

Exercise As Medicine for **Parkinson's Disease**

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Objectives

- ❖ **To learn about the research and scientific studies indicating that exercise is beneficial for people with Parkinson's Disease**
- ❖ **To learn practical ideas on how to incorporate exercise into daily life**

Disclaimers

- ❖ **Intent is to provide information**
- ❖ **Presenter is an employee of CNOS**
- ❖ *Multiple products and services are mentioned in this presentation. They are provided for information purposes. No financial compensation has been provided to the presenter from these vendors*

Background



Biology of Parkinson's

- ❖ **Decrease in the amount of dopamine created by the midbrain (substantia nigra)**
- ❖ **Dopamine is a key neurotransmitter that helps nerves communicate with each other**
- ❖ **By the time symptoms present, much of the damage to substantia nigra has already occurred**

Overview of Parkinson's Disease

- ❖ **10.9 cases per 100,000 in general population***
- ❖ **49.7 cases per 100,000 for those over age 50****
- ❖ **PD is progressive, and although symptoms can be treated and delayed (with medications, surgeries, and exercise), it cannot be cured**
- ❖ **Often has a cognitive component, especially regarding movement planning**

*(*Dorsey et al, 2007; **Brower et al, 1999)*

Movement Characteristics of Parkinson's Disease (PD)

- ❖ Small movements
- ❖ Shuffling steps
- ❖ Difficulty initiating movement or turning
- ❖ Slowness
- ❖ Balance problems & falls
- ❖ Resting tremors
- ❖ Paralyzing muscle rigidity

SENSORY Deficits in PD

- ❖ **Sensory integration deficits interfere with movement plans, body orientation, and error detection capabilities**
- ❖ **Reduced sensory proprioceptive processing**

Vaugoyeau, M et al. "Impaired vertical postural control and proprioceptive integration deficits in Parkinson's disease." Neuroscience vol. 146,2 (2007): 852-63.

Abbruzzese, Giovanni, and Alfredo Berardelli. "Sensorimotor integration in movement disorders." Movement disorders : official journal of the Movement Disorder Society vol. 18,3 (2003): 231-240.

SENSORY Deficits in PD

- ❖ **Perpetual mismatch between what they feel & actual movement they can produce**
 - ❖ **Ex. When walking with a characteristic PD gait, the pt feels like it's a normal gait pattern, despite small arm swing & small step length**
- ❖ **Despite having the physical capability for long steps, pts don't b/c don't detect deficit**

Exercise Treatment Options for Parkinson's Disease



LSVT Big® for PD

❖ LSVT Big is one of a few exercise programs that target PD

❖ Other Examples:

- ❖ Rock Steady Boxing
- ❖ Power for Parkinson's

LSVT BIG®

❖ Common theme:

Big, powerful movement patterns

History of LSVT Big®

- ❖ Program is an outgrowth from successful treatment techniques used in Speech therapy
- ❖ Lee Silverman Vocal Training started in 1983
 - ❖ Good clinical study support; morphed into LSVT Loud®
- ❖ Since LSVT Loud® was successfully working on the speech muscles, LSVT Big® applied the same philosophies and techniques to limb muscles

LSVT Big® Overview

- ❖ **LSVT Big® is a PT/OT treatment technique for Parkinson's**
- ❖ **Solid clinical research and clinical rationale behind its methodology**
- ❖ **Focuses on large amplitude ("Big") movements to improve function**
- ❖ **Focusing on big movement has carry-over to other deficits (gait speed)**
- ❖ **Patient cueing is simplified to decrease cognitive load.
Ex. Say "Do what I do", then demonstrate.**

LSVT Big® Overview

- ❖ **LSVT Big addresses both motor and sensory aspects of PD**
- ❖ **Re-calibrate the senses of what normal movement is**
- ❖ **Train pts to use what feels like EXTRA BIG movements for everything**
- ❖ **Requires repetition and intensity to re-calibrate brain**

LSVT Big® Overview

- ❖ Requires repetition and intensity to re-calibrate brain
- ❖ It's rehearsal, not just exercise
 - ❖ Ex. Dancers, Baseball hitters, Golfers
- ❖ Home exercises become part of everyday life (just like meds)
- ❖ Goal: instill BIG movements ALL THE TIME

Research



Study Support for LSVT Big®

- ❖ **Intensive rehab in early stages can slow the disease progression and lead to better motor performance**
 - ❖ **sedentary lifestyle worsens balance and gait and accelerates disease progression (Frazzitta et al, 2015)**
- ❖ **Exercises increases dopamine receptors and postural control (Fischer et al. 2013)**
- ❖ **Two Random Controlled Trial studies published support LSVT as improvement over walking program and other current standard treatments**

Exercise Improves ...

- ❖ Muscles and Strength
- ❖ Heart Disease Risk
- ❖ Insulin Effectiveness (help prevent and treat diabetes)

❖ ***YOUR BRAIN***



Brain-Derived Neurotrophic Factor (BDNF)

- ❖ **Brain-derived neurotrophic factor**
- ❖ **BDNF supports existing neurons, and supports their growth and ability to connect (make synapses) with other neurons**
- ❖ **Multiple studies have shown that exercise dramatically increases BDNF in the brain**

Exercise Research: BDNF

A meta-analytic review of the effects of exercise on brain-derived neurotrophic factor

Review of 29 prior studies

"...a single session of exercise increases BDNF levels, reflecting a moderate effect size. Moreover, regular exercise intensifies the magnitude of these effects ...

... there is reliable evidence from human studies indicating that each episode of exercise results in a "dose" of BDNF activity and that the magnitude of this "dose" can be enhanced over time by regular exercise."

Szuhany KL, Bugatti M, Otto MW (January 2015). "A meta-analytic review of the effects of exercise on brain-derived neurotrophic factor". Journal of Psychiatric Research. 60: 56–64.

Exercise Research: BDNF

Neuroprotective effects of physical activity on the brain

"... physical activity alters trophic factor signaling and, in turn, neuronal function and structure in areas critical for cognition."

Phillips C, Baktir MA, Srivatsan M, Salehi A (2014). "Neuroprotective effects of physical activity on the brain: a closer look at trophic factor signaling". Frontiers in Cellular Neuroscience. 8: 170.

Exercise Research: Depression

Exercise and Depressive Symptoms in Older Adults: A Systematic Meta-Analytic Review

Systematic Review of 41 randomized trials concluded that exercise was associated with significantly lower levels of depression

Rhyner, Kathleen T, and Amber Watts. "Exercise and Depressive Symptoms in Older Adults: A Systematic Meta-Analytic Review." Journal of aging and physical activity vol. 24,2 (2016): 234-46.

Exercise Research: Depression

**Exercise improves depressive symptoms in older adults:
An umbrella review of systematic reviews and meta-analyses**

"Our umbrella review indicates that exercise is safe and efficacious in reducing depressive symptoms in older people."

Catalan-Matamoros, Daniel et al. "Exercise improves depressive symptoms in older adults: An umbrella review of systematic reviews and meta-analyses." Psychiatry research vol. 244 (2016): 202-9. doi:10.1016/j.psychres.2016.07.028

Exercise Research: Cognition

Possible Neuroprotective Mechanisms of Physical Exercise in Neurodegeneration

"Physical Exercise (PE) is beneficial for people suffering from neurodegenerative diseases because it improves the production of neurotrophic factors, neurotransmitters, and hormones. PE promotes neuronal survival and neuroplasticity and also optimizes neuroendocrine and physiological response ... promoting many processes such as synaptic plasticity, neurogenesis, (and) angiogenesis"

Mahalakshmi, B et al. "Possible Neuroprotective Mechanisms of Physical Exercise in Neurodegeneration." International journal of molecular sciences vol. 21,16 5895. 16 Aug. 2020

Exercise Research: Cognition

The aging hippocampus: interactions between exercise, depression, and BDNF

"..there is strong evidence that decreased BDNF is associated with age-related hippocampal dysfunction, memory impairment, and increased risk for depression, whereas increasing BDNF by aerobic exercise appears to ameliorate hippocampal atrophy, improve memory function, and reduce depression."

Erickson, Kirk I et al. The Neuroscientist : a review journal bringing neurobiology, neurology and psychiatry v ol. 18,1 (2012): 82-97.

Action Plan



Tips for Supporting Family Members

- ❖ **Support your family member's exercise objectives**
 - ❖ **Attend classes with them**
 - ❖ **Help spot them during home exercises**
- ❖ **Understand Movement Processing Deficits**
 - ❖ **Simplify Cueing**
 - ❖ **Allow Extra Time**

What Types of Exercise Are Best?

- ❖ Almost any kind has benefits
- ❖ Do an exercise that is fun
- ❖ Social Engagement (i.e., with a group) strengthens the habit
- ❖ *Routine is Powerful*

Exercise Options

Parkinson's-Specific Exercise Options

- ❖ **Parkinson's and Neurofit Classes at the YMCA**
- ❖ **Boxing Class at Siouxland Center for Active Generations**
- ❖ **See a physical therapist with experience working with Parkinson's Disease patients**

Exercise Options

Aquatic

- ❖ **Water walking / water exercise class**
- ❖ **Buoyancy makes balance easier**
- ❖ **Aquatic exercise is better for sore joints**



Exercise Options



Aerobic Options

- ❖ **Recumbent stationary bike (low-sitting seat)**
- ❖ **NuStep**
 - ❖ **Especially beneficial if walking is limited**
- ❖ **Walking (at mall, skywalk, Senior Ctr, outdoors)**

Exercise Options

At Home

- ❖ **Sit-to-Stand**
 - ❖ **Practical**
 - ❖ **“Nose Over Toes”**
 - ❖ **Can Use Lift Chair for partial assist**
- ❖ **Marches, Squats, Tip Toes at Counter**

Exercise Options

At Home

- ❖ **FREE Online exercise classes for PD:**
<https://www.powerforparkinsons.org/>
 - ❖ **Wide variety of classes targeting different goals**
- ❖ **Public Television has two free exercise classes**
 - ❖ **Classical Stretch M-F at 6:00am**
 - ❖ **Sit And Be Fit Sundays at 6:00am**
 - ❖ **General exercise classes, not targeted for PD specifically**

Exercises **NOT** Recommended

- ❖ **Treadmill (fall risk)**
- ❖ **Elliptical Machine (poor stability)**
- ❖ **Aquatic (if recent surgery, open wounds, or fear)**

Exercise Places



The YMCA in South Sioux City

- ❖ **Has Specific Classes for Parkinson's and Neuro Diseases**
- ❖ **Aquatic exercise programs / lift chair into pool if needed**
- ❖ **Cost: \$39/mo. For Seniors/\$64/mo Sr. couple**

Four Seasons Health Club

- ❖ **Has a gradual entry pool with good railing support**
- ❖ **Cost: \$34 / mo. Single / \$62 / mo. couple**

Exercise Places

Siouxland Center
for Active Generations

Siouxland Center for Active Generations (aka Senior Center)

- ❖ **Boxing Class for Parkinson's**
- ❖ **Many other activities (social and exercise-oriented)**
- ❖ **Cost: \$52 / year (<\$5 / month)**
- ❖ **Hours: M-F**

Planet Fitness

- ❖ **May be preferred due to convenience**
- ❖ **No pool or PD exercise classes**
- ❖ **Cost: \$25/month**



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THANK YOU

Questions?

Follow-up questions can be addressed to:

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Additional Studies

Exercise is Medicine ... for your Brain

Neuroplasticity is a key principle behind LSVT Big®

Exercise enhances and protects brain function.

Cotman CW, Engesser-Cesar C. *Exerc Sport Sci Rev.* 2002 Apr;30(2):75-9. doi: 10.1097/00003677-200204000-00006. PMID: 11991541

Exercise: a behavioral intervention to enhance brain health and plasticity.

Cotman CW, Berchtold NC. *Trends Neurosci.* 2002 Jun;25(6):295-301. doi: 10.1016/s0166-2236(02)02143-4. PMID: 12086747

High-intensity exercise improves cognitive function and hippocampal brain-derived neurotrophic factor expression in obese mice maintained on high-fat diet.

Kim TW, Baek KW, Yu HS, Ko IG, Hwang L, Park JJ. *J Exerc Rehabil.* 2020 Apr 28;16(2):124-131. doi: 10.12965/jer.2040050.025. eCollection 2020 Apr. PMID: 32509696

Exercise is Brain Medecine (2)

Activity-Dependent Neuroplasticity

Exercise changes neurogenesis, synapse formation, glucose utilization, decreases oxidative stress, and reduced inflammation

Exercise results in increased neurotrophin (GDNF) to protect vulnerable but not yet dead neurons

Exercise May Modify Disease Progression in Animal Models

Studies provide clinical rationale for early intervention/exercise

(Cotman & Berchtold, 202; Kleim JA, Jones TA, & Schallert T 2003)

Exercise is Medicine ... for Your Mood

Systematic Reviews Supporting the Benefits of Exercise on Mood

[Therapeutic Benefits of Physical Activity for Mood: A Systematic Review on the Effects of Exercise Intensity, Duration, and Modality.](#) Chan JSY, Liu G, Liang D, Deng K, Wu J, Yan JH. *J Psychol.* 2019;153(1):102-125. doi: 10.1080/00223980.2018.1470487. Epub 2018 Oct 15. PMID: 30321106

[Exercise in the treatment of clinical anxiety in general practice - a systematic review and meta-analysis.](#) Aylett E, Small N, Bower P. *BMC Health Serv Res.* 2018 Jul 16;18(1):559. doi: 10.1186/s12913-018-3313-5. PMID: 30012142

[Physical exercise improves quality of life, depressive symptoms, and cognition across chronic brain disorders: a transdiagnostic systematic review and meta-analysis of randomized controlled trials.](#)

Dauwan M, Begemann MJH, Slot MIE, Lee EHM, Scheltens P, Sommer IEC. *J Neurol.* 2019 Aug 14. doi: 10.1007/s00415-019-09493-9. PMID: 31414194

[Systematic review of the effects of exercise on activities of daily living in people with Alzheimer's disease.](#)

Rao AK, Chou A, Bursley B, Smulofsky J, Jezequel J. *Am J Occup Ther.* 2014 Jan-Feb;68(1):50-6. doi: 10.5014/ajot.2014.009035. PMID: 24367955