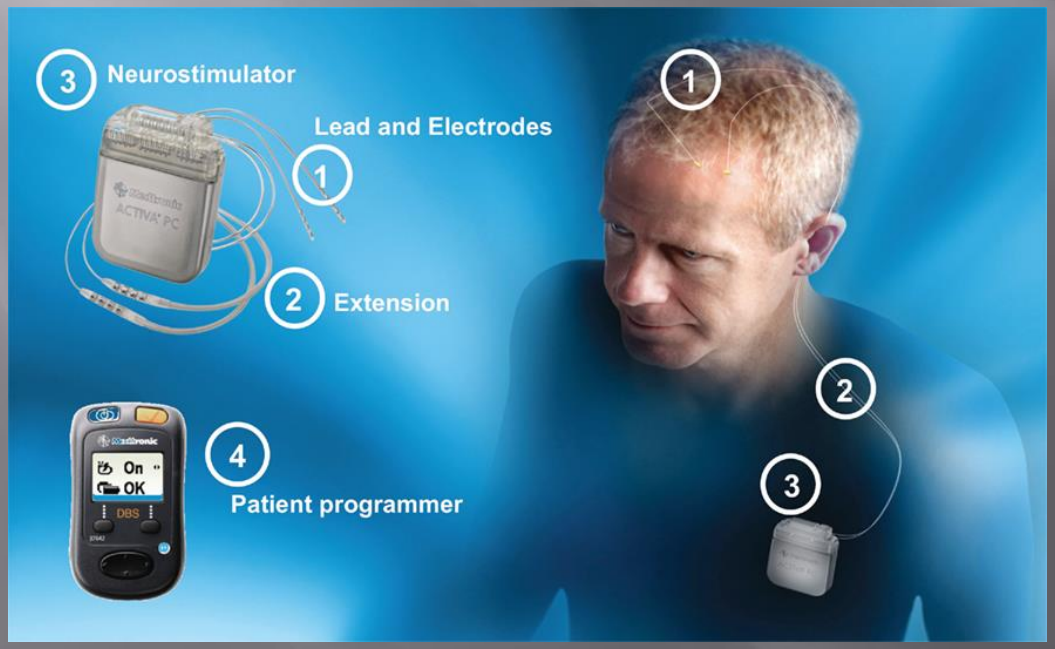
Prescore: Sinemet naïve.
Postscore: After 1 week of Sinemet 25/100 TID. Med taken 1hr prior to trial.

What This Means Functionally

- MOCA: Impairment (<26) to normal.
- BERG Balance: From medium (21-40), to low fall risk > 41.
- 10m Walk: community ambulator defined as > 0.8m/sec. So less than 12.5 seconds. Pt initially was 25 sec with no med and then 6.3 seconds with Sinemet.
- TUG: less than 11.5 seconds shows decreased likelihood of falls. For every 1 second > 11.5 sec there was a 2.5% increased risk of falls. Pt went from 55.25 seconds with no med down to 9.6 seconds with med.

Surgical Management Of Parkinsons

- Deep Brain Stimulater (DBS) used to treat motor symptoms (TRAP) of PD .
- Tremor most common reason for use
- Typically used if PD meds aren't effective.
- Typically 2 leads are placed in each structure.



The Importance of Exercise With Parkinsons

Exercise And Non-Motor Symptoms Of Parkinsons

- Exercise can improve sleep quality, RLS, depression, & GI motility. (Kaplan 2013).

- Parkinson's Outcomes Project.
  - Found that depression was the most important factor influencing health status of PD patients.
  - Exercise is widely known to improve depression.

"Capturing Ambulatory Activity Decline in Parkinson's Disease." (Cavanaugh et al. 2012).

- 33 PD pts with Modified H&Y Stage 1-4.
- Used accelerometers for 7 days at baseline & 1 year.
- Parameters measured included number of steps/day, intensity, frequency (total # of bouts), & duration.
- Results:
  - Neither frequency or duration of activity changed.
  - Number of steps decreased by 11%.
  - Time of participation in moderate-intensity exercise (> 100steps/min) decreased by 40%.

Modified H&Y Staging

- STAGE 0 = No signs of disease.
- STAGE 1 = Unilateral disease.
- STAGE 1.5 =Unilateral plus axial involvement.
- STAGE 2 = Bilateral disease, without impairment of balance.
- STAGE 2.5 = Mild bilateral disease, with recovery on pull test.
- STAGE 3 = Mild to moderate bilateral disease; some postural instability; physically independent.
- STAGE 4 = Severe disability; still able to walk or stand unassisted.
- STAGE 5 = Wheelchair bound or bedridden unless aided.

Goetz et al. 2004.

Falls And Parkinsons

- 30% of people over 65 yrs living in the community fall each year (Gillespie et al 2012).
- 70-87% of people with PD sustain a fall that results in injury during the course of their disease. (Nocera et al. 2013).
- 70% of PD pts who fall, fall recurrently and frequently (Allen et al. 2013).

Inactivity & Functional Decline Associated With Parkinsons

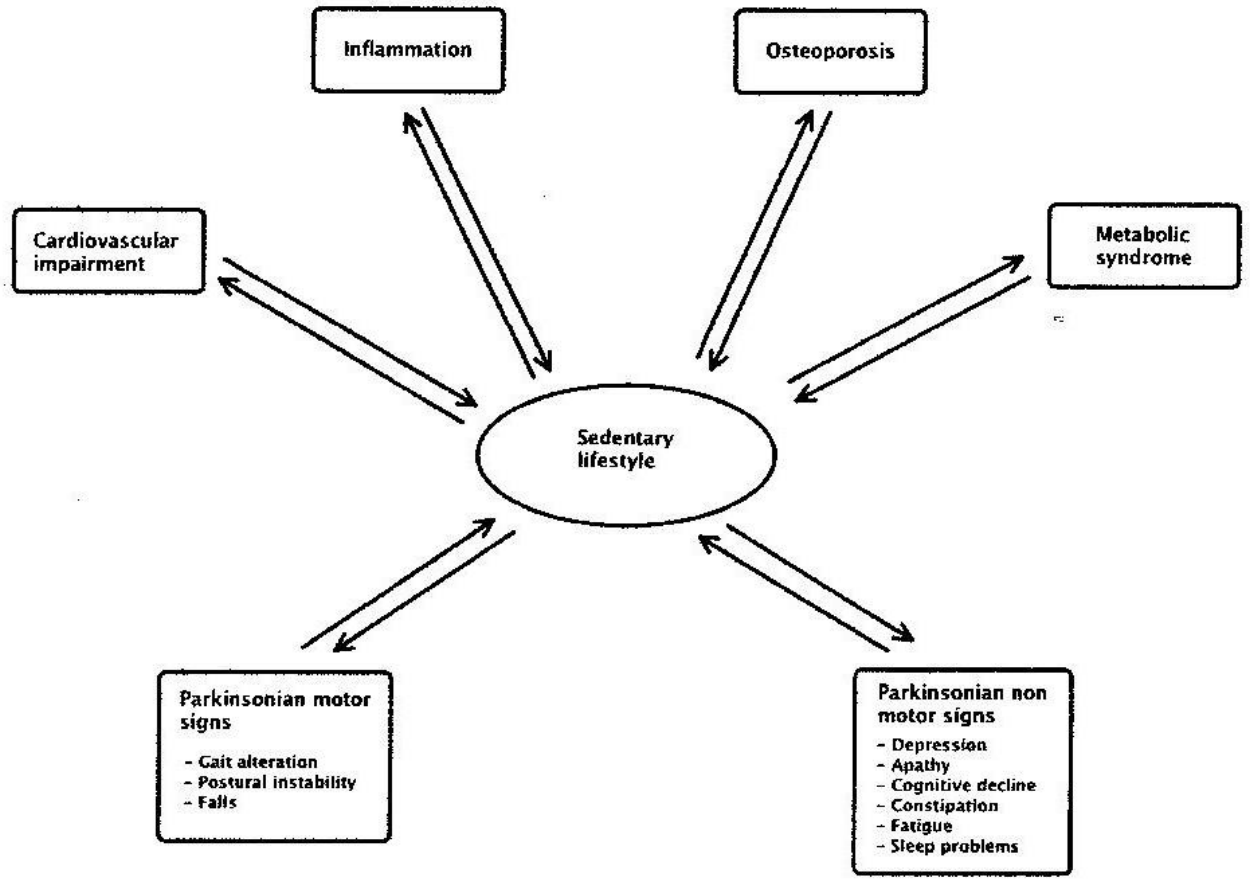


FIGURE 1 *Lack of exercise in Parkinsonian patients sets up various adverse reciprocal multiplicative effects, both at the central and peripheral levels. These effects, in turn, worsen the motor and nonmotor PD symptoms, and a vicious circle ensues (modified from Speelman et al., 2011).*

Frazitta et al. 2013.

How Do We Prevent Falls In Parkinsonism Patients?

- **EXERCISE!!!**

- Both Aerobic & Resistive Exercise Protocols have shown promise in fall reduction in PD pts.

(Morris et al. 2012 & Allen et al. 2010)

Exercise Benefits

- "The *Parkinson's Outcomes Project* shows that people with PD who start exercising earlier and a minimum of 2.5 hours a week, experience a slowed decline in quality of life compared to those who start later. Establishing early exercise habits is essential to overall disease management. " (Online published Parkinsons Foundation, May 2022)
- https://www.parkinson.org/Understanding-Parkinsons/Treatment/Exercise

Aerobic Exercise Can Be Neuroprotective

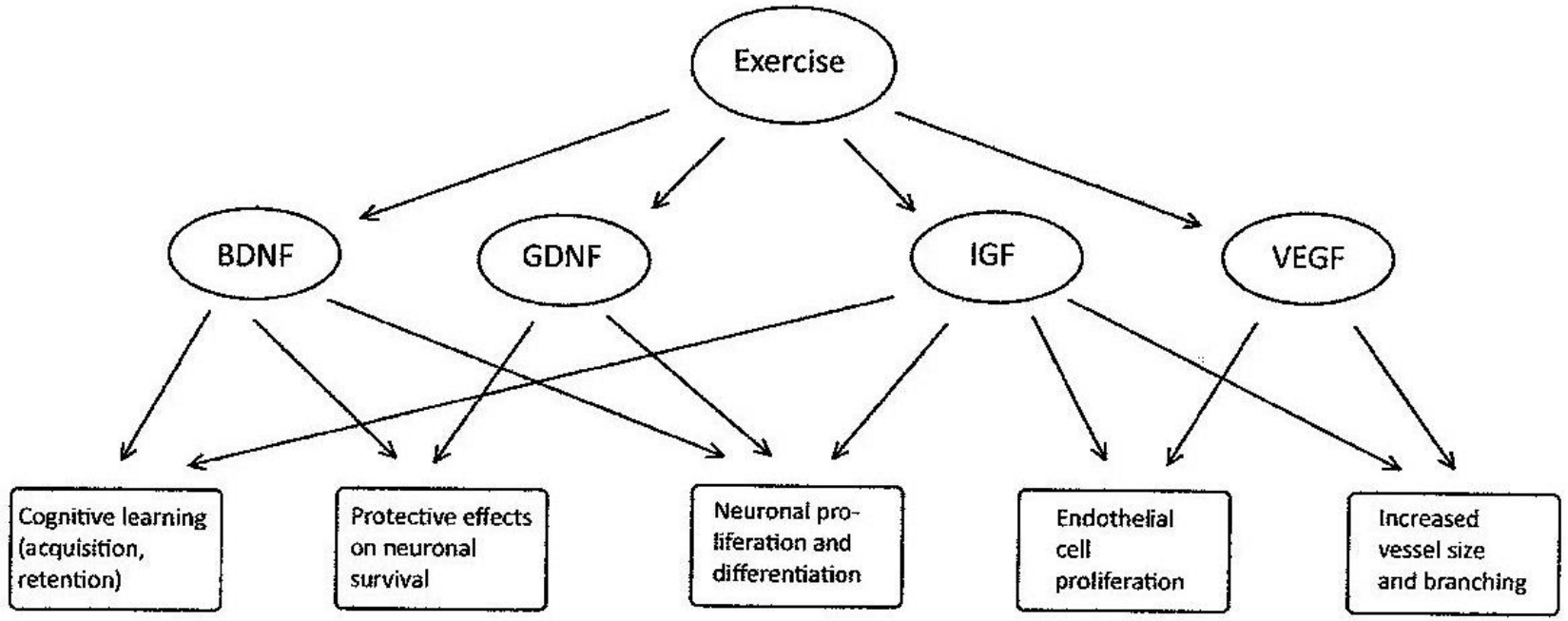
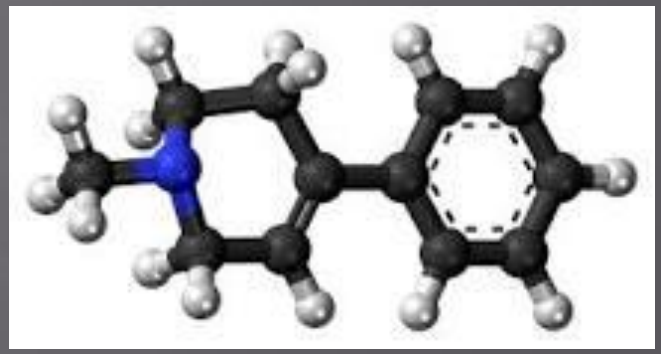


FIGURE 2 *Through growth factor production, exercise can regulate neurogenesis, angiogenesis, neuroplasticity, and learning. BDNF, GDNF, insulin growth factor-1 (IGF), and vascular endothelial growth factor (VEFG), derived from central and peripheral sources, modulate exercise-dependent effects on the brain (modified from Cotman et al., 2007).*

Frazitta et al. 2013.

Aerobic Exercise Can Be Neuroprotective

- MPTP is a precursor drug to MPP+ which causes permanent Parkinsonism in mice.
- 3 months of regular running showed near complete protection from the MPTP chemical and mice didn't develop Parkinsonism.
- 1-2 months of daily exercise or reduced frequency of the exercise over 3 months showed some protective effect but it was not as robust.



MPTP: 1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine

1-Methyl-4-phenylpyridin-1-ium

Gerecke, Et. Al. **Exercise Protects Against MPTP-Induced Neurotoxicity in Mice.** Brain Res. 2010 Jun 23; 1341C: 72–83.

More Aerobic Exercise And Parkinson Disease

- Tajiri et al. (2010) also showed in PD rat models that intense treadmill exercise increased dopamine availability throughout the Substantia Niagra.

PD And Inpatient Rehab

- "Effectiveness of Intensive Inpatient Rehabilitation Treatment on Disease Progression in Parkinsonism Patients: A Randomized Controlled Trial With 1-Year Follow-up."

Frazzitta et al. 2012

Purpose

1. Test whether inpatient rehab therapy (IRT) is effective in improving motor performance and autonomy in ADL's.

2. Evaluate if any benefits persist to reevaluation one-year later.

3. Investigate whether a second rehabilitation cycle administered after 1 year has further benefits.

4. Evaluate whether the treatment reduces the need for L-Dopa.

Treatment & Control Groups

- Treatment Group:
  - PD specific therapy.
  - 3 x 1hr sessions per day 5 days/wk for 4 wks.
  - At Discharge Patients Instructed To:
    - Continue exercises for spine, scapula, & pelvis.
    - Walk at least 30 min/day.

- Control Group:
  - Usual care. Parkinson's meds & instructed to walk & exercise at home.

L-Dopa Dosage

1. Treatment Group: L Dopa need was decreased by 52mg P=.04 (T0 to T2).
2. Control Group: L Dopa need was increased by 30mg P=.015 (T0 to T2).

Conclusions

- Significant gains in functional independence.
- 1 year post inpatient rehab, PD patients had a reduction in their L-Dopa derived medications.
- 1 year post inpatient rehab, PD patients maintained most gains from their inpatient rehab therapy.
- A second inpatient rehab stay had further gains & functional independence.

Virtual Coach & Home Rehab Exercise Training

- "Feasibility of a Virtual Exercise Coach to Promote Walking in Community-Dwelling Persons with Parkinson Disease."

Elias et al. 2013

Objective & Methods

- Objective:
  - Explore the feasibility of a virtual exercise coach to promote daily walking in community dwelling persons with PD.

- Methods:
  - 20 pts with PD.
  - Baseline used a pedometer to assess total daily steps, 6-minute-walk test, 10-meter-walk test, & max walking speed.

Methods

- Follow-up visit: 15 min tutorial about using a PC tablet , the online virtual coach program, & pedometer.
- Pt to wear the pedometer & plug into PC daily.
- Follow-up calls by research team on day 2, 14, and 28.
- Assessment:
  - Day 30: 6-min-walk test, 10-meter-walk test, & a survey regarding the patient experience.

http://links.lww.com/PHM/A62

Results

- Significant values at P = 0.05.
  - Walking distance improved in the 6-min-walk-test (mean 460 ft to 484ft).
  - Self selected walking speed improved in 10-meter-walk-test from 1.19 m/sec to 1.26m/sec or (8.4 sec to 7.9 sec for 10 meters).
  - Maximum walking speed improved from 1.66m/sec to 1.77m/sec.

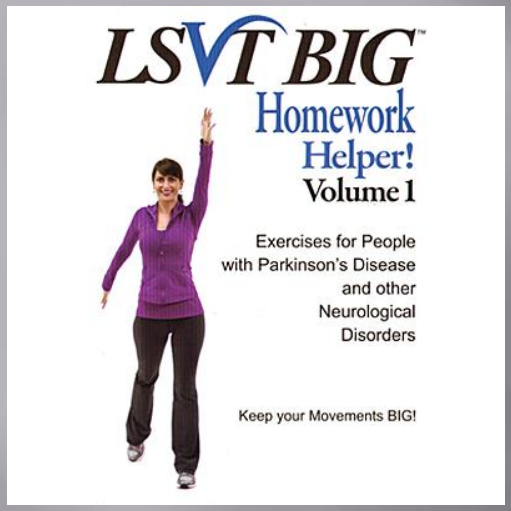
So What Types of Exercise

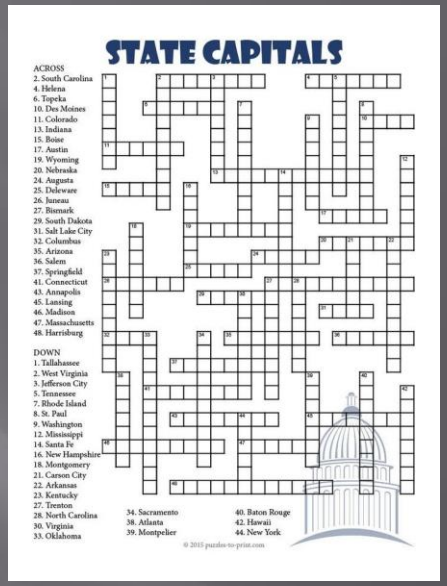
- Whatever gets you moving…
- Best results with repetitive type exercise at increased revolutions or repetitions/min.
  - Examples: Boxing, Cycling, Rowing
- How frequently?
  - 5 days per week. This helps establish the pattern of quickened movements.
- Aerobic Exercise: upregulates the brain growth factors.
- Strength Exercise: helps establish muscle motor control and strength to prevent falls.

So What Might An Ideal Program Look Like?

https://www.youtube.com/watch?v=aaY3gz5tJSk

And Don't Forget Treatment For The Cognitive/Speech





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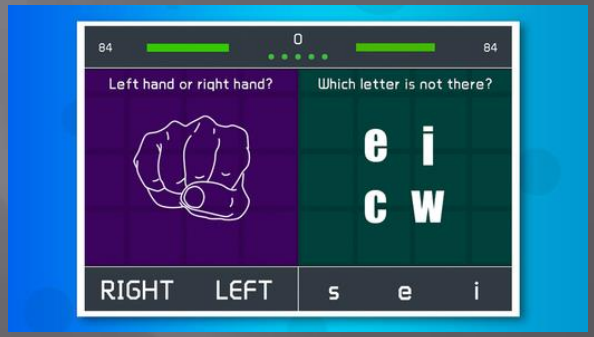

Parkinson's Foundation Exercise Videos

- You Tube Channel of the Parkinson's Foundation
- In the search bar type:
  - Parkinson's Foundation Fitness Friday
  - Filter by last month if you want most recent ones.

- Weekly videos to help with balance, posture, strength, aerobic exercises, and even vocal exercises.

Some Of My Favorites

- Sit and Fit- aerobic exercise from a chair.
  - https://www.youtube.com/watch?v=AZV3_NfcpVs
- Focused Interval Training- about half done in a chair.
  - https://www.youtube.com/watch?v=9_2UDGF7Pck
- LSVT Loud- Speech therapy guided exercises
  - https://www.youtube.com/watch?v=L8bkqvf6TRs
- Balance
  - https://www.youtube.com/watch?v=uOljoOvycuo
- Strength management and multitasking for Brain and Body
  - Parkinson's Brain and Body Fitness Friday Exercises – YouTube

Downloadable "Fitness Counts" for Parkinson's Book

- https://www.parkinson.org/pd-library/books/fitness-counts?utm_source=google&utm_medium=adgrant&utm_campaign=&utm_term=exercises%20for%20parkinsons%20disease&gclid=EAIaIQobChMIqfqw-u3K9wIVysLCBB23IwUtEAAYASAAEgLSDvD_BwE
- There are sample exercises with pictures that patients can do at home.

Take-Home Points

- Epidemiology: Prevalence 1-2% over age 60
- Diagnosis
  - Bradykinesia plus (tremor OR rigidity OR postural instability)
  - Supported by response to levodopa
- Precursor symptoms can precede the diagnosis.
- Both Motor and Non motor symptoms are benefited by aerobic exercise.
- Sinemet trials can objectively assess whether a patient is a Sinemet responder.

Take-Home Points

- Repetitive exercise has demonstrated gains in function & reduction in Parkinson meds.
- Even virtual coach guided-therapy has been shown to be effective.
- Frequency, increased velocity (revolutions or repetitions/min), duration, and patient accountability are all important.
- Parkinson's Foundation at https://www.parkinson.org
- You Tube Parkinson's Foundation Channel
  - https://youtube.com
  - Search: Parkinson's Foundation Fitness Friday

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