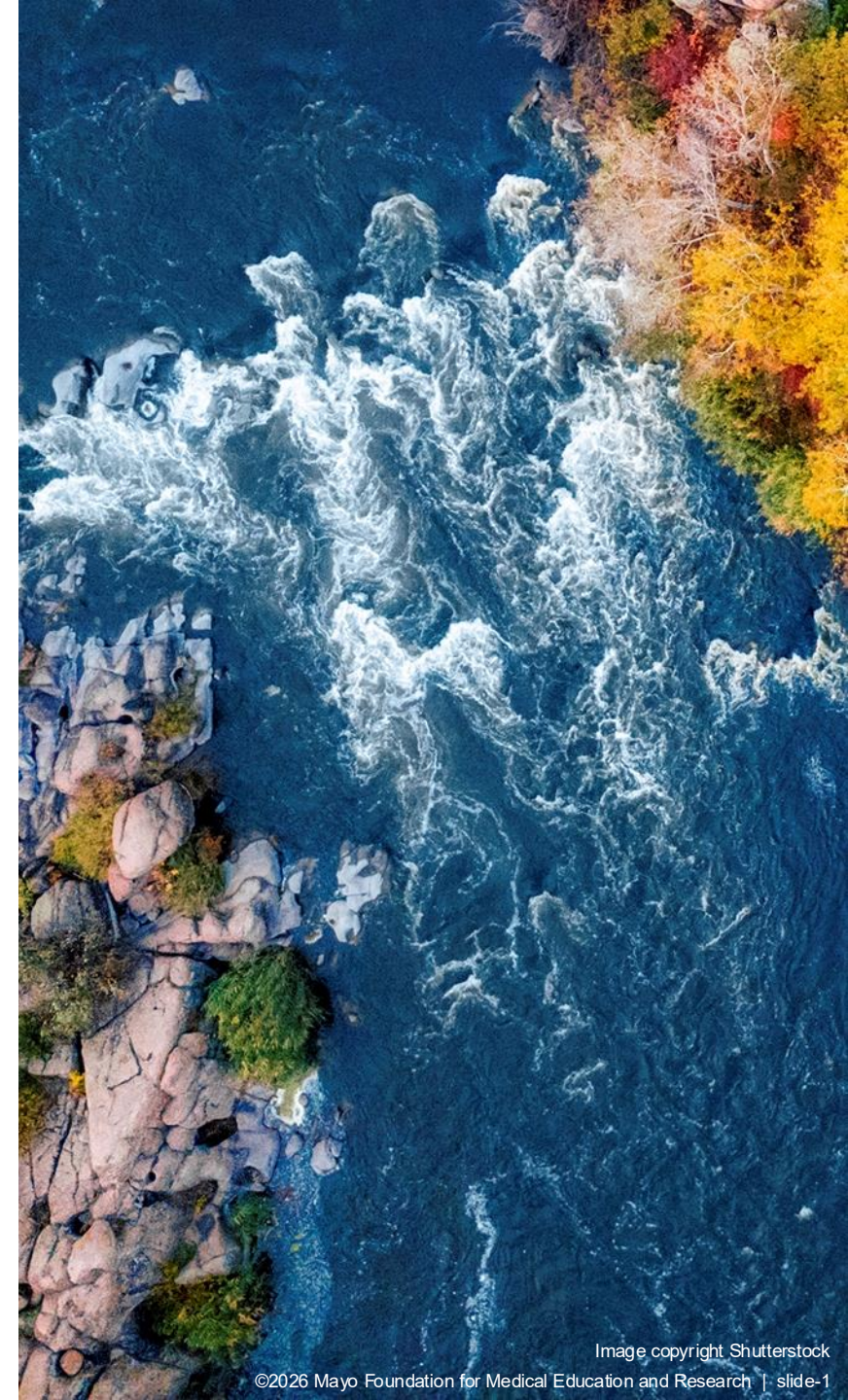




# **LIVING WELL WITH PARKINSON'S: UNDERSTANDING MEDICATIONS, BOOSTING MOBILITY, & THRIVING DAY-TO-DAY**

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PD Care Connection Experience Event 2026  
March 27, 2026



# DISCLOSURES

- No relevant financial relationships to report in last 24 months with an ineligible company
- Dr. Chiu receives NIH funding

# LEARNING OBJECTIVES



Recognize how protein intake interacts with levodopa absorption



Learn about nutrition & healthy eating tips in Parkinson disease (PD)



Understand how exercise helps mobility, balance, mood, overall function in PD and disease progression

# PARKINSON DISEASE

Motor and nonmotor Parkinson disease symptoms

Fewer ← ————— → More

Tremor, rigidity, bradykinesia, dystonia, and/or gait issues  
Autonomic, psychiatric, and/or cognitive symptoms

**A** 1886 Illustration of Parkinson disease



**B** Mild motor-predominant Parkinson disease

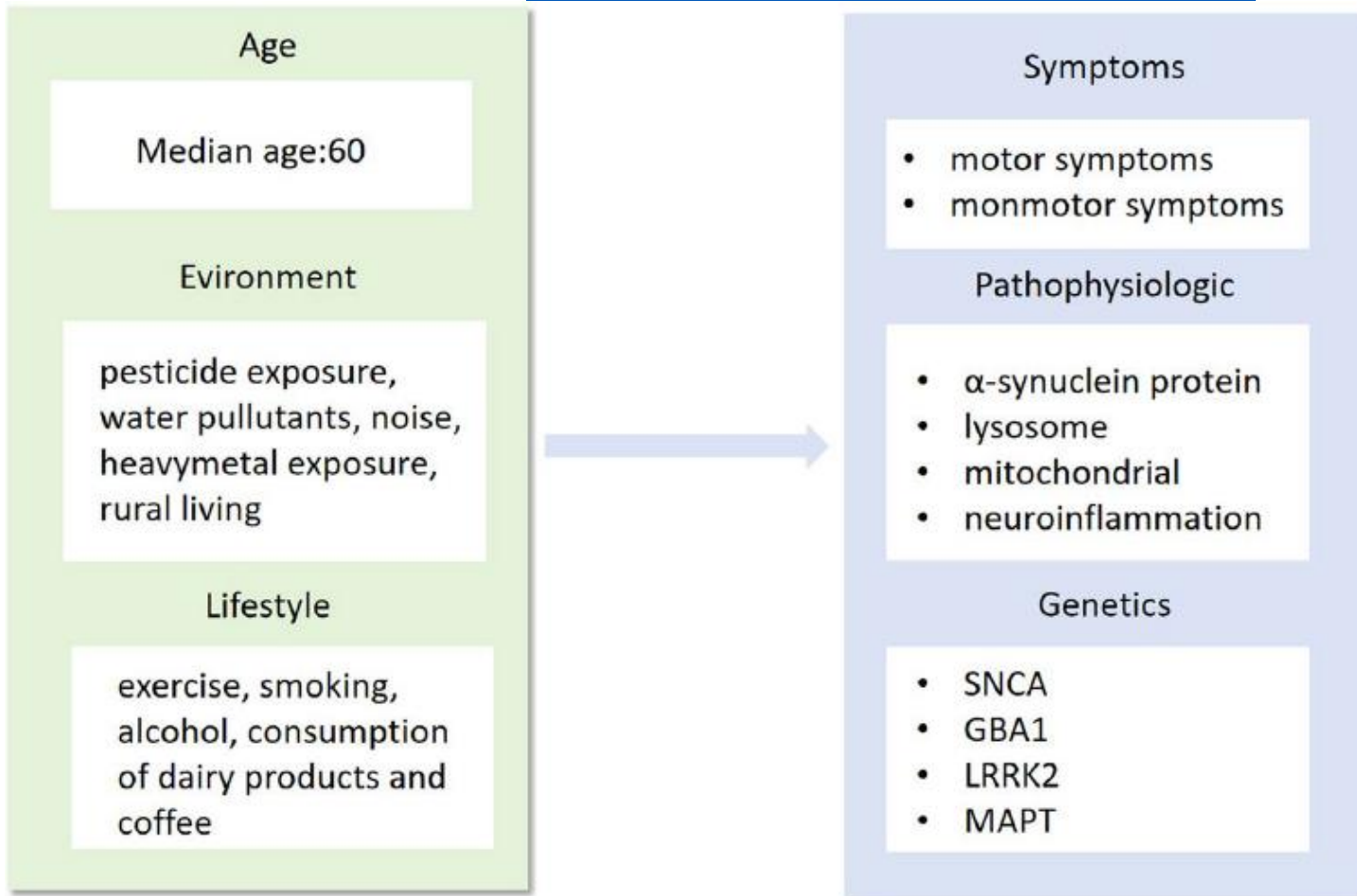


**C** Intermediate Parkinson disease



**D** Diffuse malignant Parkinson disease





# DISEASE HETEROGENEITY

- Many factors can affect phenotype, pathogenesis and genotype of PD
- **PD is highly complex neurological syndrome**

# NON-MOTOR SYMPTOMS OF PD



Cognitive impariment

Depression



Apathy

Anxiety



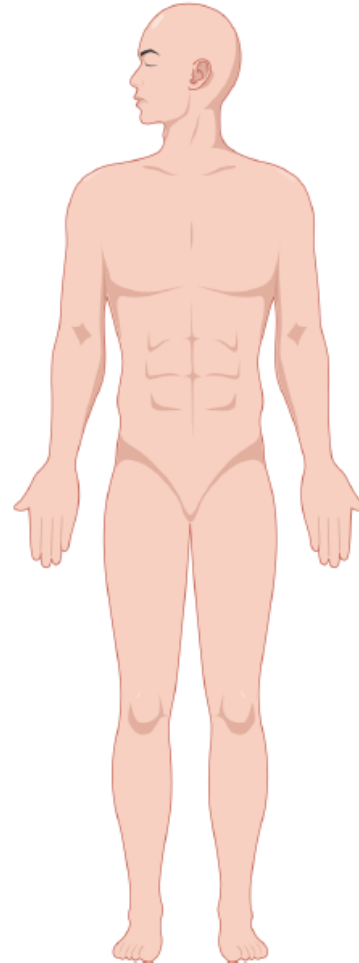
Hallucinations

Orthostatic hypotension



Sleep dysfunction

Pain



Visual disturbances



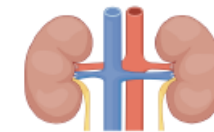
Olfactory loss



Postprandial fullness



Urogenital dysfunction

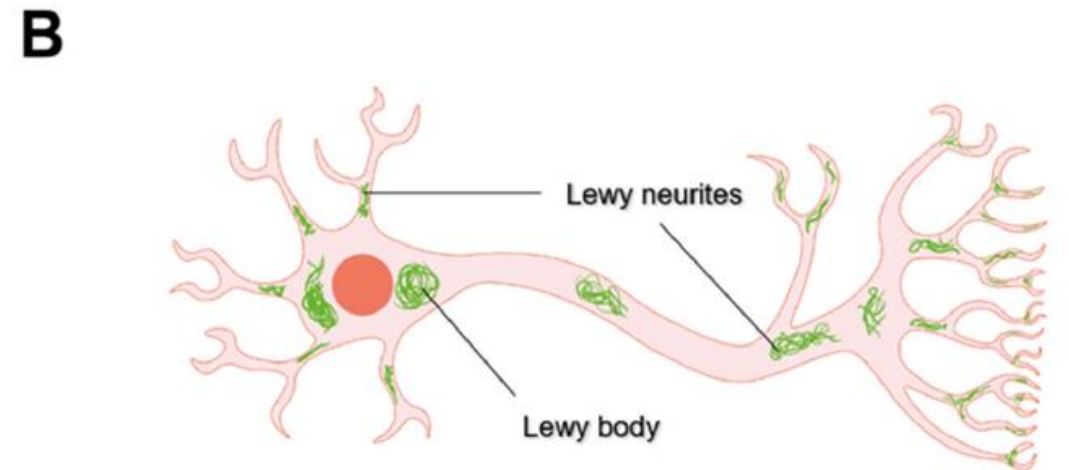
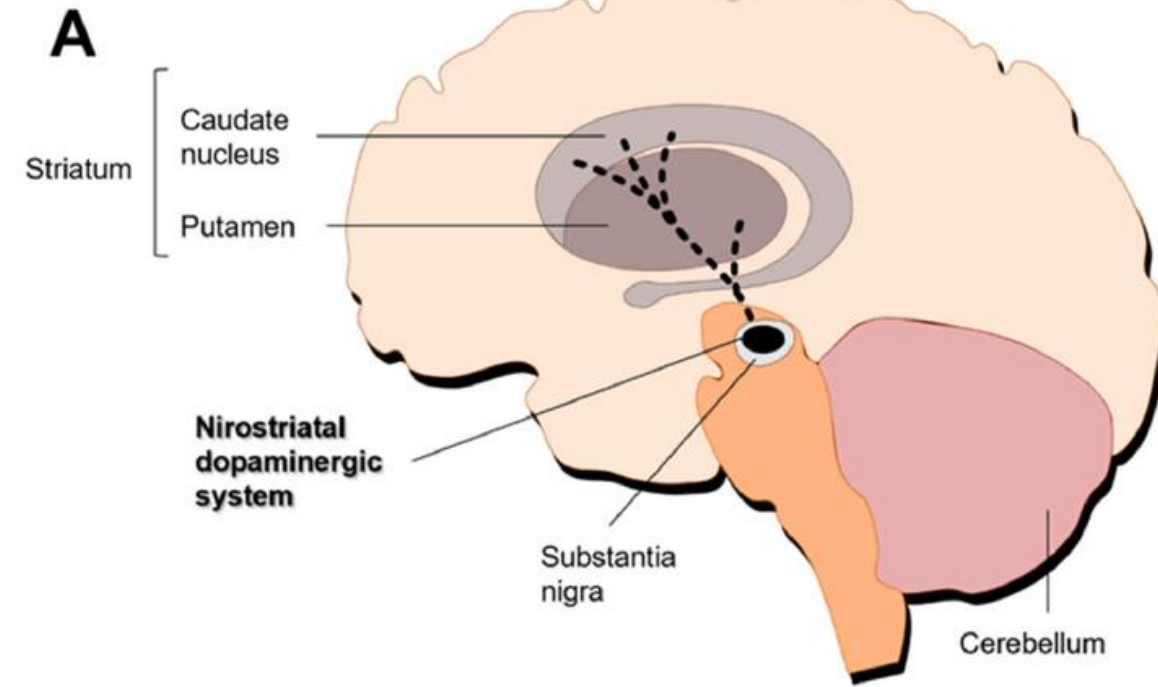


Constipation

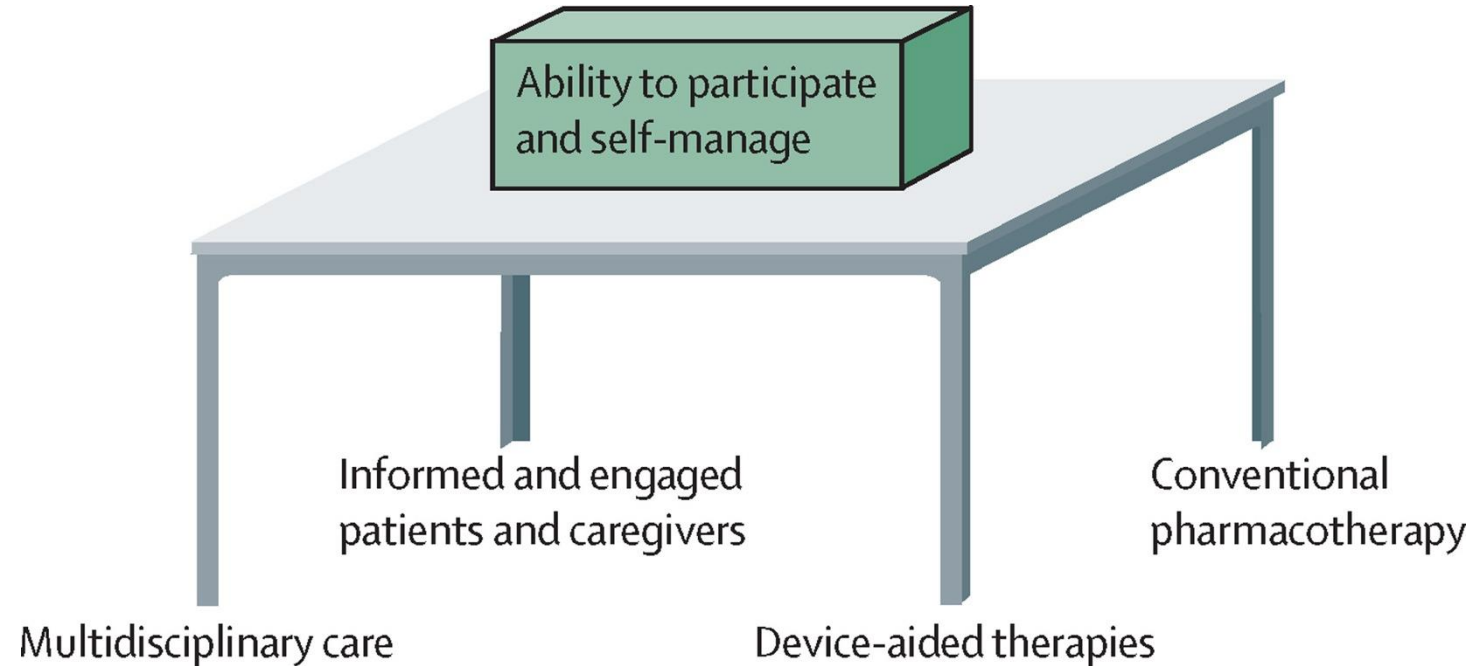
# MAJOR HALLMARKS OF PD

A. Degeneration of nigrostriatal dopaminergic neurons

B. Formation of Lewy bodies

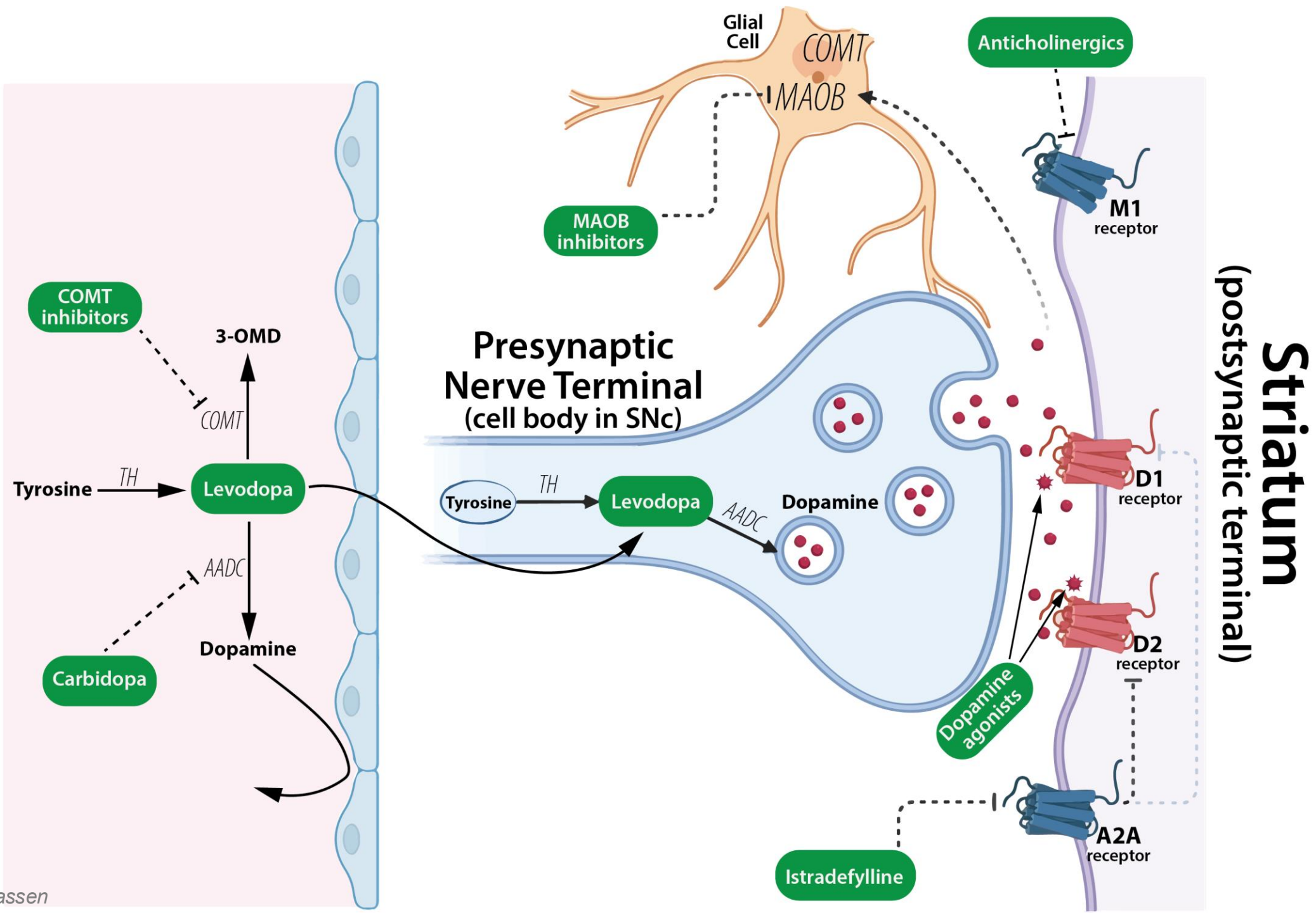


# SYMPTOMATIC MEDICAL MANAGEMENT IN PD



- No rationale to postpone symptomatic tx in people w/ PD who develop a disability (LEAP study, 2019)
- Conversely, presence of recognizable symptoms w/o disability  $\neq$  start tx

Blood



Striatum  
(postsynaptic terminal)

# MANAGING **PROTEIN** AROUND PD MEDICATIONS



Levodopa = most effective PD treatment, but **efficacy can vary due to absorption**



**Dietary protein** breaks down into amino acids that **can compete with levodopa** at transport mechanisms in intestine & blood brain barrier



This competition may reduce levodopa's ability to get to the brain

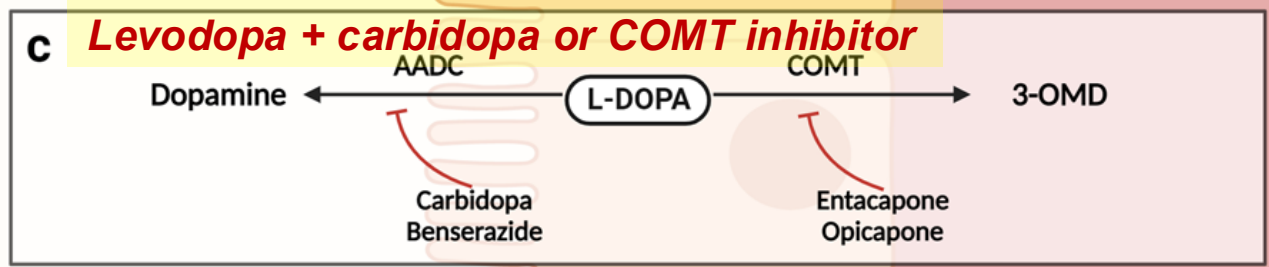
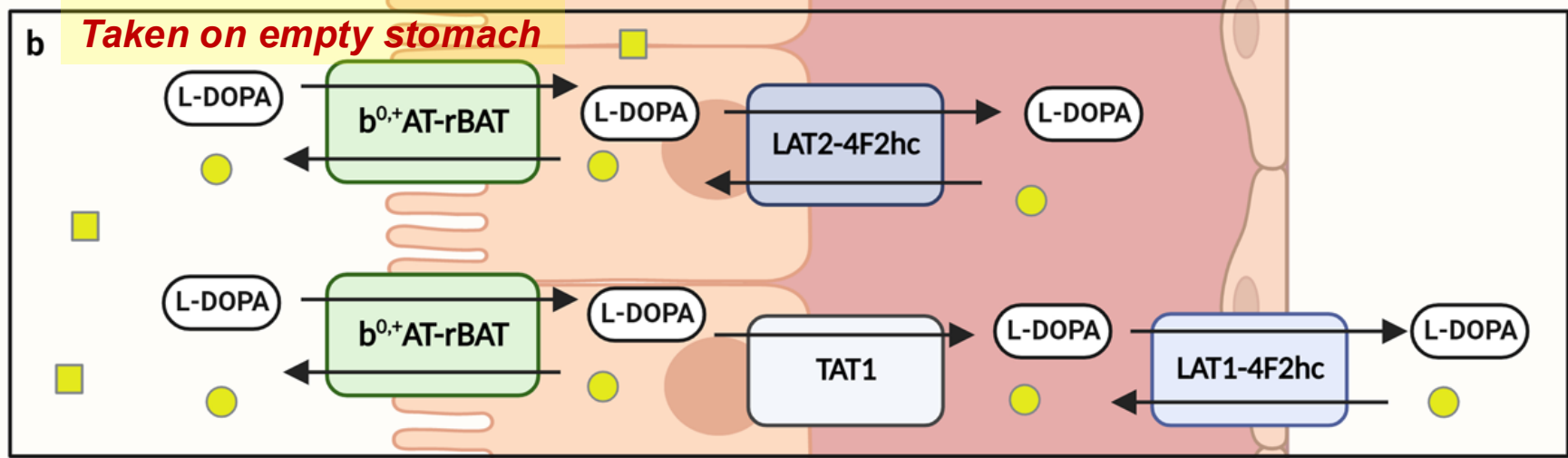
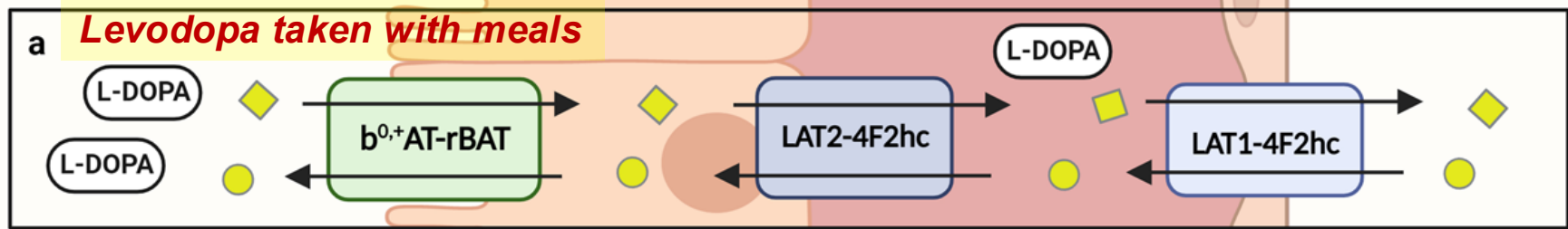
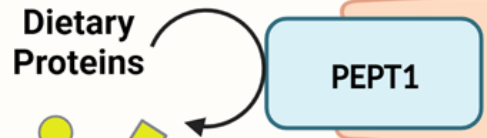


**COMMON GI issues** (e.g., constipation, delayed gastric emptying) *further complicate this*

INTESTINE

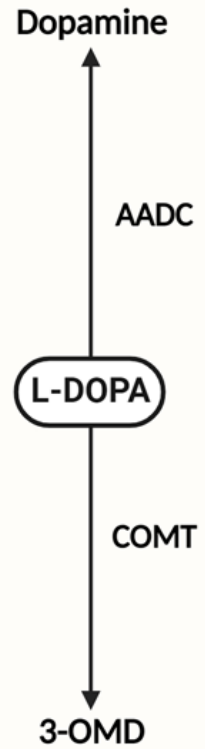
BLOOD

BRAIN



**Dietary Protein Competes with Levodopa Absorption & Brain Transport**

Meal w/ Protein  
↓  
Amino Acids Compete  
↓  
Gut Absorption ↓  
↓  
Less Levodopa Reaches Brain  
↓  
Reduced Medication Effect



Adapted from Rusch C, et al. NPJ Parkinsons Dis. 2023;9(1):98.

# LEVODOPA & DIETARY STRATEGIES EXPLORED

## Low-protein diets

Limit overall protein (<0.8 g/kg/day)

Scientific evidence limited

Risk of weight loss or muscle loss

## Protein redistribution diets

Shift bulk of protein to evening meals

Lower daytime protein

May improve medication effect in some people, but study results vary

## **Best practice** (*if able to tolerate without side effects*)

Taking levodopa on empty stomach

~20-30 min before meals

**-OR-** 1-2 hrs after meals

## Practical considerations

**Monitor weight & nutrition**

**Adjusting levodopa timing with meals**

**Addressing other GI / digestive issues**

# Factors that influence pharmacokinetics & levodopa response

## NEUROLOGICAL

- Effectiveness of Levodopa formulations (IR, CR/ER, enteral)
- Cognitive impairment and dementia
- Mood changes (anxiety, depression)

## DIET & NUTRITION

- Nutrient composition of meals
- Meal size and timing
- Vitamin and mineral supplements
- Altered food preferences

## GASTROINTESTINAL

- Nausea/early satiety
- Dysphagia
- Gastroparesis
- Constipation
- SIBO, *H.pylori*, ↑ *Lactobacillus*
- Microbiome changes

## NUTRITIONAL STATUS

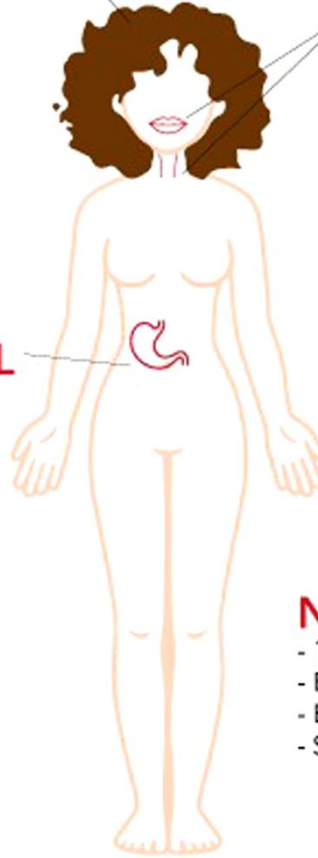
- ↑ energy expenditure
- Body weight and BMI
- Body composition
- Sarcopenia and/or malnutrition

## DEMOGRAPHICS

- Age
- Age of onset
- Sex
- Ethnicity
- Comorbidities

## SOCIOECONOMIC AND GLOBAL

- Education-level
- Access to medications
- Access to healthy foods



# COMMON DIETS IN PARKINSON'S: BENEFITS & CONSIDERATIONS

Diet Type	What to Encourage	Possible Benefits	Notes for Patients/Caregivers
<b>Mediterranean Diet</b>	Veggies, fruits, nuts, seeds, fish, olive oil, whole grains, poultry, legumes	Linked with <b>reduced symptoms</b> , better gut health, may slow progression	Encourages whole, unprocessed foods; limit sweets, soda, fried foods
<b>MIND Diet</b>	Mediterranean-style diet emphasizing leafy greens & berries, seafood, olive oil, whole grains, poultry	Associated with <b>lower PD risk, slower progression</b>	Limit red meat, butter, refined grains, sweets, soda
<b>Ketogenic Diet</b>	High-fat, low-carbohydrate	Some studies show <b>motor &amp; non-motor symptom improvements</b>	Requires medical oversight; not suitable for everyone
<b>Protein-Redistribution Diet (PRD)</b>	Limit protein earlier in day, more at dinner	May <b>reduce motor fluctuations</b> and improve levodopa effect	Monitor nutrition and weight; partner with clinician
<b>Low-Protein Diet (LPD)</b>	Overall low protein intake	Some small benefits, but <b>risk of weight/muscle loss</b>	Not generally recommended without supervision

# SUPPLEMENTS & NUTRITION SUPPORT

- **Helpful / often recommended especially if deficient levels**

- **Vitamins B12, folate, D; Calcium** – Supports brain, bone
- +/- Magnesium (sleep; muscle cramps; constipation)
- Melatonin (sleep)








- **Uncertain / limited evidence**

- Antioxidants: Vitamin C & E, CoQ10
  - *Alternative food sources of Vit E: whole grains, nuts, avocado, vegetable oils*
- Others: Creatine, Glutathione, Green tea polyphenols, Ginkgo, Lion's Mane





- **Use caution / avoid**

- Lithium, IV Glutathione, high-dose B6
- Herbal products (e.g., St. John's Wort for mood)
  - ⚠ Potential drug interactions (e.g., rasagiline/selegiline, antidepressants)






## Boost Your Vit B12 & 6 Intake

-   **Beef, chicken, turkey**
-  **Fish:** salmon, tuna
-  **Dairy:** milk, cheese, yogurt
-  **Eggs**
-  **Leafy Greens:** spinach, kale
-  **Fortified cereals & whole grains**

## Boost Your Vit D Intake

-  **Sunlight**
-  **Fortified Foods:** milk, margarine, cereals
-  **Fatty Fish:** salmon, fish liver oils
-  **Eggs**

## Boost Your Calcium Intake

-  **Fortified Orange Juice**
-  **Fortified Plant Milks:** add to cereal, smoothies, cooking
-  **Calcium-Fortified Foods:** breakfast cereals, snacks
-  **Calcium Supplements:** calcium citrate
-  **Chewable Tablets:** better absorption

# MUCUNA PRURIENS & PD



## What is it?

- Natural plant containing levodopa

## Potential benefits

- May improve motor symptoms
- Some studies showed faster onset
- *Possible antioxidant properties (still being studied)*

## Limitations & Risks

- Unregulated = Inconsistent levodopa amount; No standard dose
- Potential for more side effects (nausea, GI upset)
- Potentially less well tolerated with long-term use

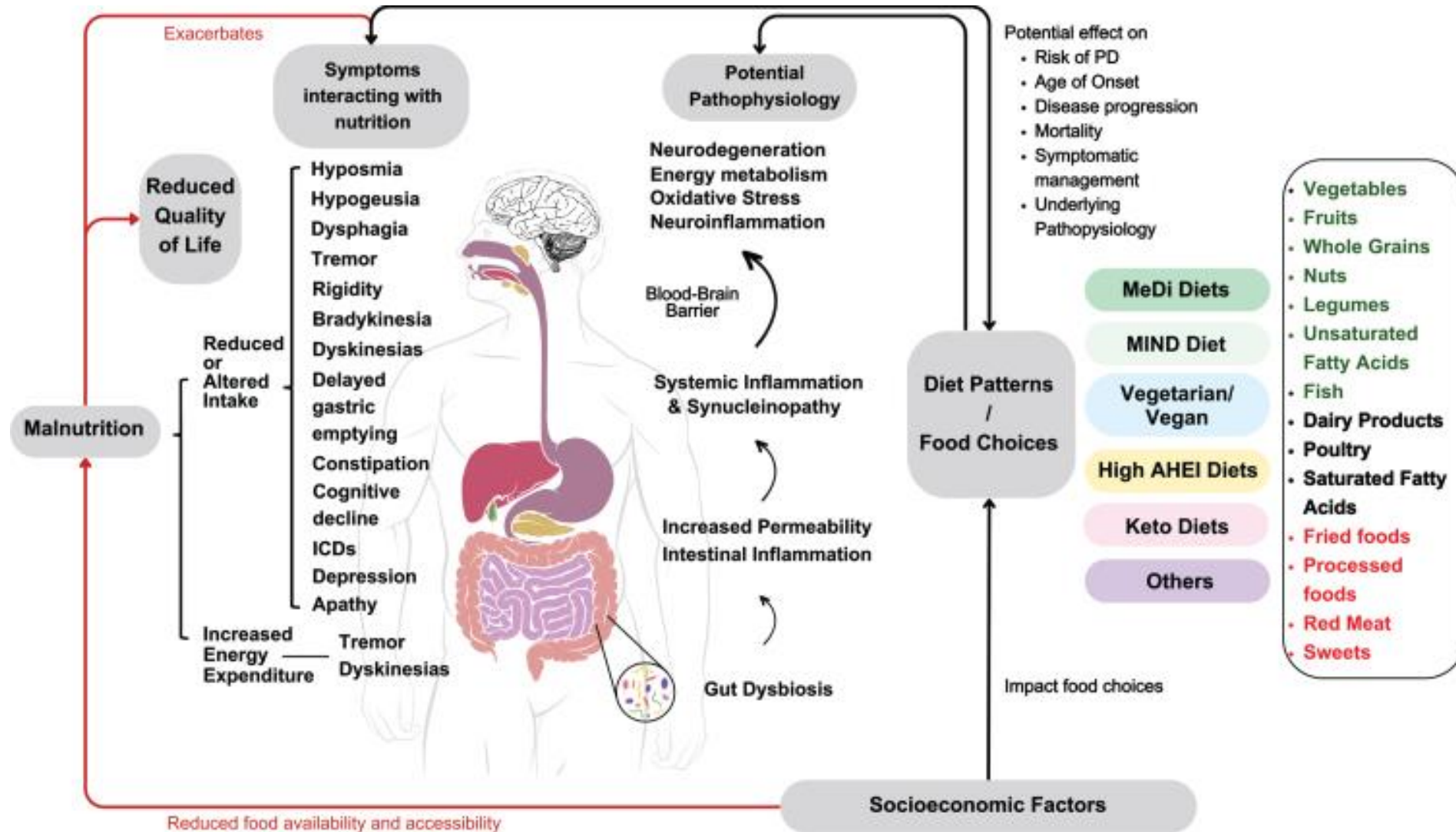
## Key difference from standard therapy

- Lacks carbidopa

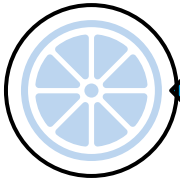
## Bottom line

- Investigate before deciding if this natural remedy is right for you
- Caution, as with any medication
- Talk to your doctor before considering

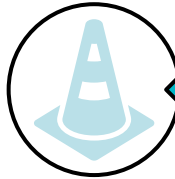
# Future perspectives: NEED MORE high-quality randomized controlled dietary intervention trials in PD



# OVER-THE-COUNTER SUPPLEMENTS: GENERAL PRINCIPLES



Supplements may **support overall health**, BUT **not a cure or replacement** for proven PD therapies



Over-the-counter meds can have side effects, high \$\$\$, potential interactions with other drugs



**Check with your doctor** before starting anything new



Remember: most herbs/supplements have not been rigorously studied; not strictly regulated by FDA

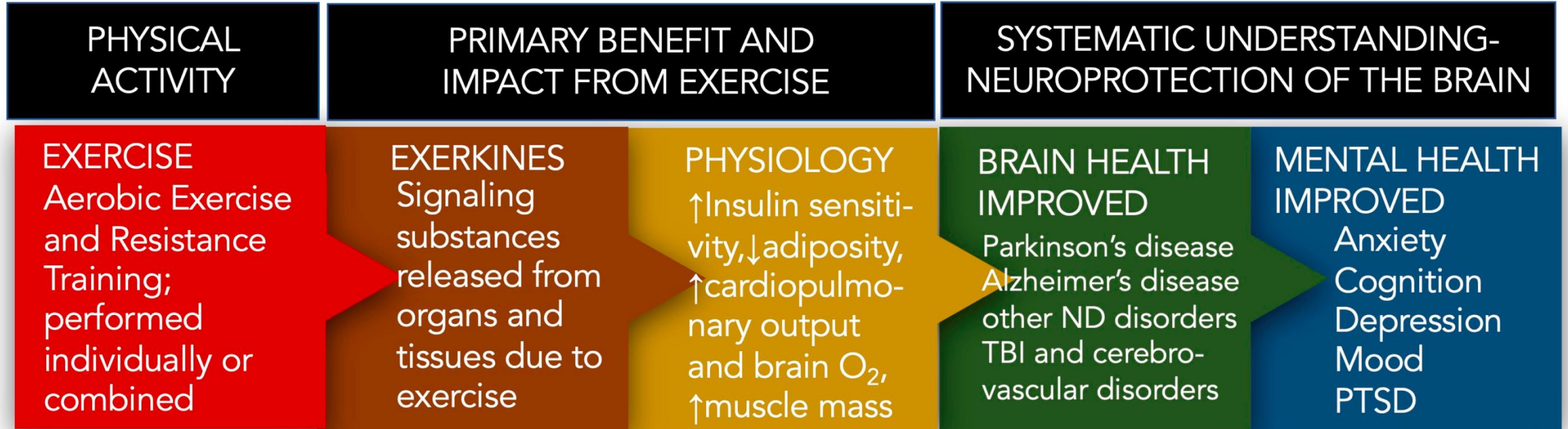


**Focus on diet, exercise & lifestyle**, first and foremost

# PHYSICAL ACTIVITY / EXERCISE

ABSOLUTELY CRITICAL!

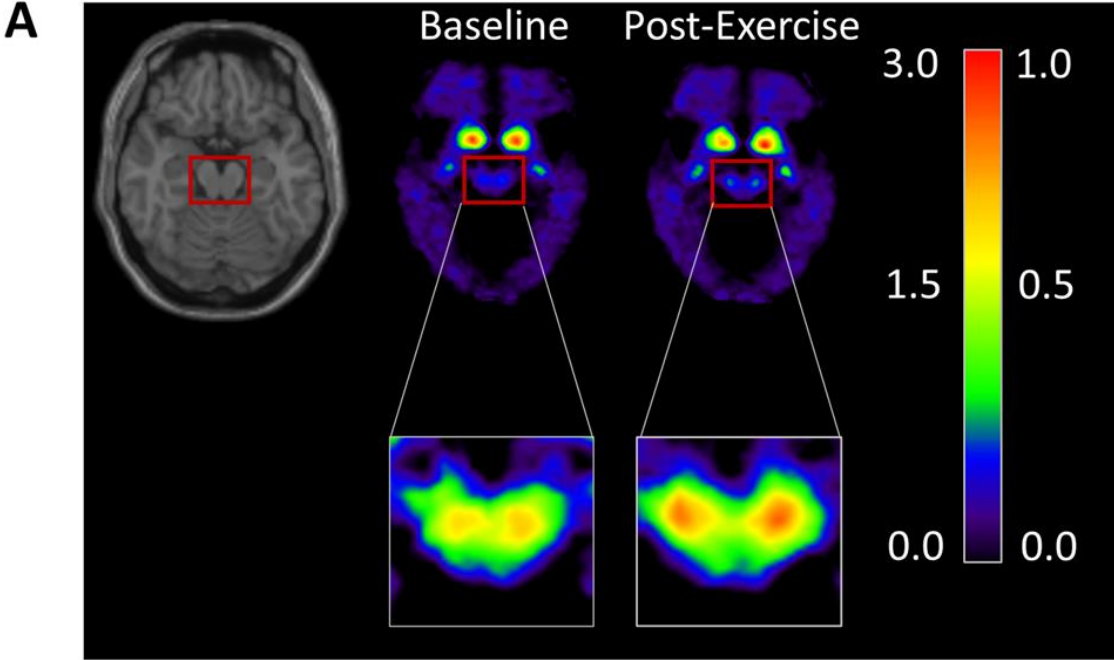
# EXERCISE IS NEUROPROTECTIVE



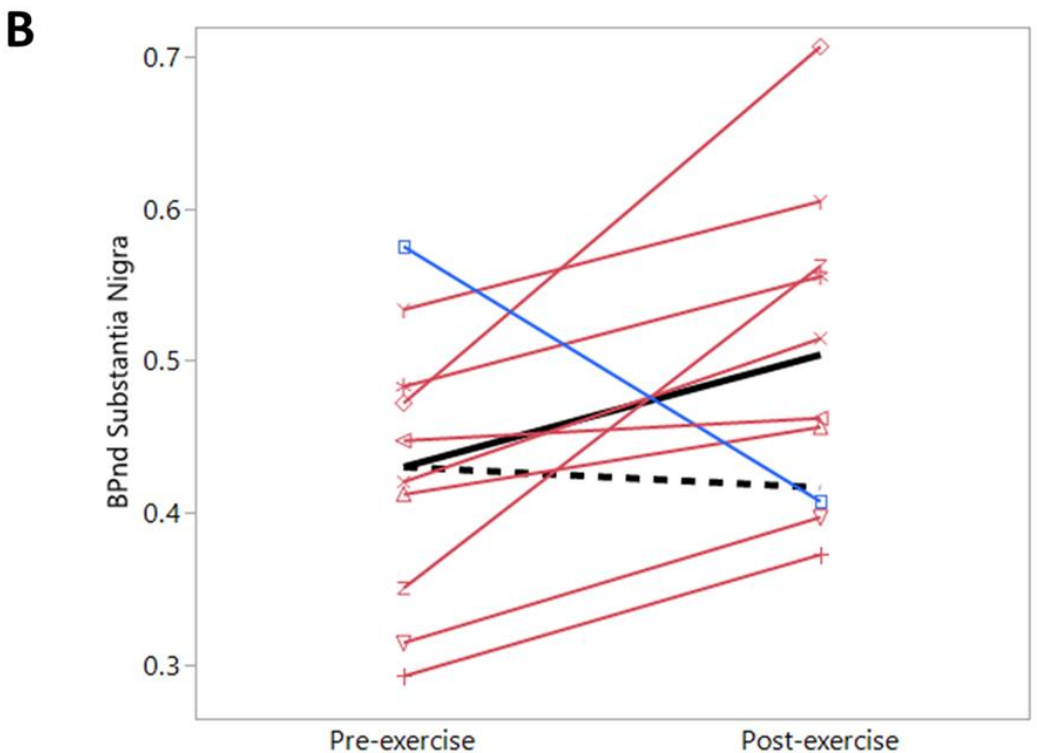
ADVANCED AGING  
 ENVIRONMENTAL TOXIN  
 GENETIC  
 IMMUNE SYSTEM DYSFUNCTION,  
 INCLUDING AUTOIMMUNE DISEASE  
 INTRACELLULAR PROTEIN DENATURATION  
 AND AGGREGATION  
 NEUROINFLAMMATION  
 OXIDATIVE STRESS  
 REDUCTION IN MITOCHONDRIAL  
 ACTIVITY



STRESS/DEATH OF DOPAMINERGIC  
 NEURONS IN THE MIDBRAIN LEADS TO  
 THE LOSS OF THE MAIN SOURCE OF  
 DOPAMINE IN THE CNS

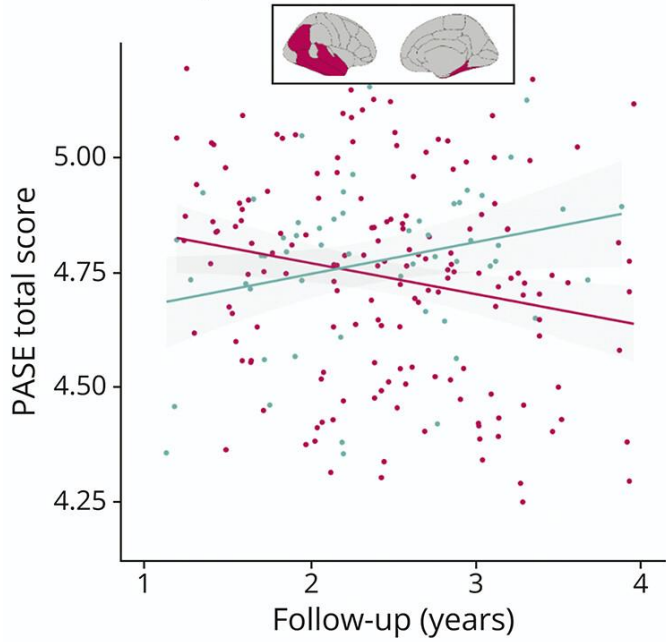


# DOPAMINE TRANSPORTER LEVELS PRE- AND POST- EXERCISE

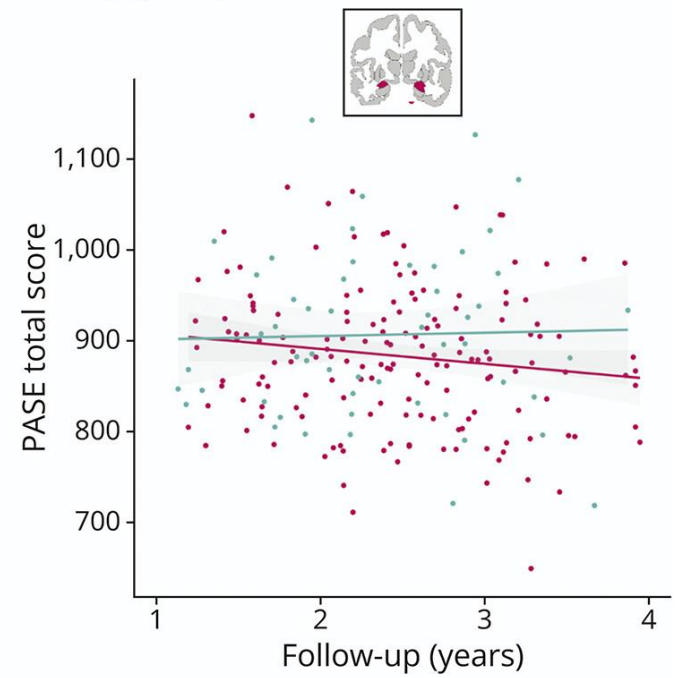


de Laat, B et al. *npj Parkinsons Dis.* 10, 34 (2024).

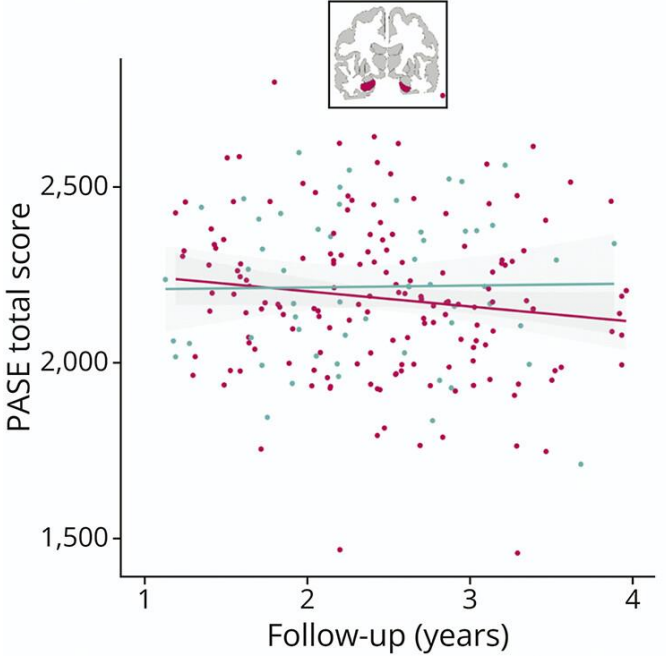
A. Physical activity-related cortical meta-ROI (thickness)



B. Amygdala (volume)



C. Hippocampus (volume)



—●— PD-PA High  
—●— PD-PA Low

*PASE = Physical Activity Scale for Elderly*

# MRI-BASED EVIDENCE OF REGULAR PHYSICAL ACTIVITY'S IMPACT ON BRAIN NETWORKS FOR MODIFYING DISEASE COURSES IN PD

# Parkinson's Exercise Recommendations

Parkinson's is a progressive disease of the nervous system marked by tremor, stiffness, slow movement and balance problems.

Exercise and physical activity can improve many motor and non-motor Parkinson's symptoms:



## Aerobic Activity

3 days/week for at least 30 mins per session of continuous or intermittent at moderate to vigorous intensity

**TYPE:** Continuous, rhythmic activities such as brisk walking, running, cycling, swimming, aerobics class

**CONSIDERATIONS:** Safety concerns due to risks of freezing of gait, low blood pressure, blunted heart rate response. Supervision may be required.

## Strength Training

2-3 non-consecutive days/week for at least 30 mins per session of 10-15 reps for major muscle groups; resistance, speed or power focus

**TYPE:** Major muscle groups of upper/lower extremities such as using weight machines, resistance bands, light/moderate handheld weights or body weight

**CONSIDERATIONS:** Muscle stiffness or postural instability may hinder full range of motion.

## Balance, Agility & Multitasking

2-3 days/week with daily integration if possible

**TYPE:** Multi-directional stepping, weight shifting, dynamic balance activities, large movements, multitasking such as yoga, tai chi, dance, boxing

**CONSIDERATIONS:** Safety concerns with cognitive and balance problems. Hold on to something stable as needed. Supervision may be required.

## Stretching

>2-3 days/week with daily being most effective

**TYPE:** Sustained stretching with deep breathing or dynamic stretching before exercise

**CONSIDERATIONS:** May require adaptations for flexed posture, osteoporosis and pain.



**See a physical therapist** specializing in Parkinson's for full functional evaluation and recommendations.



**Safety first:** Exercise during on periods, when taking medication. If not safe to exercise on your own, have someone with you.



It's important to **modify and progress** your exercise routine over time.

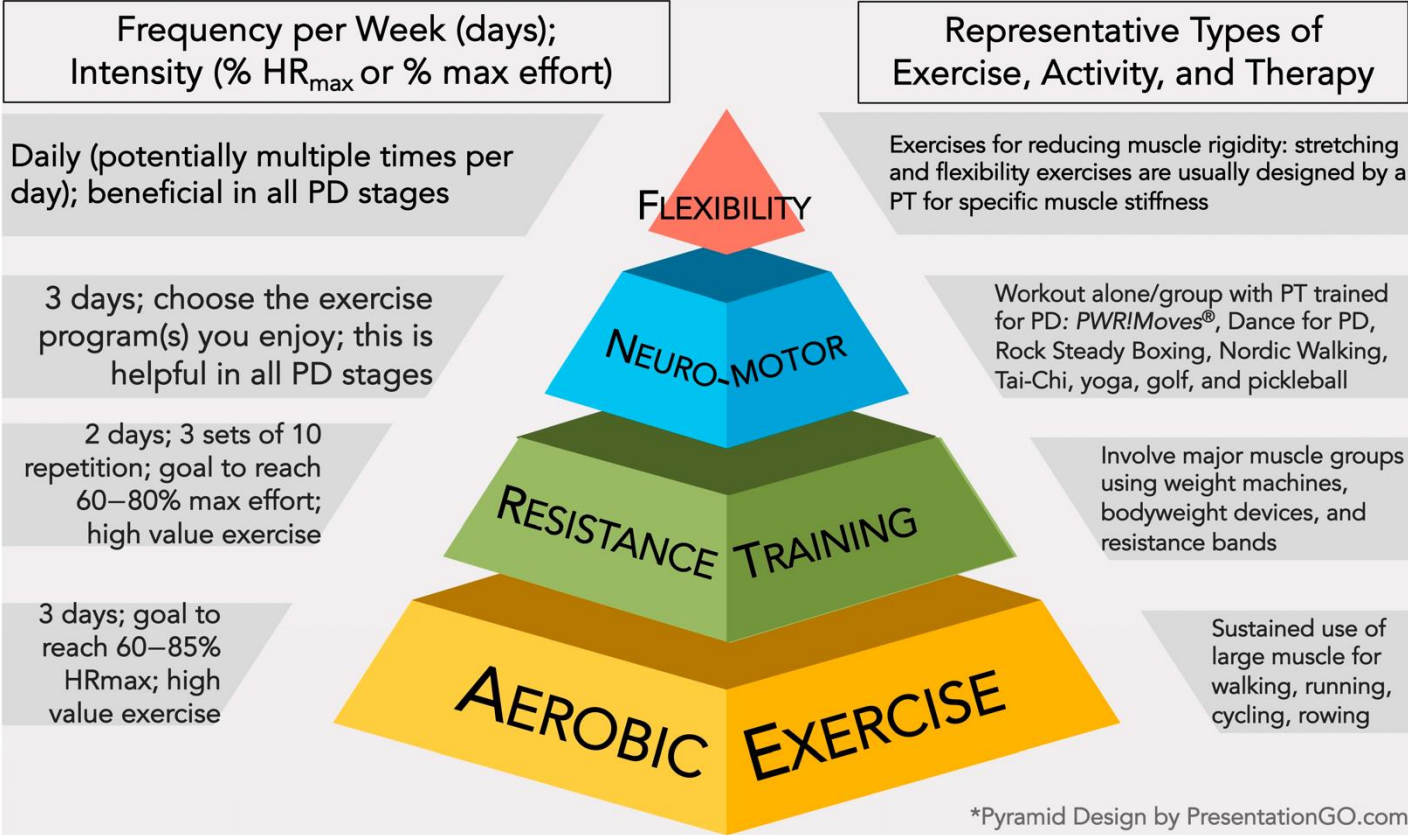


Participate in **150 minutes** of moderate-to-vigorous exercise per week.



Helpline: 800.473.4636/Parkinson.org

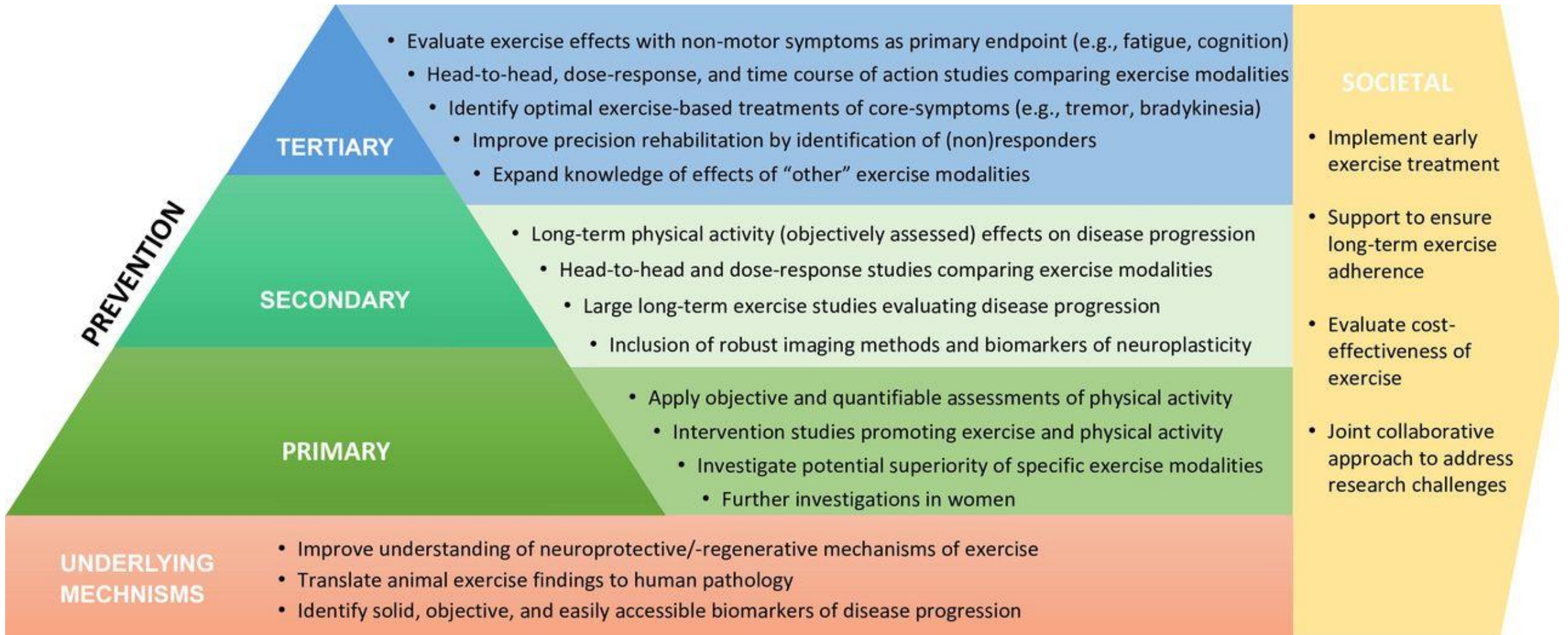
# PARKINSON'S DISEASE EXERCISE PYRAMID\*



\*Pyramid Design by PresentationGO.com

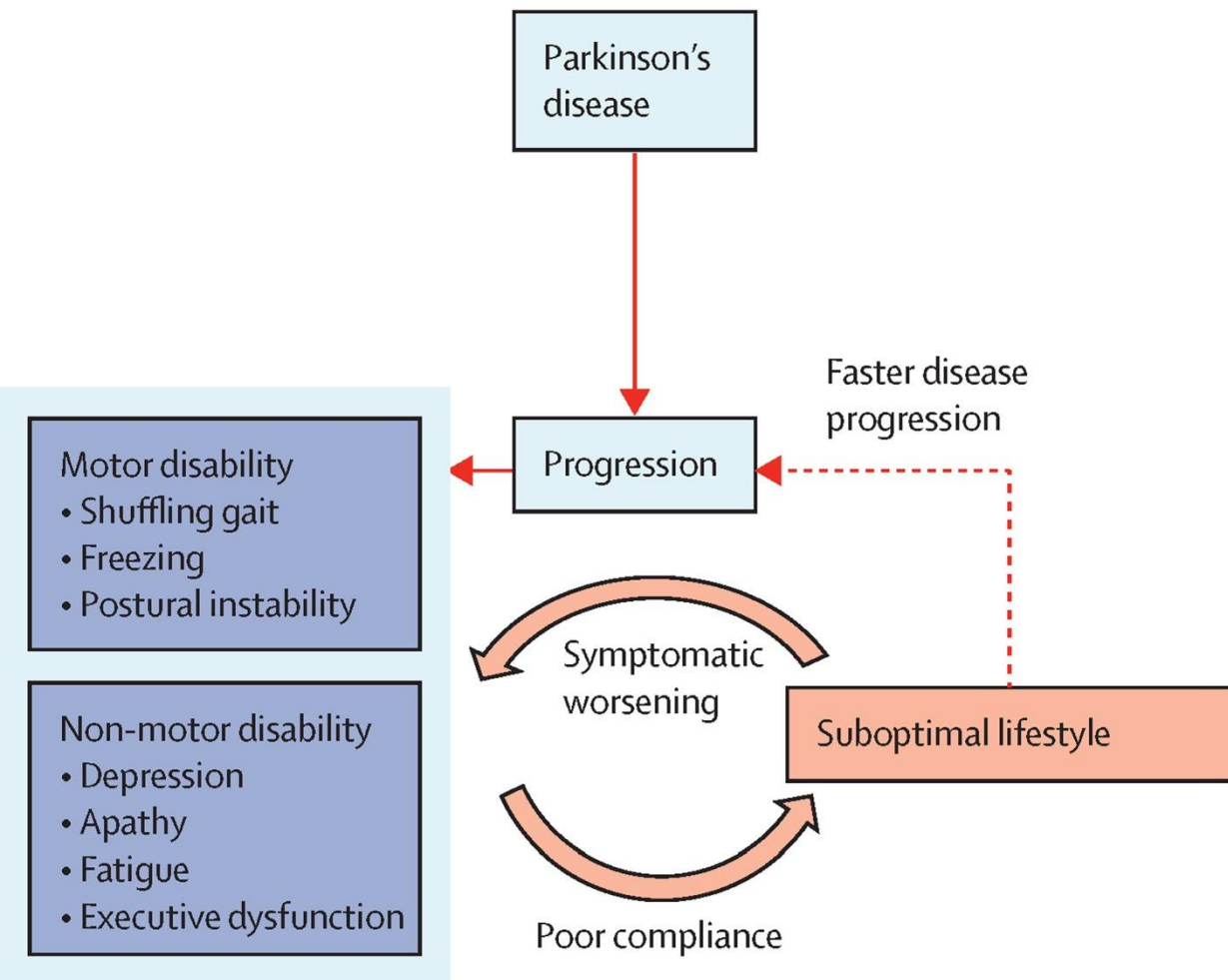
Mitchell AK, et al. Exercise, Neuroprotective Exerkines, and Parkinson's Disease: A Narrative Review. *Biomolecules*. 2024; 14(10):1241.

# EXERCISE AS MEDICINE - ONGOING RESEARCH

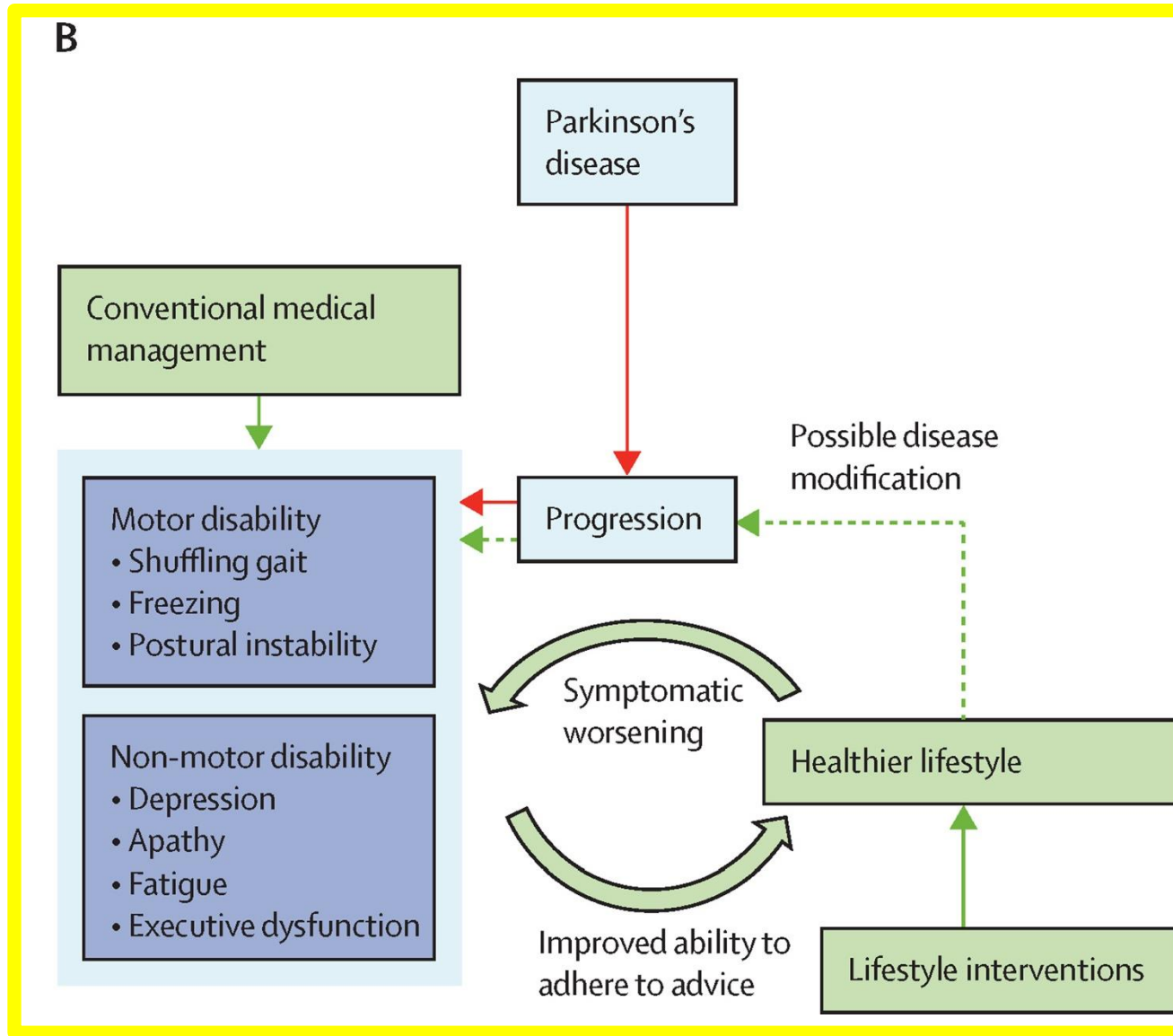


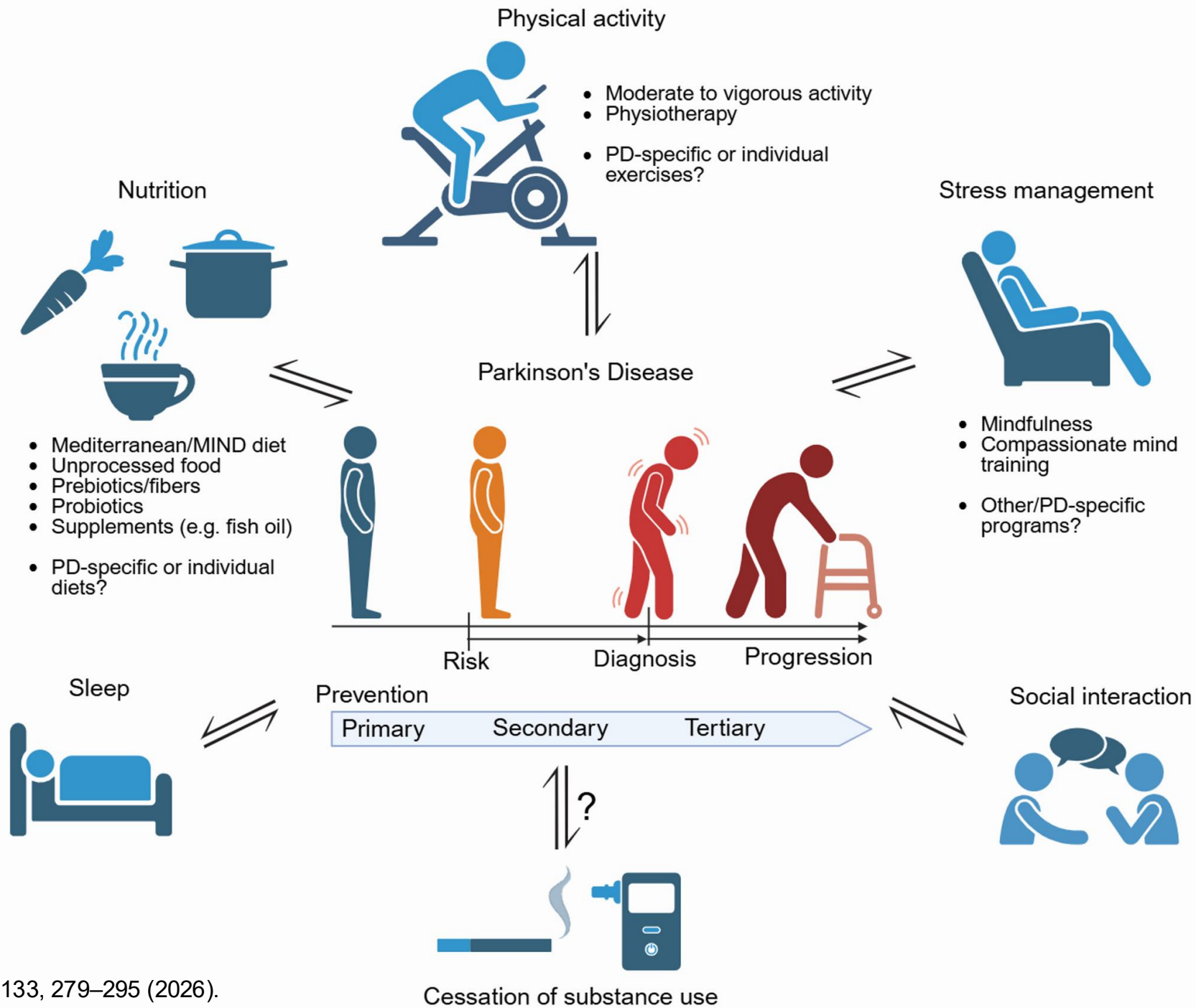
# ROLE OF LIFESTYLE INTERVENTIONS IN PD MANAGEMENT

A



B





# CONCLUSIONS

**Lifestyle matters:** exercise, nutrition, smart supplement use support living well with PD

**Exercise is ESSENTIAL:** one of the most effective non-drug therapies

Nutrition supports **energy, weight, medication efficacy**

Be cautious with supplements: “natural” doesn’t always mean safe or effective

**Work with your care team to personalize your plan**

# ACKNOWLEDGEMENTS

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