Neurorehabilitation in Parkinson's Disease

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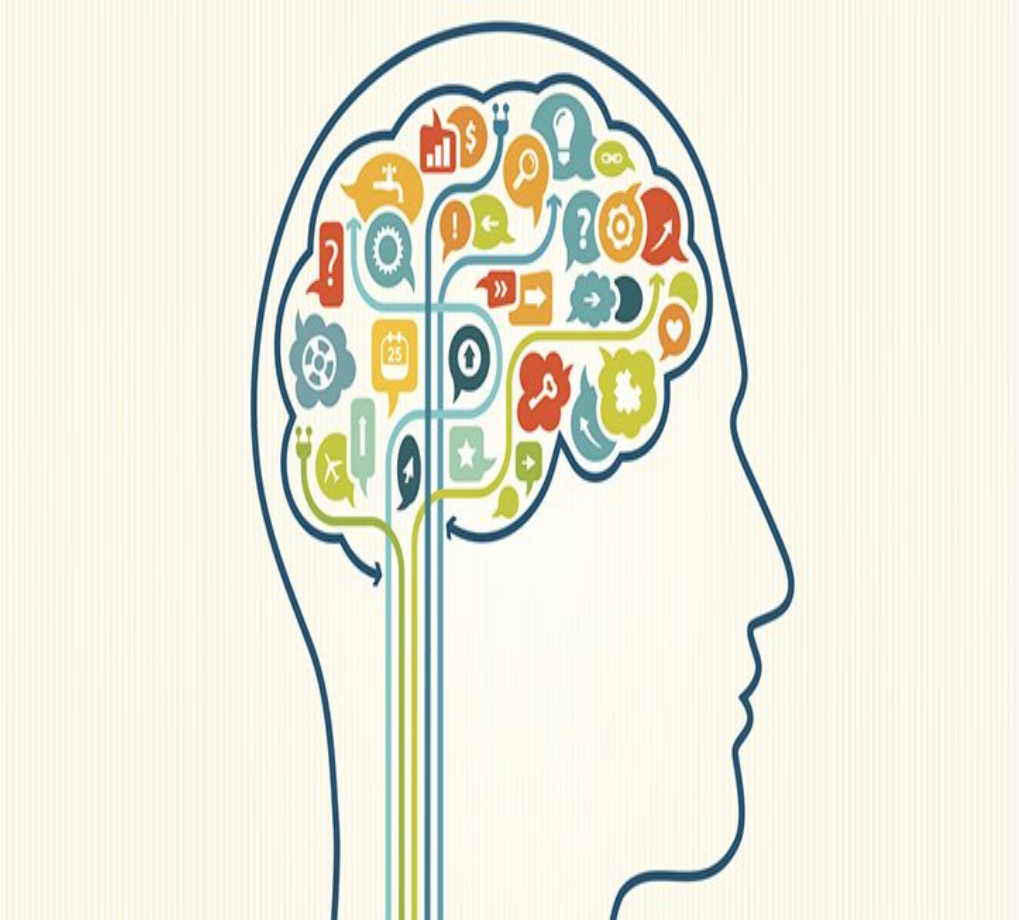
Outline

- Parkinson's Disease and Cognition
- Cognitive Resiliency
- Neurorehabilitation in everyday life
    - Cognitive functioning
    - Physical functioning
    - Social functioning



Parkinson's Disease

- PD is a neurodegenerative process that includes motor and non-motor symptoms
  - Motor Symptoms
    - Tremor
    - Bradykinesia
    - Rigidity
    - Postural instability
  - Nonmotor Symptoms
    - Autonomic symptoms
      - Bladder control
      - Orthostatic hypotension
      - Erectile dysfunction
    - Sleep disorders
    - Behavioral
      - Anxiety
      - Depression
      - Hallucinations
      - Cognitive impairment

Parkinson's Disease and Cognition

- Approximately 20-50% of PD patients experience cognitive impairment (Yarnal et al., 2014)
  - Cognitive impairment may be present early in the course of the disease, before motor symptoms become noticeable (Goldman et al., 2015).
  - Cognitive impairment may continue to deteriorate as the disease progresses
- Mild Neurocognitive Disorder (MND, formerly MCI) is cognitive impairment that is present while functional independence continues
  - 9-15% of PD patients who develop MND go on to develop dementia yearly (Pedersen et al., 2013)

Parkinson's Disease and Dementia

- Cognition may deteriorate until dementia develops (approximately 10-25 years after diagnosis; Hely et al., 2008)
  - Changes is cognitive functioning in combination with decline in independent functioning
- Dementia in PD compromises quality of life
  - Decreased independence, health, and social relationships
- Therefore, because PD is neurodegenerative, there is a higher risk for the eventual development of dementia

Dementia

- HOWEVER, one recent meta-analysis suggested that cognitive impairment in PD may be attributed to modifiable risk factors (Guo et al 2019)
  - Vascular risk factors
    - Obesity
    - Diabetes
    - Smoking/Alcohol abuse
- Depression
    - Chronic and untreated
- Cognitive inactivity
    - Sedentary lifestyle

Clinical Management of Cognitive Impairment

- Pharmacological Interventions
  - Levodopa
    - Increase alertness, mood, arousal, processing speed (Pillon et al., 2001)
  - Rivastigmine (Exelon)
    - Improvement in global cognitive functioning, attention, and executive functioning (Poewe et al., 2006)
    - *Adverse side effects
      - Nausea, vomiting, diarrhea
- Non-pharmacological Interventions
  - Cognitive remediation
    - Group or individual
  - Physical activity
    - Regular, consistent
  - Social activity

Cognitive Resiliency

Cognitive Functioning Changes as We Age

- Some causes of cognitive problems in older age:
  - Normal aging
  - Structural changes in our brains caused by diseases: Vascular, neurological, and/or medical
  - Sedentary lifestyle

Research

Research has suggested that one of the keys to keeping your brain healthy is..... ACTIVITY!

Activity

Emerging research in humans has modestly shown that activity at the very least preserves if not enhances cognitive functioning in aging populations

Cognitive Functioning Changes as We Age

Lifestyle factors can help reduce cognitive decline:

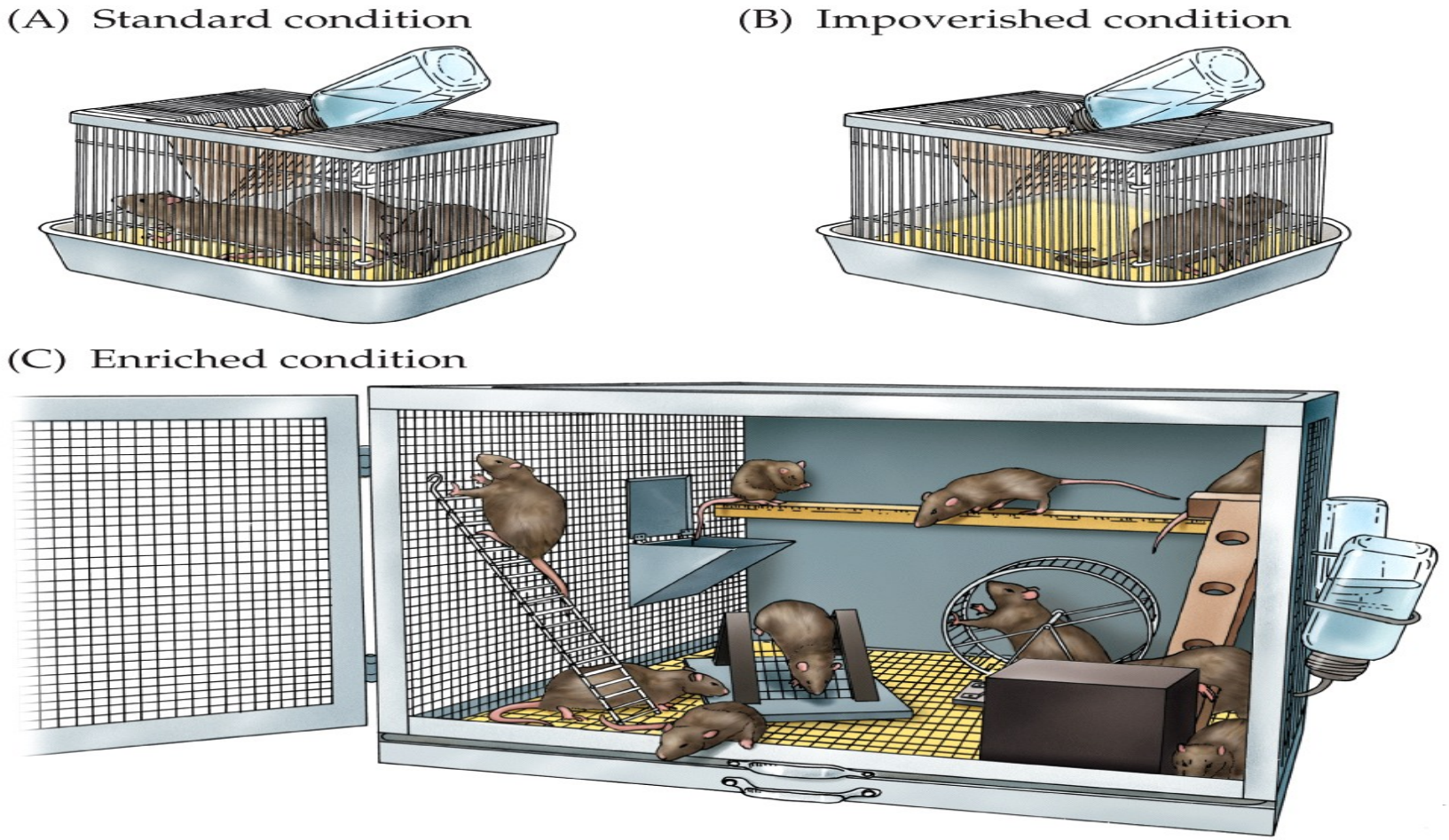
- Living in a favorable environment.
  - Involvement in enriching activities.
  - Having a partner (e.g., carepartner, loved one, friends, etc.) who will motivate you to stay active.

How Do We Know This?

Animal Research

- Lab animals living in a complex environment demonstrated biochemical and anatomical brain changes.
- Three housing conditions:
  - **Standard condition** (SC)
  - **Impoverished** (or *isolated*) **condition** (IC)
  - **Enriched condition** (EC)

Experimental Environments to Test the Effects of Enrichment on Learning and Brain Measures



***BIOLOGICAL PSYCHOLOGY 7e*, Figure 17.19**

Diamond et al. 1967; Greenough et al., 1976

Environment and the Brain

- Animals housed in enriched environments developed:
  - Heavier and thicker brains
  - Enhanced cholinergic activity which is good for creating new and stronger memories
  - Larger connections between neurons in the brain.
  - Enhanced recovery from brain damage.

Neuroplasticity

What these studies have shown us, is that enrichment in one's life can promote neuroplasticity

What is Neuroplasticity?

The ability of neurons in the brain to change and reorganize continuously to meet the dynamic demands of the internal and external environment.

Neurorehabilitation as an Intervention to Promote Neuroplasticity

- A multimodal intervention targeting the recovery of brain function following disease and or injury
- In PD, neurorehabilitation targets the following areas:
  - Physical therapy

Physical Therapy

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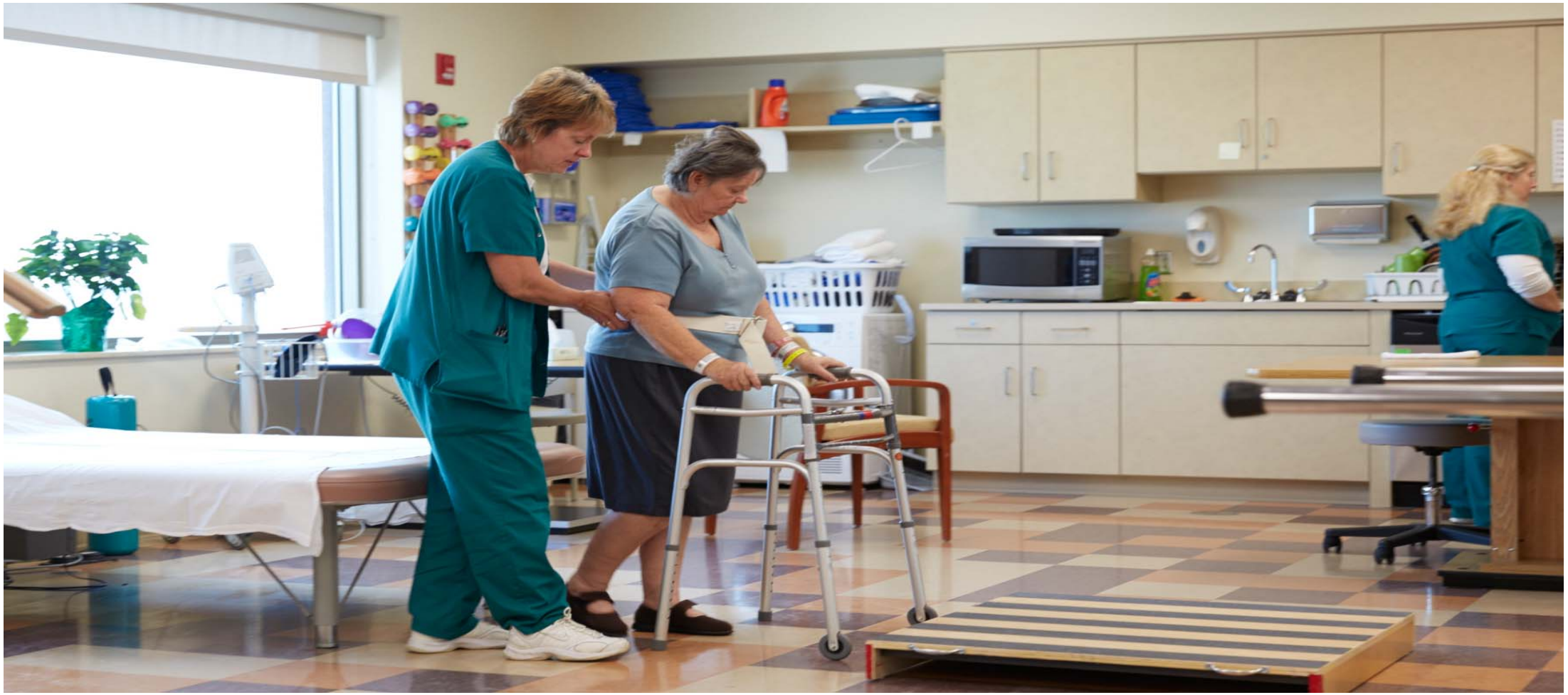
Occupational Health



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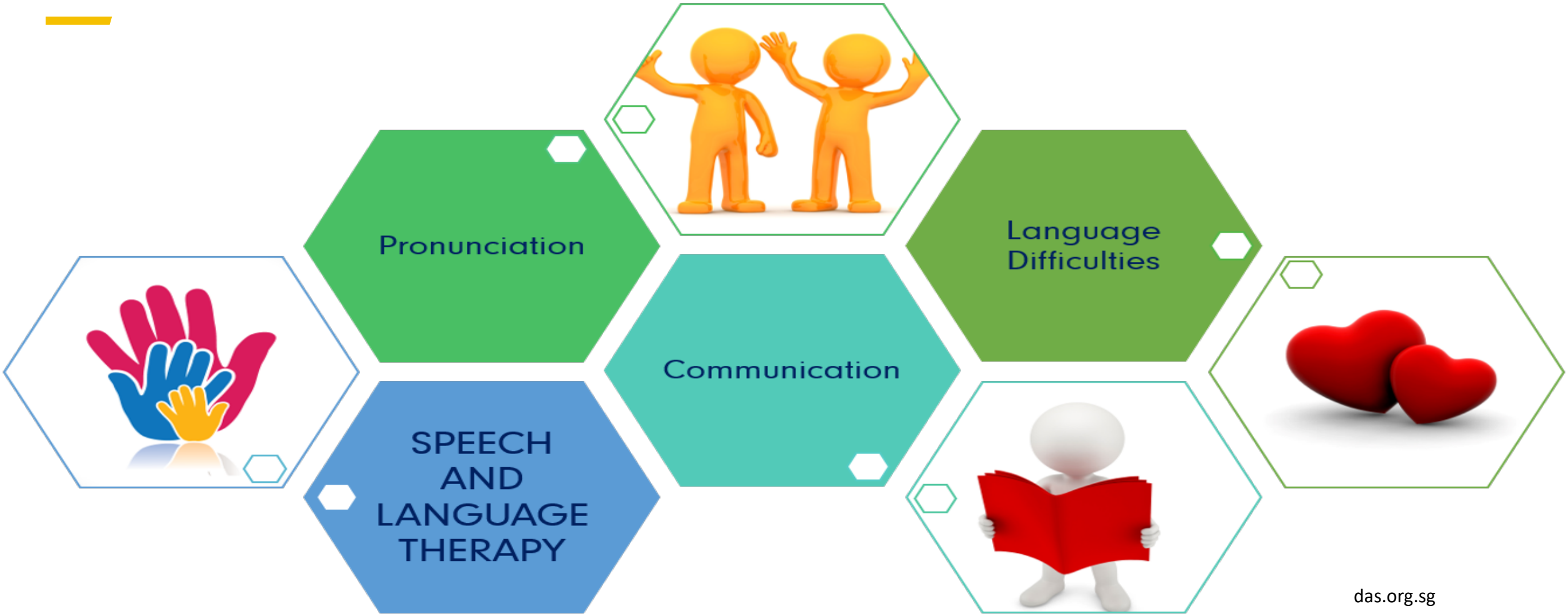
Speech and Language Therapy



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Neurorehabilitation as an Intervention to Promote Neuroplasticity

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  - Physical therapy
  - Occupational therapy
  - Speech and language therapy
  - Neurocognitive functioning
    - Cognitive training
    - Physical functioning
    - Social functioning

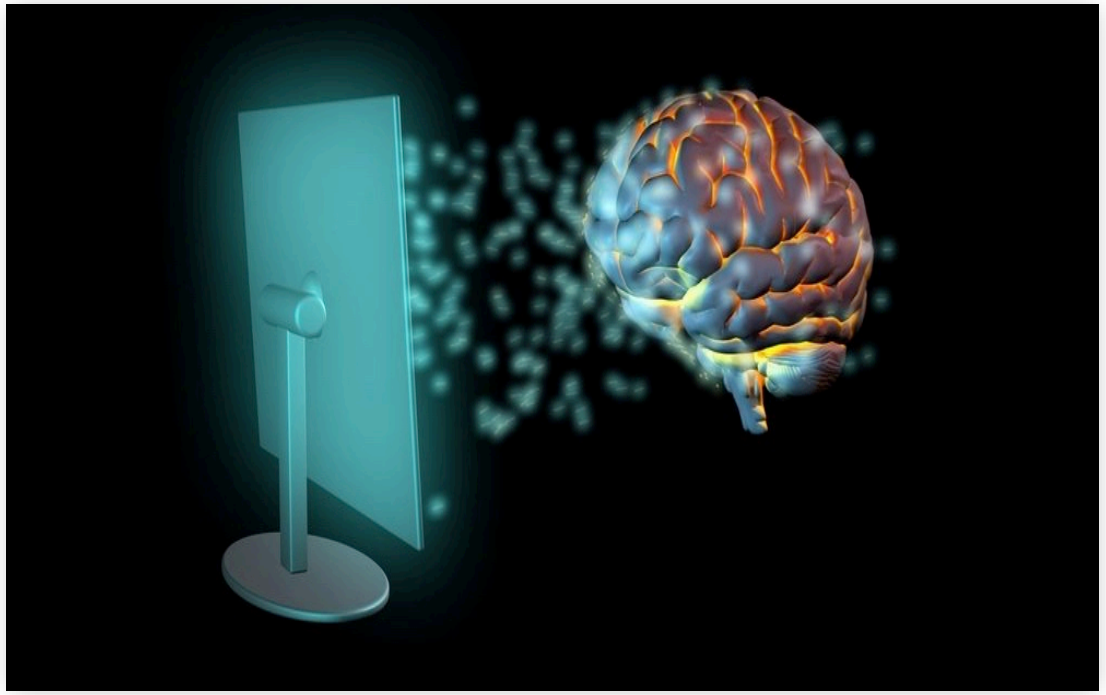
Cognitive Training

Developing Cognitive Skills Training

- Based on the concept that repeated execution of cognitive tasks leads to improved cognitive functions
- Variability in the neuropsychological deficits that may be present in PD makes it challenging to have a “one size fits all” model for cognitive decline in PD (Buindo et al. 2017)
- Areas of cognitive impairment:
  - Attention
  - Processing Speed
  - Executive functioning – Problem-solving, organization, mental flexibility
  - Learning and memory

Cognitive Exercises

- You brain, like muscular strength, requires you to “use it or lose it.”
- The more you work out your brain, the better you will be able to process and remember information.
- The best brain exercising activities break your routine and challenge you to use and develop new brain pathways.



Criteria for Cognitive Exercises

- IT IS NEW!
  - No matter how intellectually demanding, if it's something you're already good at, it's not a good enough brain exercise
  - The activity needs to be something that is unfamiliar and out of your comfort zone
  - Examples:
    - Learning a new language
    - Learning about a new topic
    - Learning a new instrument
    - Learning a new hobby/sport

Criteria for Brain Exercises

- IT IS CHALLENGING!
  - Anything that takes some mental effort and expands your knowledge will work.
  - Engaging in the same activities you have always practiced does not allow your brain to grow and strengthen.
  - It is not about becoming a master at the task/hobby/topic you are learning.
  - It is in the simple process of learning something new that you will enhance the possibility for neuroplasticity

Criteria for Brain Exercises

- IT'S FUN!
  - Physical and emotional enjoyment is important in the brain's learning process.
  - The more interested and engaged you are in the activity, the more likely you will be to continue doing it and the greater the benefits you will experience.
  - The more enjoyment you get out of it, motivation to achieve goals will be high.

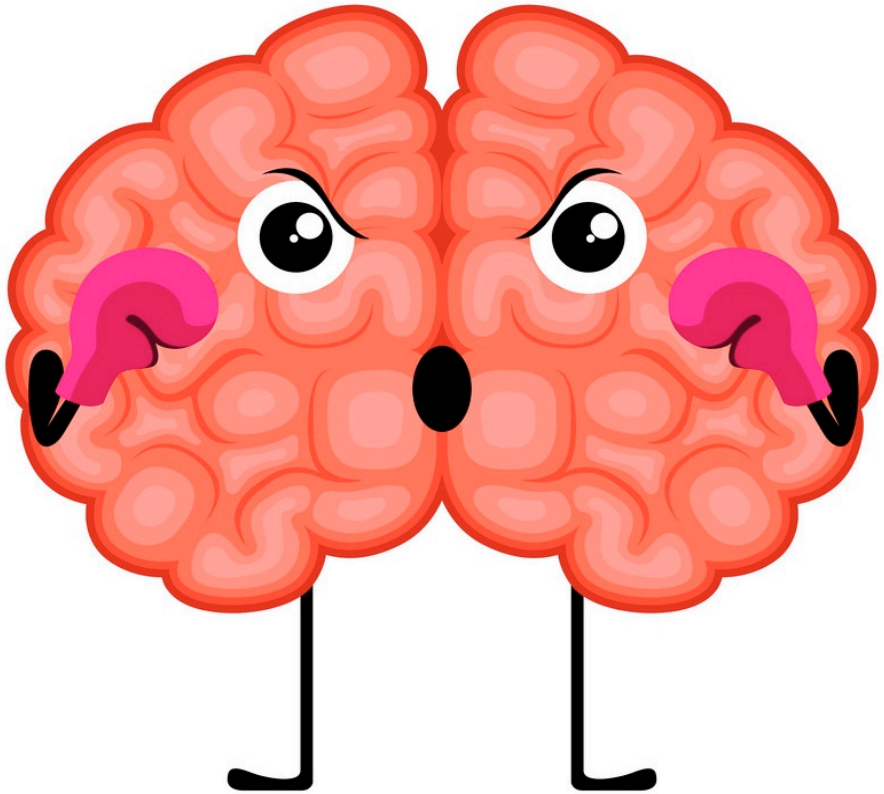
Physical Exercise

Physical Exercise

- If you get clearance from your medical provider to exercise, do it!
- There are many exercises that have been proven to be effective in Parkinson's patients
- There is significant research to suggest that aerobic and resistance exercise may improve cognitive functioning in PD (Cruise et al., 2011; Uc et al., 2014) particularly related to executive functioning and attention/processing speed
  - For example, 6 months of moderate-intense aerobic exercise three times per week improved executive functioning in mild to moderate PD patients

Boxing

- A study by Combs and colleagues (2011) demonstrated that PD patients who exercise via fairly regimented boxing, demonstrated improvements in walking, balance, and in their ability to perform their activities of daily living.
- This full-body workout, tests balance, agility, hand-eye coordination, which can all be affected by PD.
- It can build muscle strength and importantly, offer an outlet for frustration.

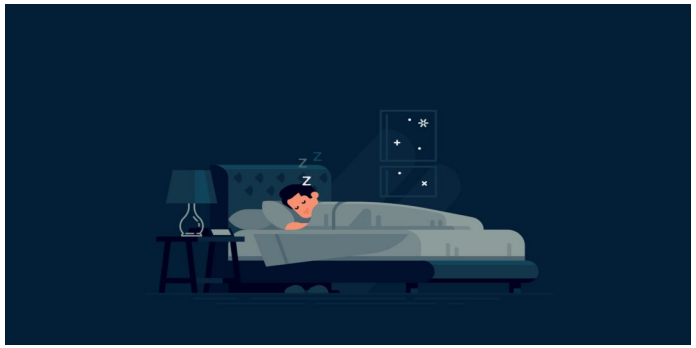


Mind-Body Exercises

- Mind–body exercises increase self-consciousness of the body, thereby increasing the energy, mental clarity, concentration, and ability to tolerate physical discomfort.
- Movement based mind–body interventions comprise low-impact exercises, which enhance mind–body coordination and awareness through the practice of a sequence of controlled motions and focused attention.

Sleep

- Sleep may be problematic in PD for several reasons:
  - Rigidity
  - REM sleep behaviors
  - Hallucinations
  - Urinary frequency



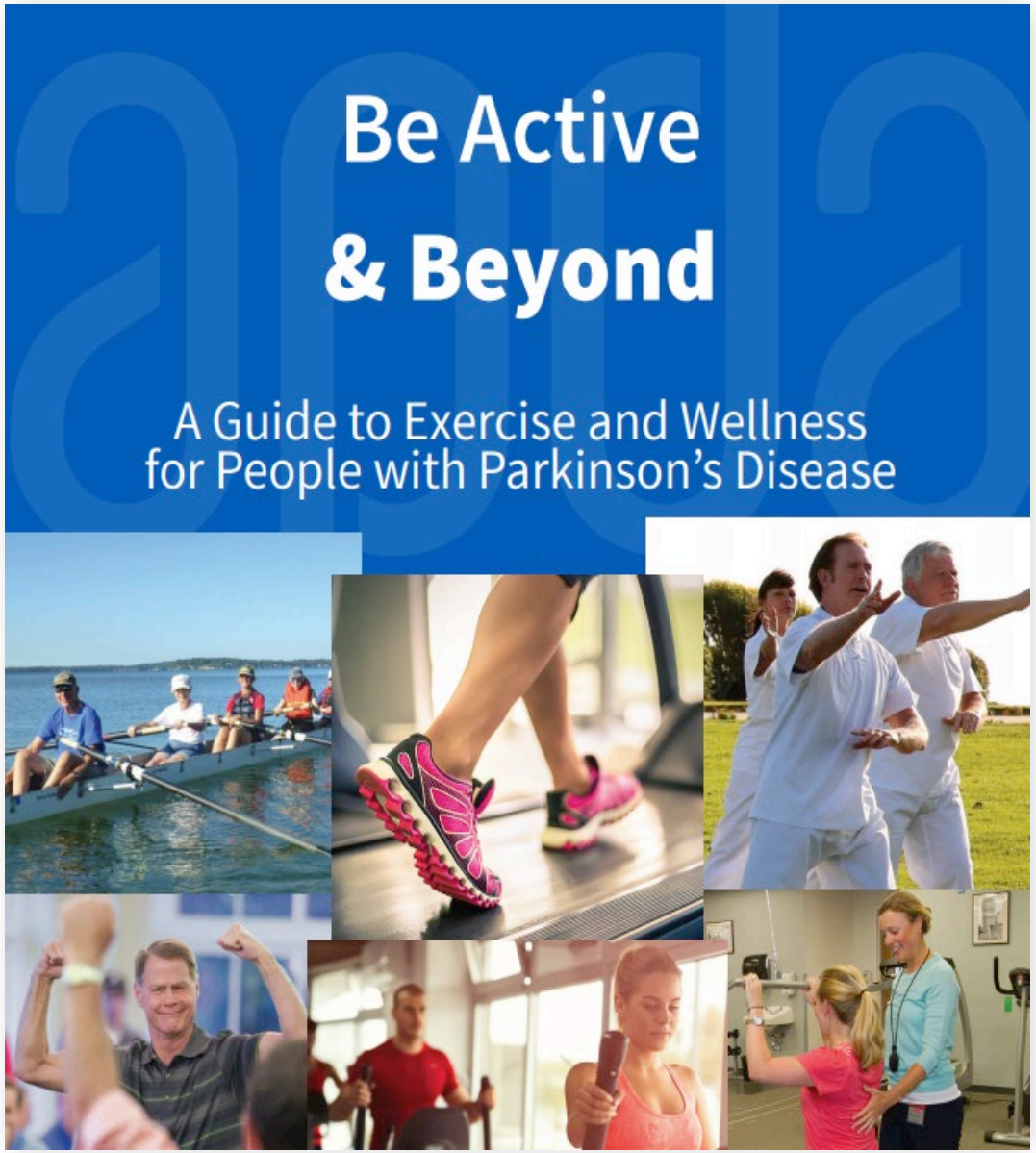
- Sleep is one of the most important sleep behaviors as it has been shown to have a direct relationship with health:
  - Cardiovascular health: Obesity, diabetes, heart disease
  - Emotional health: Depression, anxiety
  - Cognitive health: Alertness, arousal, processing speed

Sleep

- Ways to improve sleep:
  - Nighttime routine
  - Bed, just for sleep
  - Limit daytime naps to <30 minutes
  - Limit electronic devices
  - If you can’t sleep, get up!
  - Exercise early in the day
  - Avoid alcohol and coffee

APDA Resource

https://www.apdaparkinson.org/download-exercise-guide/your-exercise-guide-copy/



Social Functioning

Socialization

- Socialization is the key for cognitive health
  - Isolation is unstimulating and leads to INactivity
  - Isolation has been demonstrated to be related to increased depression
  - Isolation has been shown to be related to mental decline
    - Interferes with learning and leads to lack of engagement in stimulating activities (Luo & Waite, 2014).
    - Leads to neurodegeneration due to built up stress affecting the immune system (Cacioppo & Hawkley, 2009).

Socialization

- Socialization is key because it decreases isolation
- It increases motivation to do things
- It allows you to learn from others
- It gives you an opportunity to practice your cognitive skills

Types of Socialization

- Getting together with friends to go to a movie
- Taking a cooking class
- Hosting dinners at home
- Volunteering
- Joining a book club
- Attending the local senior center
- Joining the gym/YMCA/exercise class

Socialization

If you do it? You are more likely to incorporate all other levels of activity!

How Do You Get Started?

- Schedule it!
  - Weekly calendar at a glance!
    - Schedule all activities on a calendar
      - This will hold you accountable
      - Will increase motivation (there is nothing more unmotivating than an open-ended day)
      - Will help you develop goals for increasing activity over time
    - On Sunday, fill in your calendar for the week
      - Start slow and steady
      - Increase activity over time
      - Set goals and reward yourself!

How Do You Get Started

- Join a group!
  - Performing activities with someone else makes it more likely to happen
    - You can hold each other accountable
    - Share the experience with someone else
    - Encourage each other to continue

Summarize

- Activity does not only include physical activity
  - Cognitive
  - Physical
  - Social
- With increased activity, you are likely to feel much better physically and emotionally
- Activity may help keep you cognitively resilient.

QUESTIONS?