



MOTION THERAPY

# The Science Behind Physical Therapy and Parkinson's Disease

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An Overview of Benefits and Approaches

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# Agenda



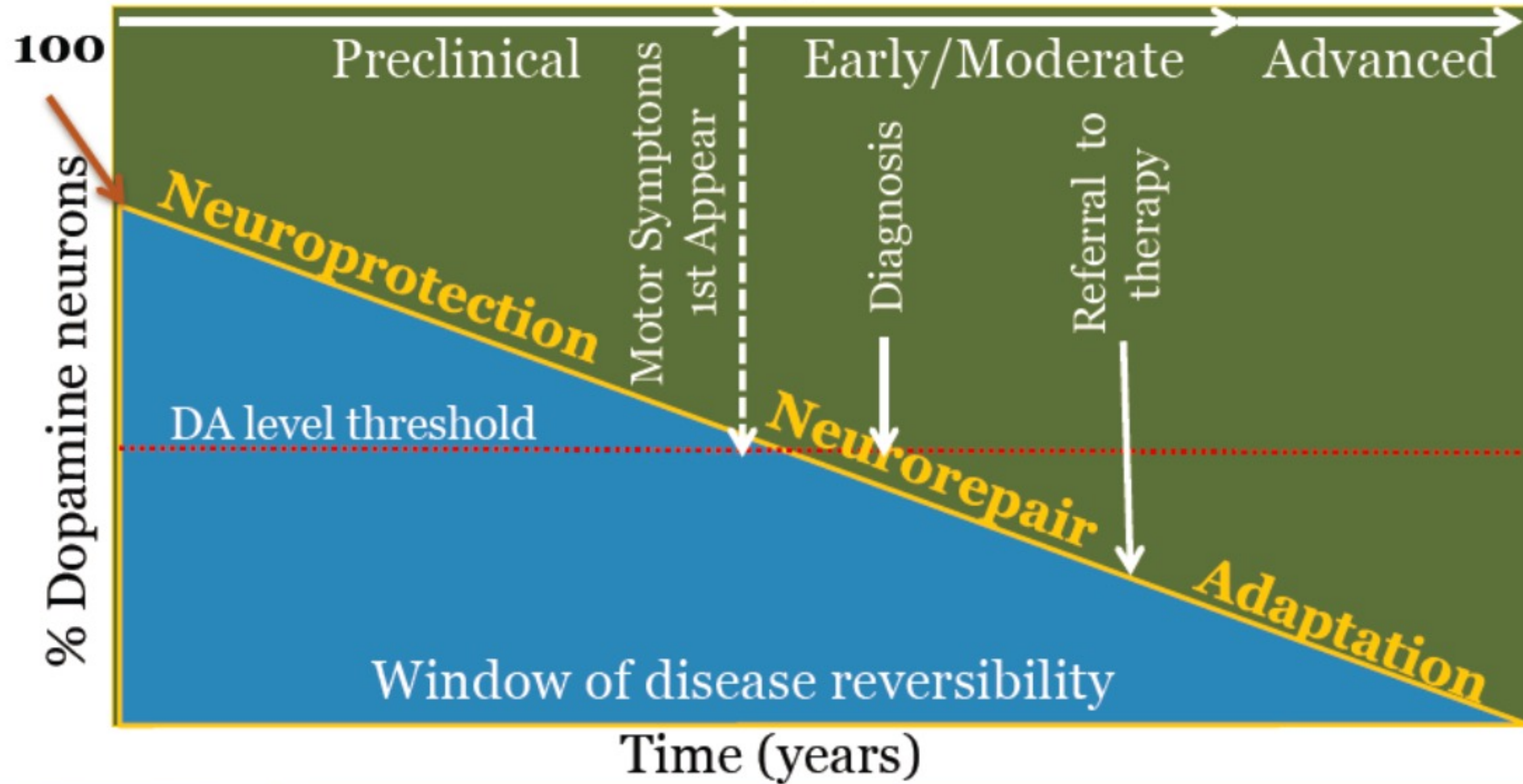
- 1 Injury Risk
- 2 The Brain
- 3 PT and Parkinsons
- 4 LSVT BIG and Boxing
- 5 What to do next?



# Injury Risk X Parkinson's Disease

- **70%** of people with PD experience at least one fall annually
- **39%** suffer recurrent falls (Moreau et al., 2017)
- Fall rates for those with subthalamic deep brain stimulation has progressively **increased** over a 15-year period (Zampogna et al., 2022)
- Falls are the leading cause of injury-related deaths among persons aged >65 years

# Neuroplasticity Mechanisms are Time Dependent



# Neuroprotection

- Severity of motor/nonmotor symptoms can be reduced by regular exercise, with 3-6 month retention
- 3-4 studies have shown changes in executive function and language ability through aerobic exercise

## **Progressive Aerobic Exercise and Improved Motor Function in PWP**

Increased gait speed/stride length<sup>\*only</sup>

<sup>\*TM</sup>

Improves rhythmicity/stability<sup>\*only</sup>

<sup>†Cycling</sup>

Symptoms improve<sup>\* †</sup>

Retention 1-3 months<sup>\* †</sup>

Transfers to DGI/Berg/FES improve<sup>\*</sup>

Generalized to LE function<sup>\* †</sup>

Transfers to UE function<sup>\* †</sup>

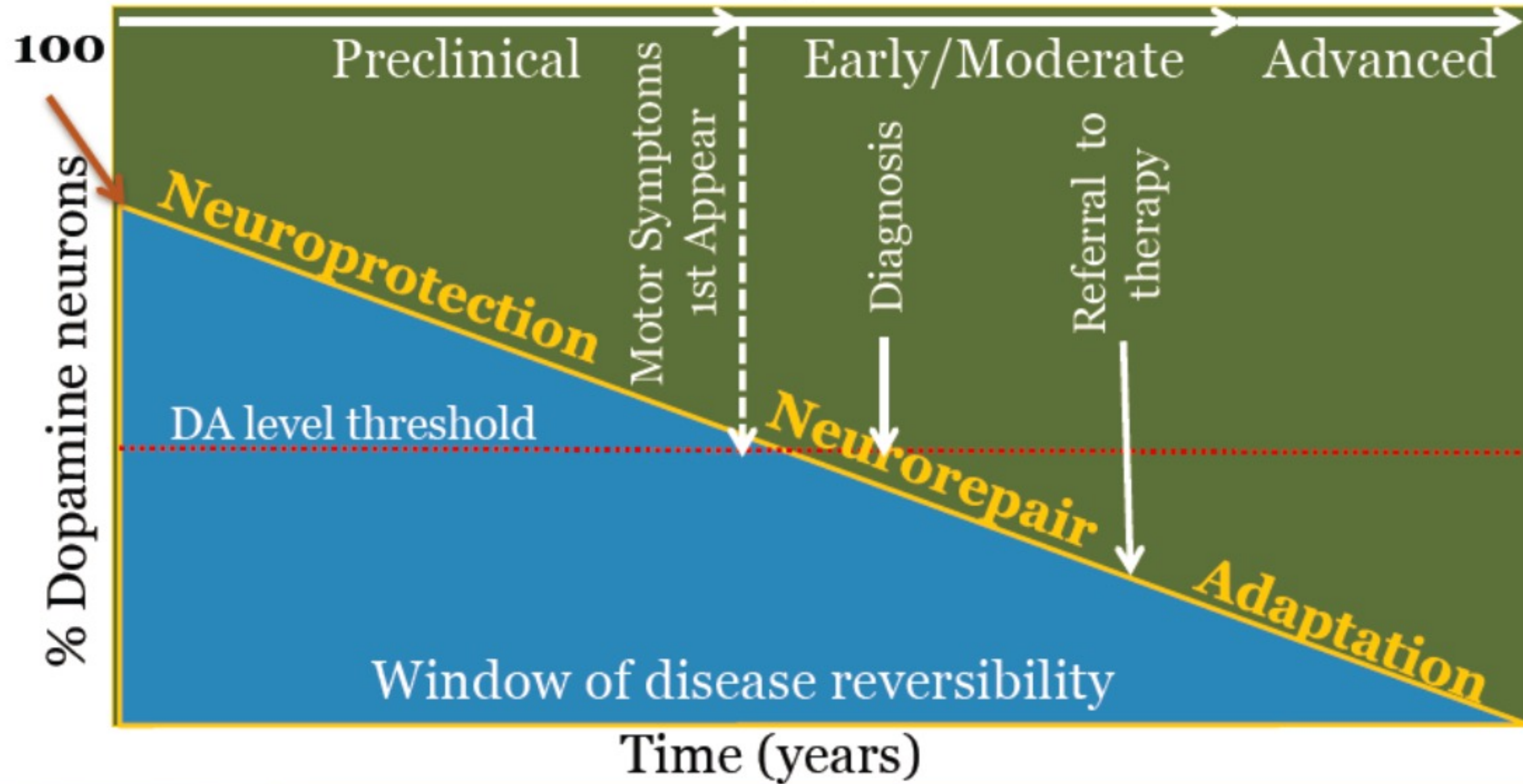
Improves economy of walking – metabolic efficiency<sup>\*only</sup>

Alters cortical excitability<sup>\*</sup> and improves brain activation<sup>†</sup>

Frenkel-Toledo; Pohl; Miyai, Cakit; Herman; Kurtais; Fisher; Alberts

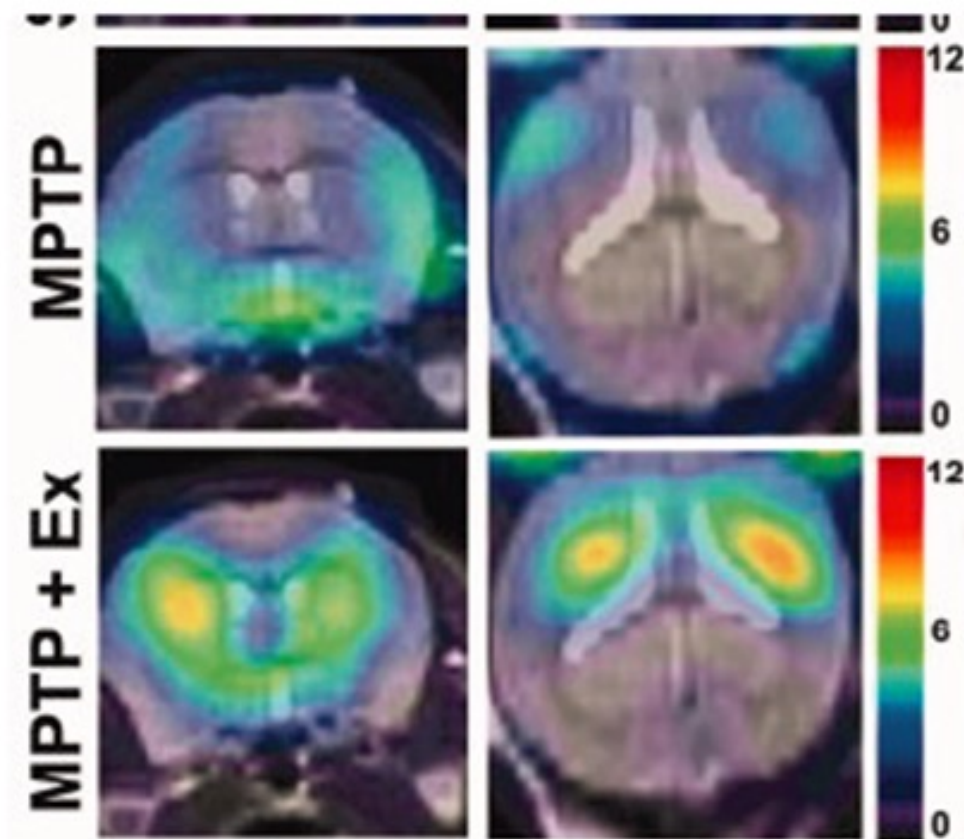


# Neuroplasticity Mechanisms are Time Dependent



# Early/Moderate Phase- Neurorepair

- Animal Models
  - Overall levels of dopamine are unchanged
  - Compromised dopamine signaling pathways show restoration



Positron Emission Tomography (PET)

**Mechanisms of Repair cont ...**

- **more D2 receptors!**

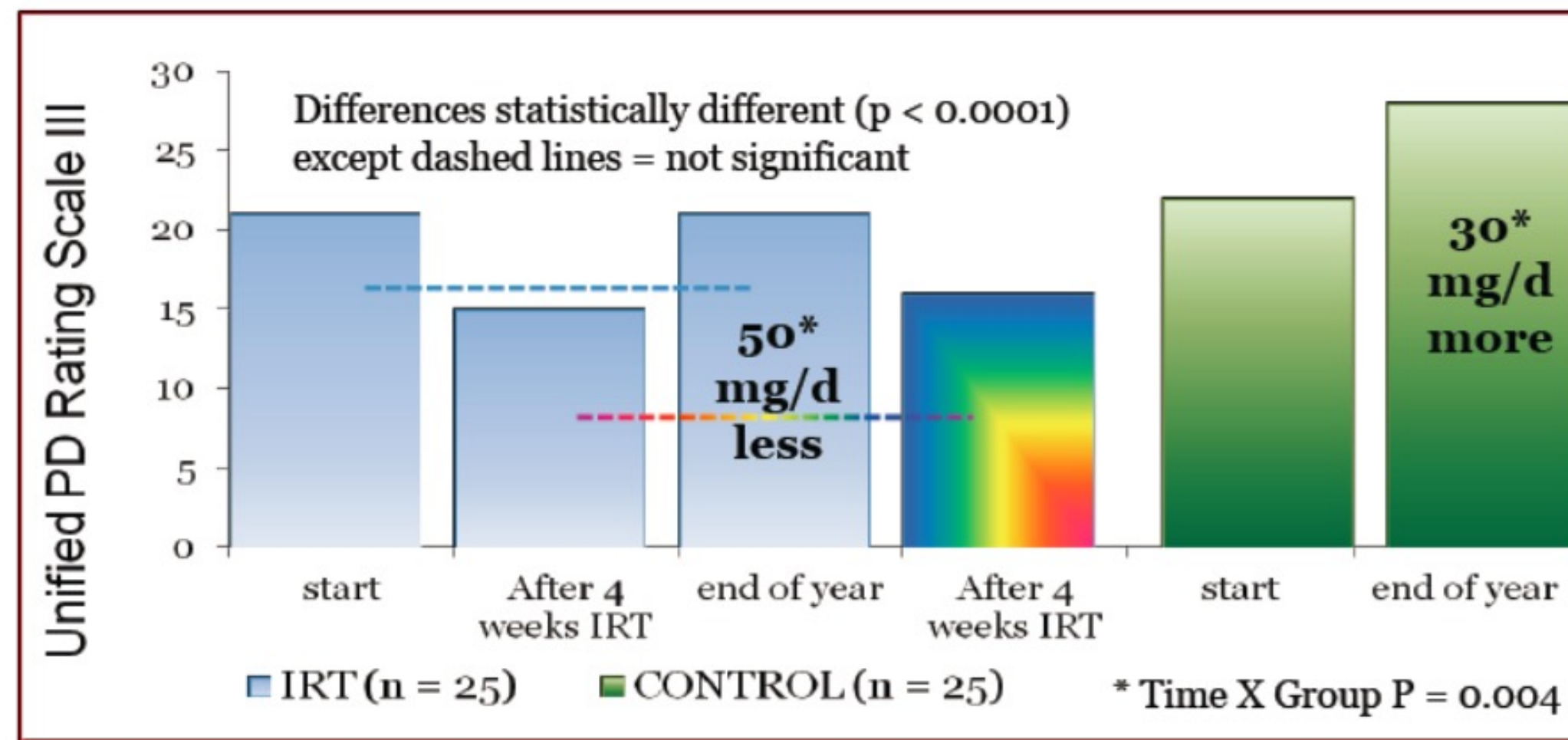
Vuckovic MG, et al. Exercise elevates dopamine D2 receptor in a mouse model of Parkinson's disease: In vivo imaging with  $^{18}\text{F}$ Fallypride. *Mov Disord* 2010;25(16):2777



# Early/Moderate Phase- Neurorepair

- Human Models
  - Annual intensive bouts of exercise augment the effects of medication and affect behavioral recovery

## Evidence That Annual Intensive Bouts of Exercise Augment the Effects of Medication and Effect Behavioral Recovery



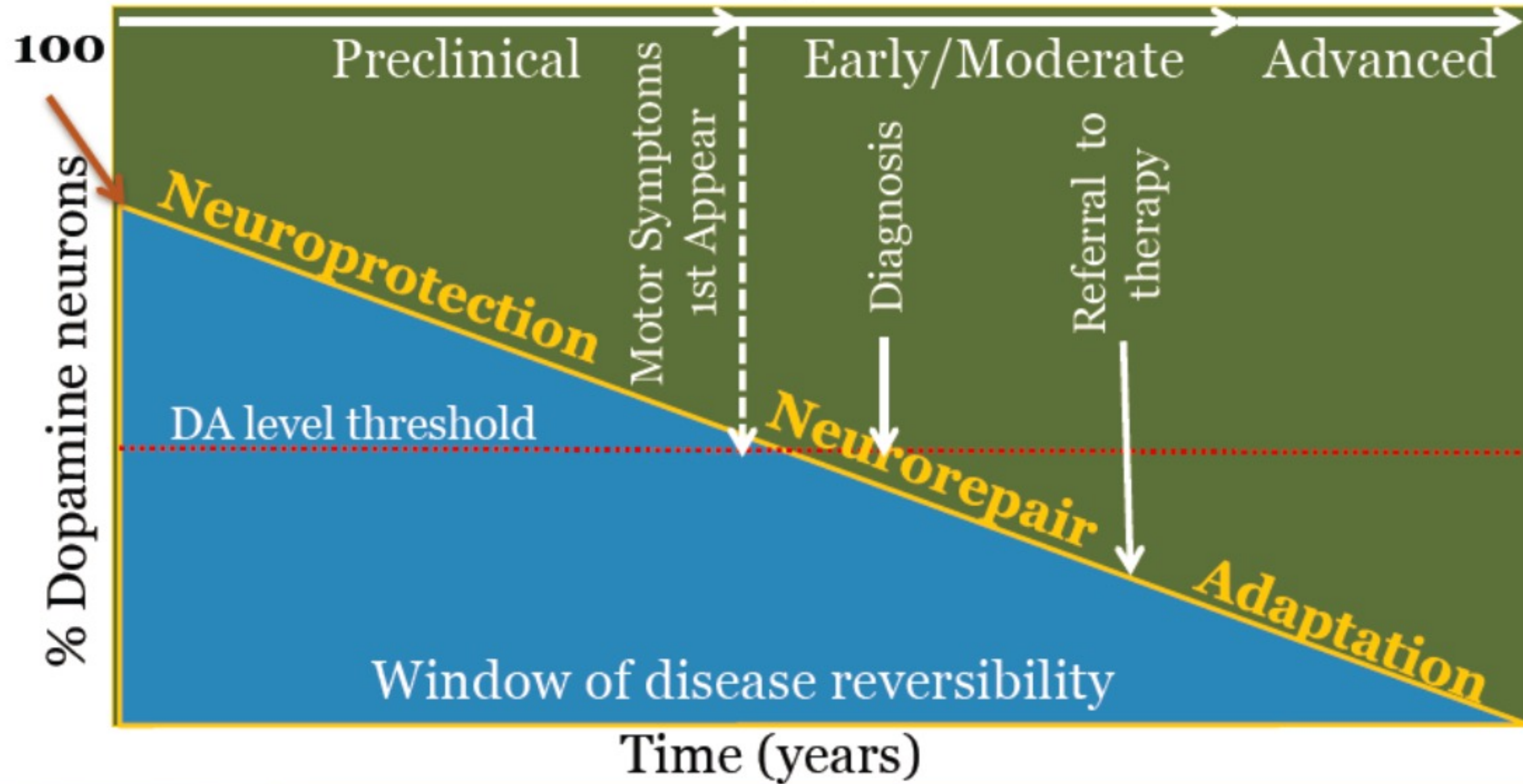
**Effectiveness of Intensive Inpatient Rehabilitation Treatment on Disease Progression in Parkinsonian Patients: A Randomized Controlled Trial With 1-Year Follow-up.**

Giuseppe Frazzitta, MD et al. *Neurorehab Neural Repair*, Aug 15, 2011





# Neuroplasticity Mechanisms are Time Dependent



# Late Phase- Adaptation

- **Animal Models**

- Once we have no dopamine left, reliance on undamaged systems increases. Saw partial behavior recovery.

- **Human Models**

- Still being researched...

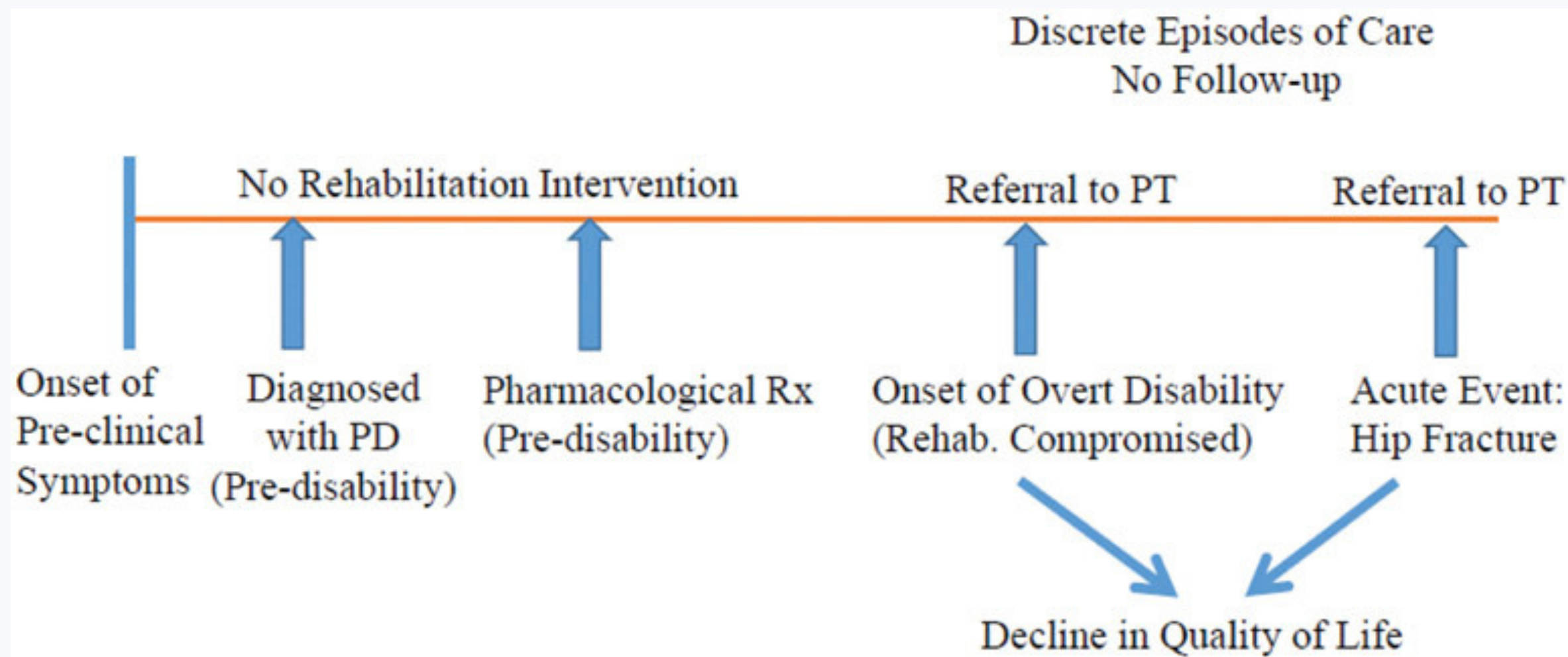


MOTION THERAPY

**Do we have evidence that therapy is  
effective for people with Parkinson's  
Disease?**

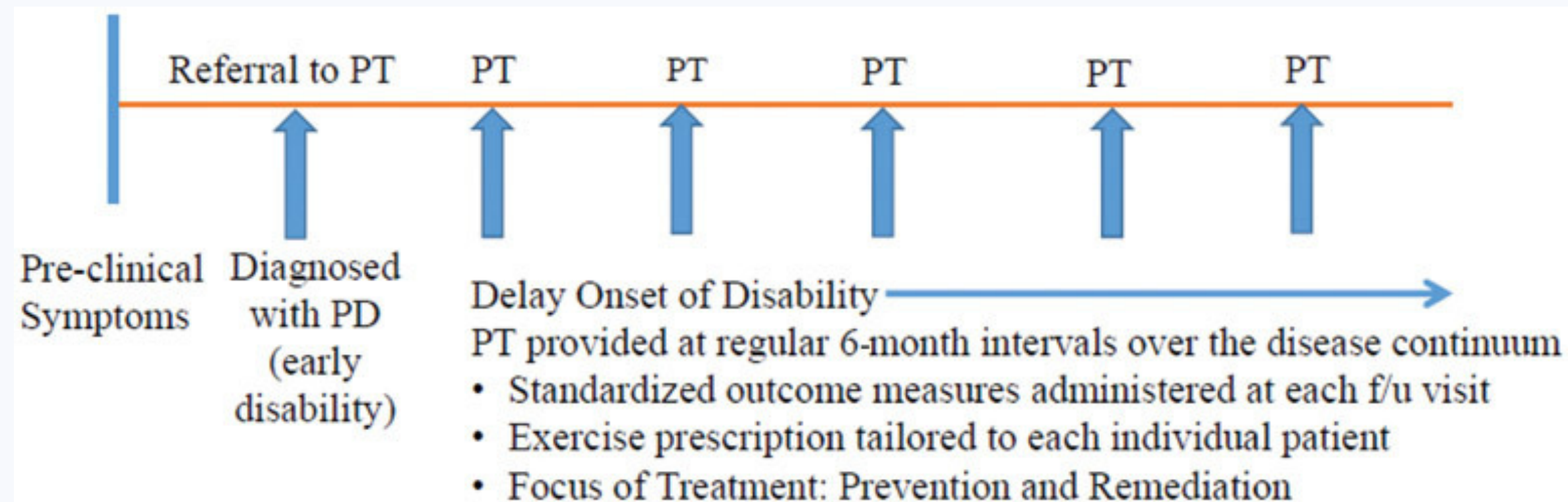
# YES! START EARLY

The presence of early disability coupled with the benefits of exercise suggests that **physical therapy should be initiated earlier in the disease.** (T. Ellis et al., 2021)



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# GET STRONGER

- Physical Therapy can improve motor performance, quality of life, functional status, and balance
- Physical Therapy + **Progressive Resistance exercise** was found to be more effective than Physical Therapy alone.

(P. Dharmaraj et al., 2019)



# MAKE IT INDIVIDUAL



- **Individualized** Physical therapy programs that focus on:
  - Muscle strength
  - Flexibility
  - Mobility
  - Posture
  - and Gait
- Improve Physical status and daily living activities
- > Classes or standardized therapy

(I. V. Didokha, 2022)

# DIVERSIFY

- Physical therapy interventions such as:
  - **Walking on an anti-gravity treadmill**
  - **Pole walking**
  - **Tai-chi gymnastics**
- Can improve both **motor** and **non-motor symptoms** in Parkinson's disease patients (M. A. Chistov et al.)





# LSVT BIG



- **Definition:**
  - Large amplitude, whole-body movements
- **Goal:**
  - Speed
  - Quality
  - Ease of Movement
- **Method:**
  - 16 sessions over a single month
- **Certification:**
  - Specialized Training

# LSVT BIG

**START**



**1 OUT BIG**



**2 DOWN BIG**



**3 UP BIG**



**4 HOLD BIG**



**5 END BIG**



# LSVT BIG BENEFITS

- Improvements in:
  - **Balance**
  - Walking abilities with **larger steps**
  - Enhanced trunk **rotation**
  - Overall **mobility**.
- Additionally, LSVT BIG aids in enhancing activities of daily living (ADLs) for individuals with Parkinson's disease[1][2][3][5].



# BOXING x PARKINSONS

- Beneficial:
  - **Punching** movements of the arms
  - **Footwork**
  - Heavy Bag Punching
  - **Stretching** Exercises
  - **Resistance** Training
  - Aerobic **Conditioning**
- Helps with:
  - **Balance** issues
  - **Stiffness**
  - **Tremors** [6][7][8][9][10]



# What can I do now?

Start **ASAP**

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Find a **professional**

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Establish an **individualized** care plan

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Begin any kind of **resistance** training

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Do as many **different** things as possible

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