

EXERCISE IS MEDICINE FOR PEOPLE WITH PARKINSON'S

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SUCCESS STORIES: ALL THE WAYS I'VE SEEN EXERCISE HELP



- Improve** • Improve mobility + quality of life
- Maintain** • Maintain improvement over long periods of time (slow disease progression??)
- Treat** • Treat symptoms that are resistant to other types of treatment
- Help** • Help someone recover faster after an injury

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19 YEARS AFTER PD DIAGNOSIS – AMAZING ATHLETE!

- Ann
- 59 years old (in 2023), Diagnosed at 40 years old (PD x 19 years)
- Started Physical Therapy/Exercise when she stopped working in 2012.
- LEDD in 2012 was ~1500mg
- LEDD in 2023 is ~1000mg

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22 YEARS POST DIAGNOSIS: 10 YEARS OF EXERCISE SUPPORTS LESS FREEZING AND BETTER WALKING OVERALL!

- Dennis
- 74 years old (in 2023)
- Diagnosed with PD 2001
- Bilateral STN DBS in 2009

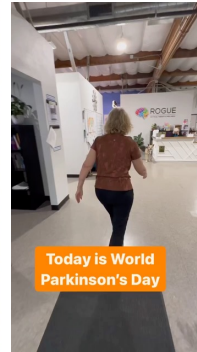
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75 YEARS OLD, 14 YEARS POST PD DX



We don't rise to the level of our expectations, we fall to the level of our training.

Archilochus



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POSTURAL IMPROVEMENT WITH EXERCISE



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IMPROVING FREEZING OF GAIT



- 73 years young
- Diagnosed with PD ~1.5 years ago

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**MANY FORMS
OF EXERCISE
ARE SHOWN
TO IMPROVE
SYMPTOMS**

**THERE ARE A
LOT OF WAYS
TO DO
AEROBIC
EXERCISE**



Aerobic Exercise



Balance Training



Amplitude/Functional Mobility Training



Strength Training



Dancing

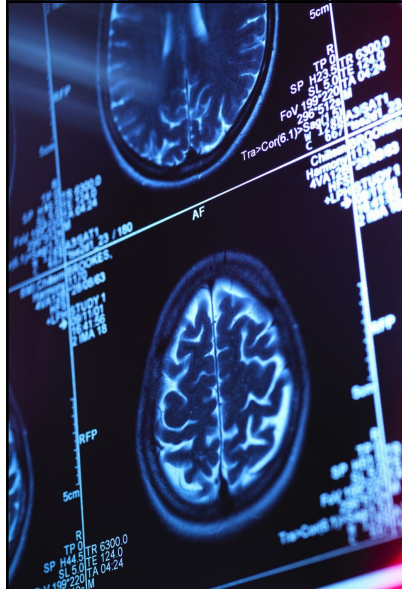


Boxing



Tai Chi

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IS OUR GOAL
TREATING SYMPTOMS

OR

SLOWING DISEASE
PROGRESSION?

OR

BOTH??

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POTENTIAL MOTOR/NONMOTOR TARGETS OF AEROBIC EXERCISE IN GENERAL!

- Prevention of cardiovascular complications
- Arrest of osteoporosis
- Improved cognitive function
- Prevention of depression
- Improved sleep
- Decreased constipation
- Decreased fatigue
- Improved functional motor performance
- Improved drug efficacy
- Optimization of the dopaminergic system

Speelman, AD *et al.* *Nature Reviews Clinical Neurology* 7, 528-534 (September 2011)

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RESEARCH: FREQUENCY

~ Most Research Studies have a frequency of 3-4 times per week

~ Anything is better than nothing, more is better!

~ Most helpful research we have is from Dr. Laurie Mischley



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How much do I have to Exercise?

“On how many of the past 7 days did you do at least 30 minutes of exercise?”

Days per Week of Exercise	N-1072 (%)	Predicted Change in PRO-PD Score (SE)	P-value (95% CI)
0	67 (6.2%)	-	-
1	48 (4.5%)	-7 (73)	0.923 (-151, 137)
2	104 (9.7%)	-39 (60)	0.516 (-158, 79)
3	145 (13.5%)	-146 (57)	0.011 (-258, -34)
4	156 (14.6%)	-172 (56)	0.002 (-282, -62)
5	205 (19.1%)	-209 (55)	0.000 (-316, -101)
6	148 (13.8%)	-231 (56)	0.000 (-341, -122)
7	199 (18.6%)	-245 (54)	0.000 (-352, -138)

Used with permission—Mischley LK. Social Health in PD.

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RESEARCH: DURATION

~ As little as 10 minutes has been shown to be beneficial

~ Most research studies do 45 – 60 Minutes per session

~ Anecdotally, we have members who exercise as much as 2 hours/day, who experience benefits from this increased duration.

~ 150 Minutes/Week Minimum



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RESEARCH: INTENSITY

~ Many research studies have shown that higher intensity is beneficial

~ This is usually looking at Aerobic Intensity


~ Most research studies have shown benefits with 60-80% Heart Rate Max

~ Start with what you can handle, ideally progress intensity over time

~ If high intensity isn't an option for any reason, endurance exercise is still beneficial



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Aerobic Exercise: Evidence for a Direct Brain Effect to Slow Parkinson Disease Progression

J. Eric Ahlskog, PhD, MD

ARTICLE HIGHLIGHTS

- Parkinson disease is a slowly progressive neurodegenerative condition; after many years, dementia or medication-refractory motor symptoms may develop.
- A myriad of animal studies document a direct, favorable effect of aerobic-type exercise on the brain; this includes liberation of neurotrophic hormones and enhancement of a variety of neuroplasticity mechanisms. Exercise tends to protect animals from neurotoxins that induce parkinsonism.
- Long-term exercise and fitness in healthy humans is associated with greater volumes of cerebral cortex and hippocampus and less age-related white matter pathology.
- Midlife exercise is associated with a significantly reduced later

- Conclusion from this evidence: Regular aerobic-type exercise tending to lead to fitness is the single strategy with compelling evidence for slowing Parkinson disease progression. All patients with Parkinson disease should be encouraged to engage in regular such exercise.

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We need to move more: Neurobiological hypotheses of physical exercise as a treatment for Parkinson's disease

Renato S. Monteiro-Junior^{a,b,e,g,*}, Thais Cevada^{b,d}, Bruno R.R. Oliveira^{b,d}, Eduardo Lattari^{a,d}, Eduardo M.M. Portugal^{a,b,d}, Alessandro Carvalho^c, Andrea C. Deslandes^{b,d,f,h,1}

- Exercise has been shown to have powerful effects on PD, based on several neurobiological mechanisms
- **Physical exercise reduces chronic oxidative stress and stimulates mitochondria biogenesis and up-regulation of autophagy in PD patients**
- Antioxidant enzymes become more active and effective in response to physical exercise
- **Exercise stimulates neurotransmitter (e.g. dopamine) and trophic factors (BDNF, GDNF, FGF-2, IGF-1, among others) synthesis.**
- These neurochemical phenomena promote neuroplasticity, which, in turn, decreases neural apoptosis and may delay the neurodegeneration process, preventing or decreasing PD development and symptoms, respectively.

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Motor-cognitive approach and aerobic training: a synergism for rehabilitative intervention in Parkinson's disease

Davide Ferrazzoli¹, Paola Ortelli², Alberto Cucca, Leila Bakdounes, Margherita Canesi³ & Daniele Volpe

Practice points

- Parkinson's disease (PD) is not a mere 'movement disorder,' but rather it is a complex motor behavior disease responsible for a tremendous social and economic impact.
- The optimal management of PD should involve integrated, multidisciplinary approaches combining both pharmacotherapy and non-pharmacological interventions, such as rehabilitation.
- Bottom-up and top-down cognitive coping strategies and adaptive techniques are useful for achieving motor benefits in patients with PD.
- The aerobic exercise may promote neural rearrangements and improve cognition in patients with PD.
- Combining a 'goal-based,' motor-cognitive practice with aerobic training seems to provide sustained clinical benefits rather than conventional physical therapy in patients with PD.
- Neuroplastic changes probably drive the clinical rehabilitation-induced benefits in patients with PD.
- Future studies should identify optimal parameters of intensity, frequency and duration of rehabilitation in patients with PD.

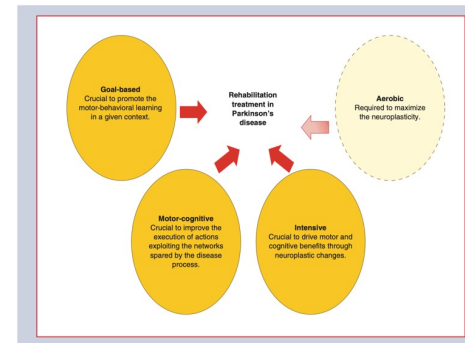


Figure 2. The theories on which rehabilitation in Parkinson disease should be based. Combining an intensive and 'goal-based,' motor-cognitive practice with aerobic training promotes neuroplasticity at the corticostriatal level, stimulates the executive resources and promotes the learning processes, thus probably representing the best way to obtain sustained improvements in Parkinson's disease (see both of the paragraphs about motor-cognitive intervention and aerobic exercise in Parkinson's disease).

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Forced, Not Voluntary, Exercise Improves Motor Function in Parkinson's Disease Patients

Angela L. Ridgel, PhD, Jerrold L. Vitek, MD, PhD, and Jay L. Albers, PhD

Background. Animal studies indicate forced exercise (FE) improves overall motor function in Parkinsonian rodents. Global improvements in motor function following voluntary exercise (VE) are not widely reported in human Parkinson's disease (PD) patients. **Objective.** The aim of this study was to compare the effects of VE and FE on PD symptoms, motor function, and bimanual dexterity. **Methods.** Ten patients with mild to moderate PD were randomly assigned to complete 8 weeks of FE or VE. With the assistance of a trainer, patients in the FE group pedaled at a rate 30% greater than their preferred voluntary rate, whereas patients in the VE group pedaled at their preferred rate. Aerobic intensity for both groups was identical, 60% to 80% of their individualized training heart rate. **Results.** Aerobic fitness improved for both groups. Following FE, Unified Parkinson's Disease Rating Scale (UPDRS) motor scores improved 35%, whereas patients completing VE did not exhibit any improvement. The control and coordination of grasping forces during the performance of a functional bimanual dexterity task improved significantly for patients in the FE group, whereas no changes in motor performance were observed following VE. Improvements in clinical measures of rigidity and bradykinesia and biomechanical measures of bimanual dexterity were maintained 4 weeks after FE cessation. **Conclusions.** Aerobic fitness can be improved in PD patients following both VE and FE interventions. However, only FE results in significant improvements in motor function and bimanual dexterity. Biomechanical data indicate that FE leads to a shift in motor control strategy, from feedback to a greater reliance on feedforward processes, which suggests FE may be altering central motor control processes.

Neurorehabilitation and
Neural Repair
Volume 23 Number 6
July/August 2009 600-608
© 2009 The Author(s)
10.1177/1545968308328726
<http://nrr.sagepub.com>

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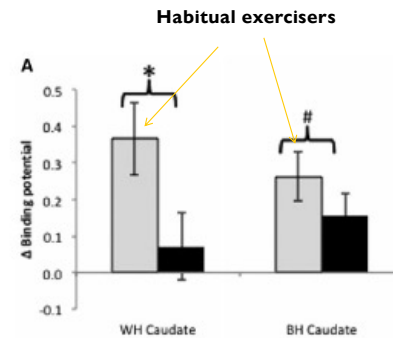
HABITUAL EXERCISERS SHOWED INCREASED RELEASE OF DOPAMINE IN RESPONSE TO EXERCISE

Habitual Exercisers Versus Sedentary Subjects With Parkinson's Disease: Multimodal PET and fMRI Study

Matthew A. Sacheli, MSc,¹ Danielle K. Murray, MD,^{1,2}
 Nasim Vafai, MASC,³ Mariya V. Cherkasova, PhD,¹
 Katie Dinelle, MSc,³ Eitham Shahinfard, PhD,¹
 Nicole Neilson, RN,¹ Jessamyn McKenzie, LPN,¹
 Michael Schulzer, PhD,¹ Silke Appel-Cresswell, MD,^{1,2}
 Martin J. McKeown, MD, BEng,^{1,2} Vesna Sossi, PhD³ and
 A. Jon Stoessl, MD^{1,2}

Pre / Post

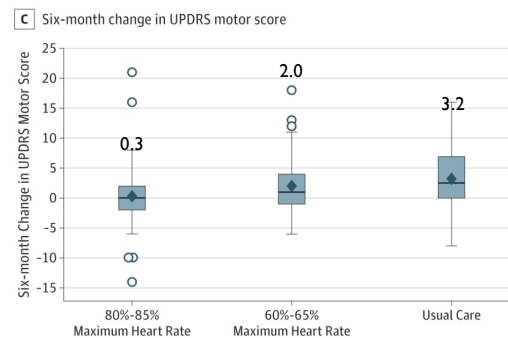
- 30' stationary cycling
- 60% max HR



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What is the best exercise intensity to slow disease progression in PwP?

Are changes in motor symptoms sufficient to warrant further investigation?



Effect of High-Intensity Treadmill Exercise on Motor Symptoms in Patients With De Novo Parkinson Disease: A Phase 2 Randomized Clinical Trial

Margaret Schenkman¹, Charity G Moore², Wendy M Kohrt^{3,4}, Deborah A Hall⁵, Anthony Dello⁶, Cynthia L Comella⁷, Deborah A Jossebo⁸, Cory L Christiansen^{1,4}, Brian D Berman⁷, Sarah M Kogge⁷, Edward L Melanson^{9,10}, Sameer Jain⁹, Julie A Robichaud¹⁰, Cynthia Poon¹¹, Daniel M Corcos¹²

- High Intensity
- Treadmill Training 40 min 3-4 x/week for 6 months
- Less worsening of motor symptoms in high intensity, while off medication

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Study protocol | [Open Access](#) | Published: 06 October 2022

Study in Parkinson's disease of exercise phase 3 (SPARX3): study protocol for a randomized controlled trial

[Charity G. Patterson](#) , [Elizabeth Joslin](#), [Alexandra B. Gil](#), [Wendy Spigle](#), [Todd Nemet](#), [Lana Chahine](#), [Cory L. Christiansen](#), [Ed Melanson](#), [Wendy M. Kohrt](#), [Martina Mancini](#), [Deborah Josbeno](#), [Katherine Balfany](#), [Garett Griffith](#), [Mac Kenzie Dunlap](#), [Guillaume Lamotte](#), [Erin Suttman](#), [Danielle Larson](#), [Chantale Branson](#), [Kathleen E. McKee](#), [Li Goelz](#), [Cynthia Poon](#), [Barbara Tilley](#), [Un Jung Kang](#), [Malú Gámez Tansey](#), [The SPARX3-PSG Investigators](#) [+ Show authors](#)

Trials **23**, Article number: 855 (2022) | [Cite this article](#)

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The primary objective of this Phase 3 randomized clinical trial is to test if high-intensity endurance exercise reduces the progression of the signs of PD at 12 months compared to moderate-intensity endurance exercise as measured by the MDS-UPDRS motor score (Part III). Based on SPARX Phase 2 data, we hypothesize the high-intensity group will have little or no worsening at 12 months. In addition, we predict that the moderate-intensity group will worsen by at least 3.5 points at 12 months [24]. We would expect the moderate-intensity to progress no more than the PPMI cohort which showed 12-month changes ranging from in untreated and treated patients in OFF state [40] to 6.3 in untreated patients [66]. If we conservatively assume a standard deviation of 8.2 (high-intensity exercise) [24], with a minimum sample size of $N=240$, we will have 91% power to detect a difference of 3.5, which is in the range of the minimal clinically important differences for change on the MDS-UPDRS motor score (Part III) ($\alpha=0.05$) [67]. If we adjust for 10% lower-adherence in the high-intensity group based on the SPARX Phase 2 [$240/(1 - 0.1)^2=296$] and inflate for 20% attrition at 12 months ($296/0.8$), we will need to randomize $N=370$ participants. The

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AEROBIC EXERCISE: LET'S MAKE IT HAPPEN!

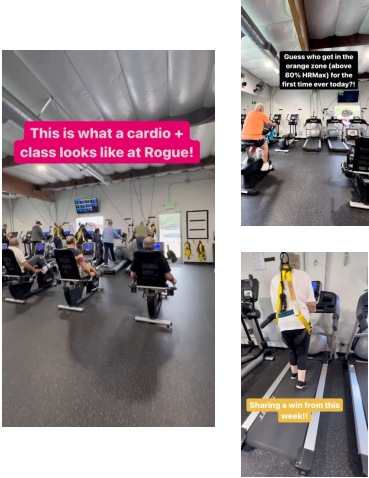
- Step 1: Calculate your 60-80% HR max using your age and resting HR (HRZones app or Kavornen method calculator online)
- Step 2: Utilize HR Monitors to assess exercise intensity
- We want high intensity ~150 minutes/week 60-80% HR Max!



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ADDRESSING BARRIERS








- Motivation
- Safety
- Fear of Falling
- Non-Motor Challenges
- Pain



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PICK A VARIETY OF TYPES OF EXERCISE

AT LEAST 1 HIGH INTENSITY AND ONE LOW/MODERATE INTENSITY

-  Aerobic Exercise
-  Balance Training
-  Amplitude/Functional Mobility Training
-  Strength Training
-  Dancing
-  Boxing
-  Tai Chi

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**TO
SUMMARIZE**

- 6-7 days/week
- 30-120 minutes/day (45-60 on aerobic days)
- Consistency + Variety of types of exercise
- Consistency + Variety of intensity of exercise
- High Intensity Exercise at least 3 times/week
- If pain, balance, etc. limit exercise, make sure to see a physical therapist!
- Our members must work harder than what feels comfortable!

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QUESTIONS?

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