## Before we begin...

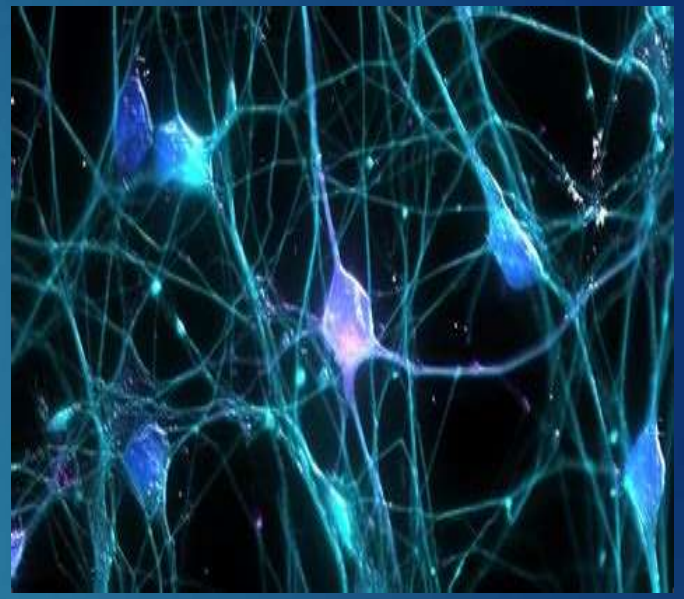
- The author of this course, Colleen Bridges, operates Rock Steady Boxing with two locations in Franklin and Nashville, Tennessee. Colleen has over 20 years' experience as a Certified Personal Trainer. In 2016, she received training by Rock Steady Boxing in the method, process and skills of boxing for Parkinson's Disease.

- Rock Steady Boxing is the originator of boxing as a therapy for Parkinson's Disease.

- Completion of this course does not establish the student as a Rock Steady Boxing coach or affiliate owner in any way.

- For more information on Rock Steady Boxing, contact their corporate office in Indianapolis or visit RockSteadyBoxing.org.

# Parkinson's Disease Fitness Specialist Certification



AUTHOR: COLLEEN BRIDGES: NSCA-CPT

# Module One:
# What is Parkinson's Disease?

# Module One: Agenda

Lesson One:

- What **is** Parkinson's Disease?
- The history of Parkinson's Disease

Lesson Two:

- The anatomy of the brain
- Characteristics of Parkinson's Disease
- Diagnosis
- Physicians- Neurologist and Movement Disorder Physicians
- Diagnostic Testing
- Progression of Parkinson's Disease
- Parkinson's Disease versus Parkinson's-like Diseases
- Current research and Parkinson's Disease
- Living with Parkinson's Disease

# Lesson One:
# Introduction to Parkinson's Disease

**Parkinson's Disease is:**

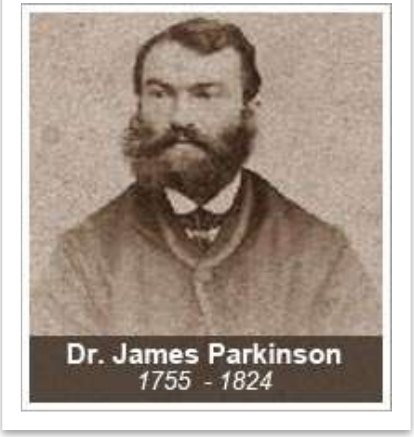
- A brain disorder that affects movement
- A progressive, chronic, neurodegenerative disorder
- Caused by damage to and loss of dopamine-producing nerve cells (neurons)
- The second most prevalent disease in America
- Referred to as the "Snowflake" disease


Approximately 1 million people in the United States and 10 million people  worldwide are affected by Parkinson's Disease.

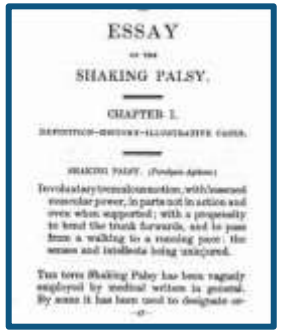
# Pioneers of Research in Parkinson's Disease

# Dr. James Parkinson (1755-1824)

- English surgeon and Apothecary with interests in Geology, Paleontology and Politics.
- Human rights advocate
- 1817, wrote “An Essay On the Shaking Palsy”
- Noted the tremor as involuntary weakened muscles with forward bending posture
- Observations and Research led to future discoveries and medical practices.



# Pioneers of Research in Parkinson's Disease


ESSAY
ON THE
SHAKING PALSY.
CHAPTER I.

James Parkinson's essay

**1817**

Jean Martin Charcot gives Parkinson's disease its name

**1861/2**

WIlliam Gowers "Manual of Diseases of the Nervous System"

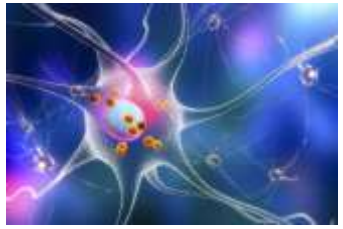
**1888**

Barger & Ewens synthesize dopamine

**1910**

Frederic Lewey found intracellular inclusions in affected brains

**1912**



Tretiakoff reports the loss of cells in the substantia nigra

**1919**

Greenfield & Bosanquet - complete PD pathologic analysis

**1953**

# Pioneers of Research in Parkinson's Disease

**1957**

Arvid Carlsson's dopamine studies

Parkinson's Disease Foundation

**1960/1**

Hornykiewicz - Dopamine in PD brains

Hornykiewicz & Birkmayer - 1st Levodopa trials

**1967**

Hoehn & Yahr Internationally used staging system

**1968**

Cotzias perfects Levodopa

**1972**

Levodopa + AADC inhibitors (carbidopa & benserazide)

**1974**

Dopamine Agonists

**1977**

MAO-B inhibitors

**1980's**

Fetal cell transplantation

**1982**

MPTP

# Pioneers of Research in Parkinson's Disease

**1985**

LSVT

**1997**

Deep-brain stimulation (DBS surgery

PET scan brain imaging

**1999**

Alpha synuclein associated with familial cases of PD and in Lewy bodies

**1998**

Parkin gene associated with juvenile PD

**2000**

Launch of MJFox Foundation

**2003**

Braak Staging of Parkinson's pathology

DJ1 linked to early onset

GDNF trial suggests neuroprotection

**2004**

Pink1 and LRRK2 associated with early onset PD

# Pioneers of Research in Parkinson's Disease

**2006**

Induced pluripotent stem cells from skin cells

**2007**

MDS-UPDRS revised rating scale

**2008**

Lewy bodies found in transplanted cells

SNCA, MAPT, and LRRK2 are risk genes for idiopathic PD

**2009**

IPS derived dopamine neurons from people with PD

**2010**

Neuroprotective effect of exercise in rodent PD models

Transeuro cell transplantation trial begins

**2014**

Successful preclinical testing of dopamine neurons from embryonic stem cells

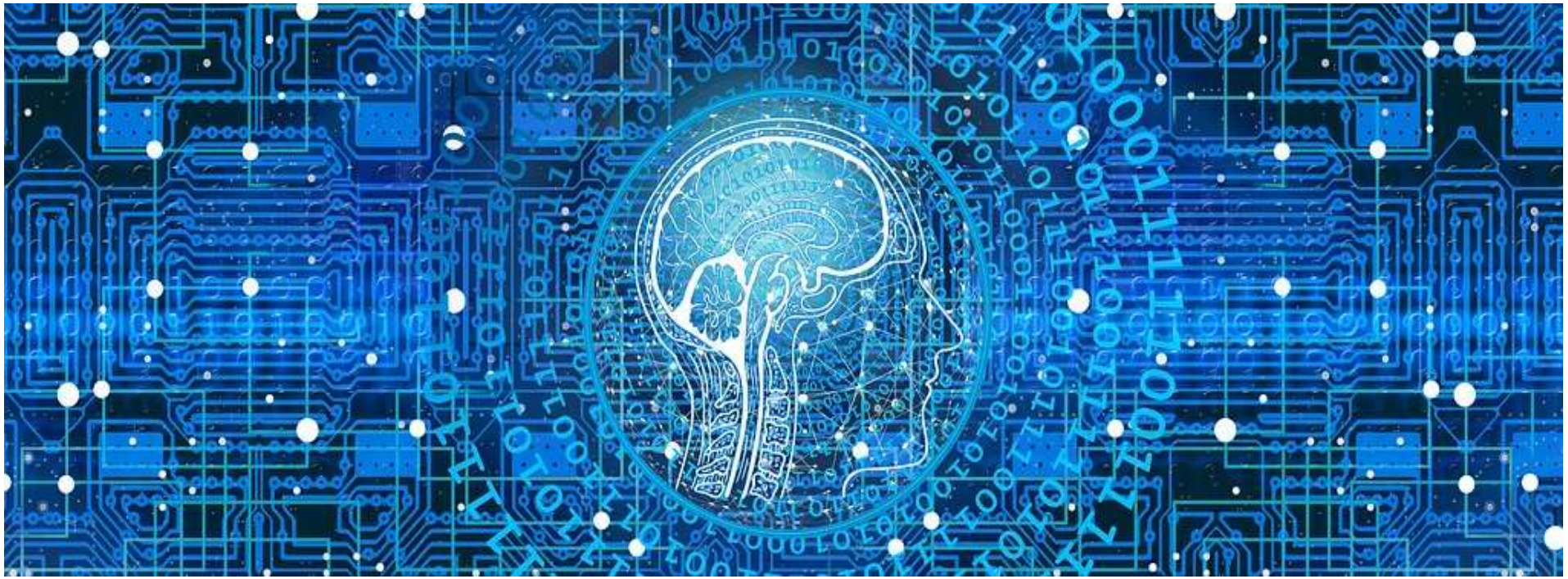
**2016**

Microbiome of the gut influences PD

# Fighting Back Is Never Over!

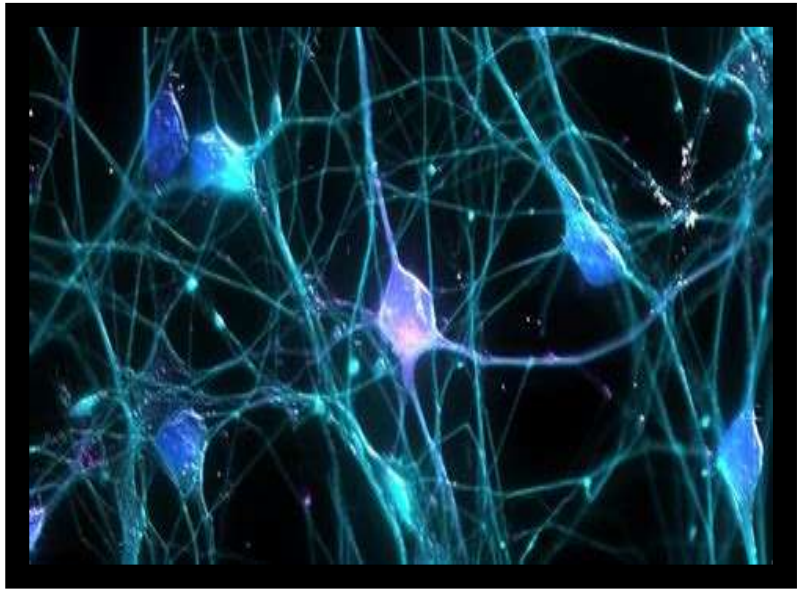
- Coach Betsy

# Lesson 2:
# The Brain - The Control Center of the Body



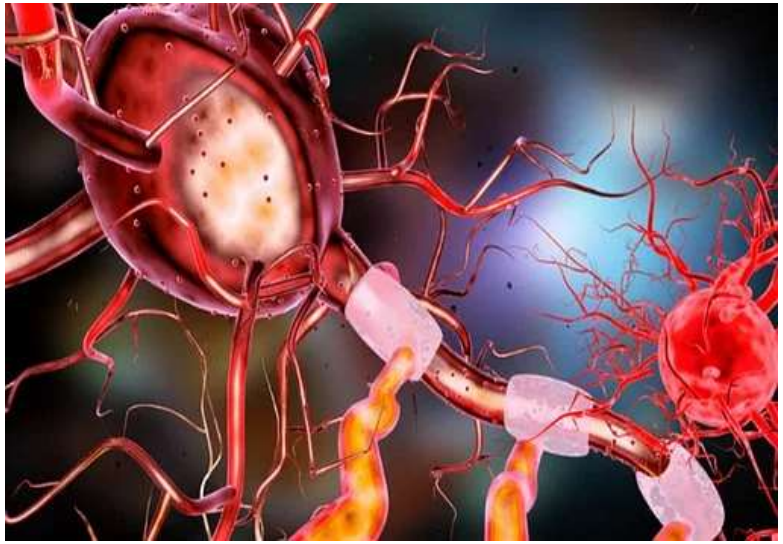
# The Brain - A Microscopic View

- The Neuron is the primary unit of the brain.
  - Also known as the brain cell
  - The average adult brain contains billions of neurons.
  - Essential parts of Neurons
    - Cell Body
    - Axon
    - Dendrite



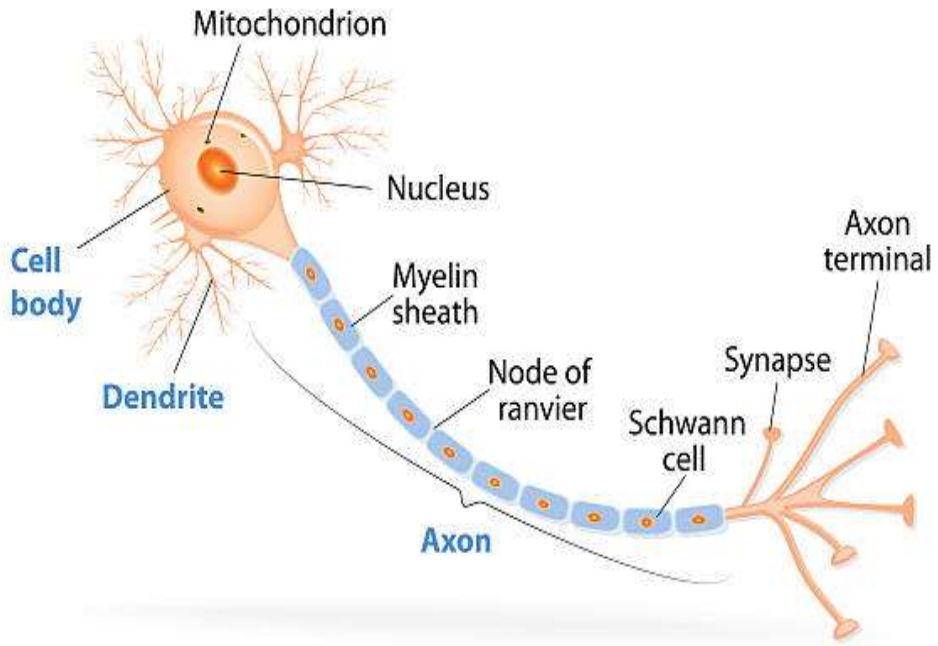
# Cell Body (also known as Soma)

- Core of neuron
- Carries genetic information
- Maintains the neurons structure
- Provides energy to perform activities



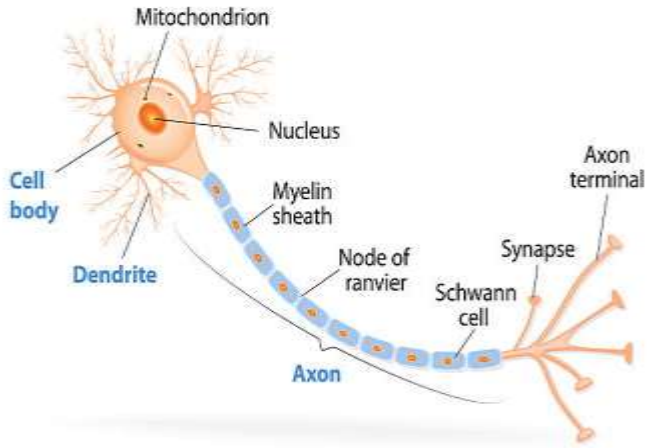
# Axon

- Long, tail-like structure
- Joins the cell body at a junction called the Axon Hillcock
- Conducts an electrical signal
- Contain small bulbs at the end called  terminals or terminus



# Dendrite

- Receives and processes  electrical signals from axons
- Resembles fibrous roots
- Branches out from cell body



# Neurotransmitters

- Considered the chemical messengers of the body
- Contained in the Terminal or Terminus at the end of the Axon
- Signal the next neuron in the brain current
- Responsible for regulating:
  - Heart rate
  - Breathing
  - Sleep cycles
  - Digestion
  - Mood
  - Concentration
  - Muscle movement
  - Appetite

# Neurotransmitters

## Parkinson's Related Neurotransmitters

**Dopamine**

(Excitatory/Inhibitory)

Controls:

- movement
- cognition
- mental focus
- Sleep
- motivation
- mood

**Norepinephrine**

(Excitatory)

- Triggers"Fight or Flight" response
- Considered the "First Responder" to stressful situations
- Lack of norepinephrine is linked to memory issues

**Serotonin**

(Inhibitory)

Regulates:

- appetite
- sleep
- memory
- learning
- mood
- muscles

# How Neurons Communicate

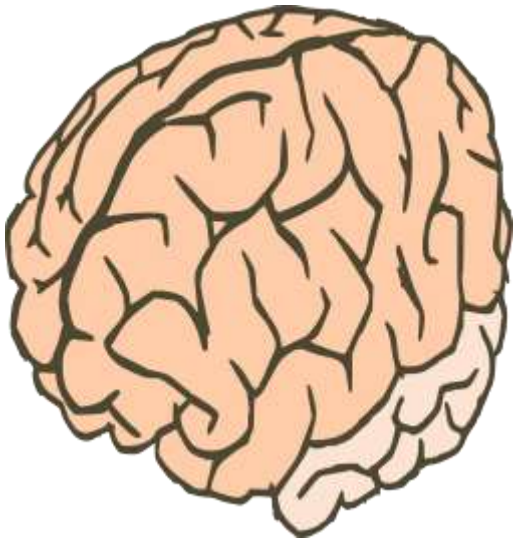
- Neurons communicate with other neurons via electrical and chemical signals.
- Communication begins as electrical signals (Action Potential) are quickly carried along neurons.
- The Action Potential changes to a chemical signal when it reaches the synapse to the neighboring neurons.

The chemical signals (Neurotransmitters) initiate the Action Potential Process to begin again.

***A lifestyle of exercise strengthens communication between neurons while a sedentary or stressful lifestyle weakens the process.***

# Brain - The Cerebral Cortex

- Complex human thought and language originates in the Cerebral Cortex.
- Thick region of outermost brain circuitry
- Made of "tightly packed" neurons
- **Damaged Cortex believed to lead to Alzheimer's and Dementia**

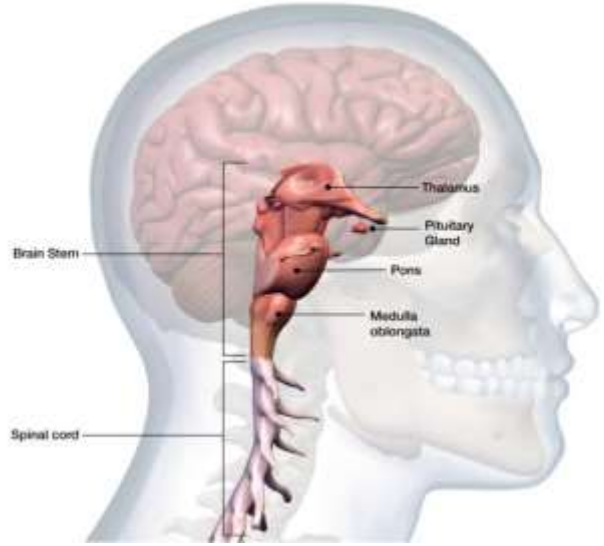


# Brain - The Cerebellum

- Integrates with other regions of the brain and assists with coordination, balance etc.
- Located just above where the neck meets the shoulders
- Shaped like a tree in ”full-leaf”
- Known as the "little brain" of the body

# Brain - The Brainstem

- Controls breathing, eye movement, swallowing and jaw opening
- Located underneath the cerebellum
- ***Substantia nigra (area affected by Parkinson's Disease) is at the top of the Brainstem.***
- Passes information from the Spinal Cord to the Brain and vice versa

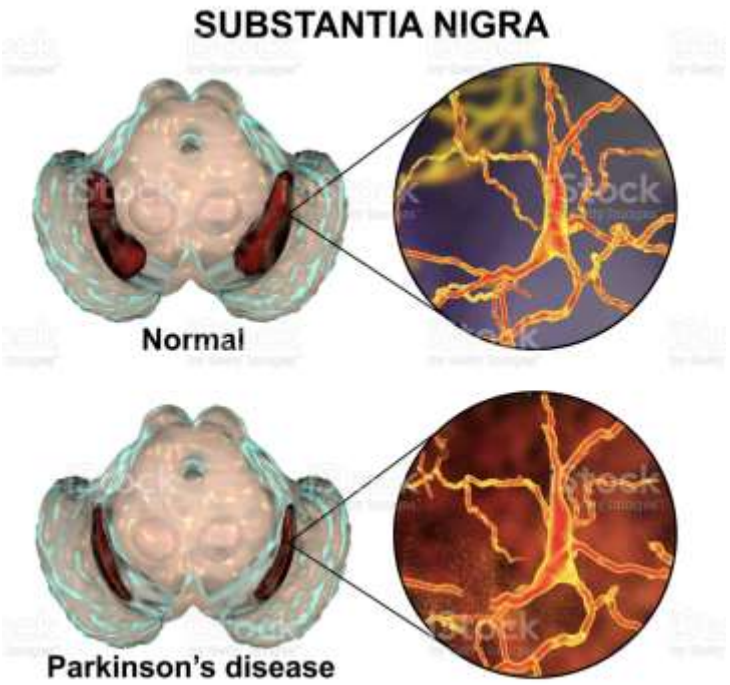


# Spinal Cord

- Pathway for the translating thought and intention to movement
- Process for action:
  1. Code for movement originates in the brain
  2. Flows downstream to brainstem
  3. Neurons in Spinal Cord are activated to move
- Process reverses when body senses pain in lower body

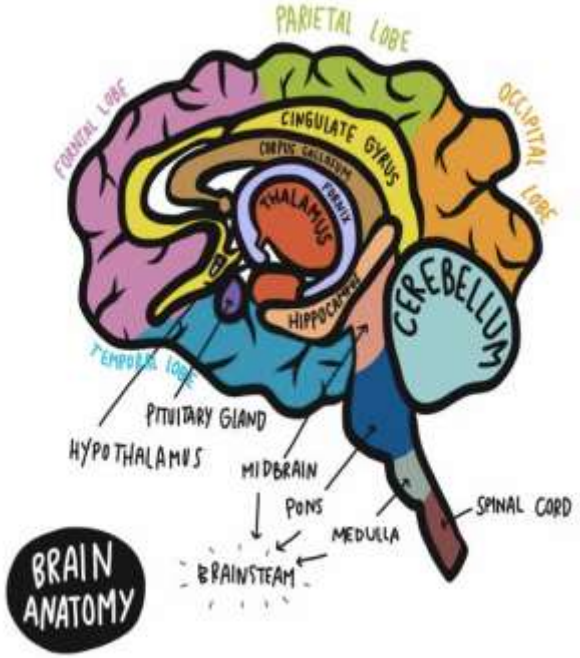
# Brain - Substantia nigra

- Substantia nigra (Latin for "Black Substance") and part of the Basal Ganglia
  - Contains the most dopamine neurons in the human brain
  - **Most important nucleus that degenerates in people with Parkinson's Disease**
  - Located at the top of the brainstem
  - Sends Dopaminergic Neurons to the Striatum



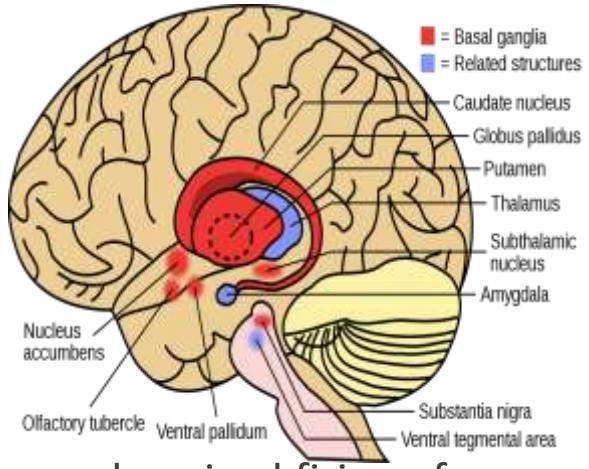
# Brain - Thalamus

- Located at the base of the Cerebrum
- Primary job is to act as a ”Relay Center” through which sensory nerves transmit signals from the spinal cord and brainstem on the way to the Cerebral Cortex
- **Thalamus is responsible for our sense of balance and awareness of our arms and legs as well as how we experience pain and much more**



# Brain - Basal Ganglia

- Term for the combination of **Striatum, Globus Pallidus**, and interconnected nuclei as well as the **Substantia nigra** and **Subthalamic Nucleus.**
- Located in the inferior part of the brain
- Globus Pallidus and Striatum responsible for regulating voluntary movement




- Subthalamic Nucleus works with Globus Pallidus to acts as a "pacemaker" to maintain synchronized firing of neurons so limb movement is controlled.
- All collaborating sections of the Basal Ganglia work together to control movement

# Neurological Review

- Parkinson’s Disease is a neurodegenerative disease
- Primary unit of the brain is the “brain cell” or Neuron
- Dopamine, Norepinephrine and Serotonin are reduced by Parkinson’s Disease
- Symptoms are due to degeneration of the Substantia nigra
- Basal Ganglia is made up of the Striatum, Substantia nigra, Globus Pallidus and Subthalamic Nucleus
- People with Parkinson's Disease take drugs to elevate brain dopamine levels or substitute for the lost dopamine

# “Exercise has changed my life!”

“Fighter Aaron”

# Diagnosis

# Diagnosing Parkinson's Disease

Diagnosis of Parkinson's Disease requires at least two out of three other specific symptoms plus Bradykinesia.

## Resting Tremor

- Occurs when limb or chin is at rest.
- Rhythmic and constant when resting.
- Begin on one side of body.
- Affects approximately 80% of those living with Parkinson's Disease.

## Gait/Balance Issues

- Loss of balance
- Shuffling of feet/shortening of gait

+

## Bradykinesia

- Slowness of movement during activities such as getting out of the car.
- Often gait shortens, speech slurs or softens.
- Seen in the late stages of Parkinson's Disease

## Rigidity

- Muscles tighten involuntarily and refuse to move
- Affects approximately 90% of those living with Parkinson's Disease.

# Changes in Gait/Walking

- **Loss of natural arm swing and trunk rotation**
  - Lack of body awareness
  - “Zombie Walk”
  - May experience back, hip, shoulder and neck pain

- **Helpful exercises**
  - Swing arms forward and backward
  - Arm circles
  - “Play Piano”
  - Gong
  - Haytoss
  - Woodchop

# Changes in Gait/Walking

- **Loss of Range of Motion in Ankles**
  - **HIGH FALL RISK!**

- **Helpful exercises**
  - Foot circles
  - Toe Point/Flex
  - Invert/evert
  - Half gong

# Decreased Facial Expression (Facial Masking)

- Reduced blinking
- Limited smile and facial expression
- May look angry
- Limited eyebrow movement

# Hypophonia (Soft Voice)

- Voice volume decreases
- Difficult to understand
- Hoarseness
- Stammering/stuttering
- Lack of inflection in speech

# Hypophonia

## Suggested Exercises

Repeat a line 3x and increase volume each time

Inhale deeply then exhale and sing a vowel for 3-5 seconds

Inhale, Speak slowly and deliberately

Think “loud”

Read a poem in front of a mirror

Join a Parkinson’s Choir

# Hypophonia - Tips Fitness Professionals may offer

- Take a breath before you start to speak.
- Pause between phrases to take in another breath.
- Express your ideas in short, concise sentences.
- Speak louder than you think is necessary.
- Do not shout over noise when you talk.
- Rest your voice when it is tired.
- Reduce throat clearing or coughing. Try a hard swallow.
- Reduce or eliminate heartburn.
- If the air is dry in your home, use a humidifier.

# Freezing

- Momentary inability to move
- When medication dose is needed unpredictable
- Causes 38% of falls
- Doorways and changes in flooring can trigger freezing

# Freezing Tips

## What to do when someone freezes

- March in place
- Step side to side 4x then step forward
- Clap a strong beat then step to beat
- Stop and rest for 30 seconds
- Don't rush
- Look through the door
- Let others exit first
- Laser pointer
- Count steps with fighter

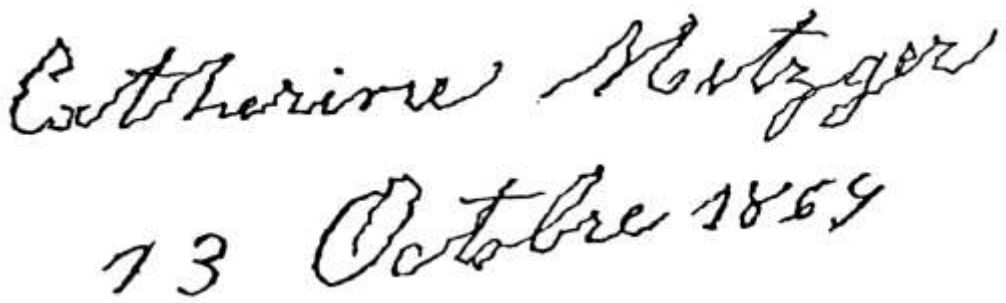
***DO NOT PULL THE PERSON**

# Micrographia

- Early Warning Sign – Writing Size And Legibility Decreases
- Worsens As The Disease Progresses
- By-product Of Bradykinesia

# Micrographia - Tips for Fitness Professionals

## Examples of Micrographia




## Exercises

- Write a page every day during "on" time
- Make a paper ball then smooth it out
- Wring out a wet washcloth
- Press thumb and pinky together for 5 seconds the repeat with the other fingers
- Make a fist and hold for 10 seconds then flick
- Fingers open fast . Repeat 10x

# Dysphagia (Difficulty Swallowing)

- Deficiency of dopamine
- Drooling because of lack of swallowing
- Causes isolation in many patients
- May Regurgitate Food
- Care-team Needs To Know The Signs
- Consult a speech pathologist for a baseline evaluation

# Aspiration - Know the Signs!

**ASPIRATION IS THE LEADING CAUSE OF DEATH IN PEOPLE LIVING WITH PARKINSON'S DISEASE**

- Coughing Before/After Swallowing
- Trouble chewing
- Pocketing food inside the cheek
- Gagging during a meal
- Crying or face turning red while eating
- Drooling especially during meals
- Clearing the throat before/after and throughout the day
- Hoarse during and after the meal

# Dysphagia

## Tips

- Take smaller bites
- Puree food
- Liquid may need to be thickened
- Avoid alcohol due to acidity
- Try to eat during "on" time
- Eat slowly and with good posture

# Dystonia

- Involuntary Muscle Cramps
- Painful
- 17% Experience It
- Worse In The Morning

# Dystonia - Tips for Fitness Professionals

- Keep a log of episodes- this will help doctors decide if the client needs to add a medication or alter dose.
- Maintain a healthy diet, get plenty of sleep and remain active.
- If Dystonia is in the foot, keep a pair of stiff shoes close by to put on when it occurs

# Non-Motor Symptoms (Autonomic)

- Constipation
- Bloating
- Heartburn
- Bladder Issues
- Erectile Dysfunction
- Excessive Sweating
- Excessive Saliva
- Postural Hypotension

# Non-Motor Symptoms (Sleep Disorders)

- Restless Leg Syndrome
- Vivid Dreams (Act Out Dreams)
- Daytime Fatigue
- Dystonia
- REM (Rapid Eye Movement) Sleep Disorder

# Non-Motor Symptoms (Neuropsychiatric)

- Dementia
- Depression
- Apathy
- Anxiety
- Loss of Libido

# Non-Motor Symptoms (Sensory)

- Pain
- Paraesthesia

# Additional issues that may be less specific

- Sense of overall weakness
- Fatigue
- Imbalance
- Sense of restlessness or nervousness
- Difficulty rising from seated position
- Slowed thinking
- Difficulty turning over in bed
- Difficulty brushing teeth

“When it comes to my attitude and Parkinson’s Disease, I can either take an “aisle” or a “window” seat.”

Fighter, M.H.

# Genetics VS. Environment

# Environmental Factors

- Head Injury
- Residence Is Near Containments
- Occupation
- Pesticides/Herbicides
- Exposure To Metals
- Solvents And Pcb's

# Potential Protective Factors

- Exercise
- Caffeine
- Uric Acid Or Urate
- Anti-Inflammatories
- Vitamin D
- Statins

# Young Onset Parkinson's Disease

- Between 2%-10% of the one million living with Parkinson's Disease in America
- 40 years of age or younger
- Generally slower progression
- Fewer problems with memory, confusion, balance
- Experience more cramping, abnormal postures and depression
- Prone to levodopa fluctuations and dyskinesia and complex medication regimen
- Candidate for Deep Brain Stimulation Surgery (DBS)

# Most Common Treatment Options for Young Onset Parkinson's Disease

- Sinemet
- MAOB  Inhibitors
- Deep Brain Stimulation
- Support Group
- Exercise

# Neurologist Vs. Movement Disorder Physician

- Neurologist- may treat patients with any of more than 100 neurological conditions. Neurologist specializes in treating disease of the nervous system (Both Central and Peripheral Nervous System)

- Movement Disorder Physician- is a neurologist who has completed an additional or specific fellowship during medical school and this enables a neurologist to become an expert in taking care of people living with Parkinson's Disease.  Many are clinical researcher and split their time between the caring for patients and running clinical trials or seeing patients for research visits.

- International Movement Disorder Society Directory can assist in finding the appropriate service provider

# Diagnostic Assessment

- Physician may find evidence that warrant further evaluation to diagnose Parkinson's Disease.

  Those include:

  - Bradykinesia
  - Rigidity
  - Gait/Balance
  - Resting tremor

# Diagnostic Assessment

- No specific test to diagnosis Parkinson's Disease
- Doctors are trained to **OBSERVE** patient(s) from the first moment they enter the examining room
  - Trouble rising from chair
  - Bradykinesia
  - Lack of Facial Expression and hand gestures
  - Tremor
  - Stiff arm
  - Low vocal volume

# Diagnostic Testing

**PET Scan-** (Positron Emission Tomography Scan)- is a test used to give doctors and patients more information about how cells in the body are functioning.

**CAT Scan-** (Computed Tomography Scan)-that uses X-rays and computers to produce images of inside the body including the brain.

**MRI-** (Magnetic Resonance Imaging)- is a test that produces extremely clear pictures of the human body without use of X-ray. Instead it uses a large magnet, radio waves and computer to produce the images. * People with a DBS are not to use an MRI.

**DatScan**- uses a small amount of a radioactive drug and a special scanner, called a single photon emission computed tomography(SPECT) scanner, to see how much dopamine is in your brain.

# Parkinson's Disease Stages

# Stage One of Parkinson's Disease

**Symptoms are mild at this stage**

- Often have an asymmetrical tremor
- Changes in posture, gait and face may occur
- People in this stage are usually still mostly independent in their activities of daily living

# Stage Two of Parkinson's Disease

**Symptoms become more obvious**

- Activities of daily living (ADL) begin to require more time
- Temor, rigidity and other movements may affect both sides of the body
- People in this stage are usually still mostly independent, but may being to require more assistance with the ADLs

# Stage Three of Parkinson's Disease

**Considered "Mid-stage" of Parkinson's Disease**

- Increased slowness of movement
- Loss of balance
- Activities of daily living significantly more difficult
- In early 3's, assistance may be needed with tasks such as landscaping or cleaning
- In late 3's, more dependent on care-partners for most tasks

# Stage Four of Parkinson's Disease

- **Symptoms are severe and limiting**
- Cane, walker or gait belt required
- Assistance with activities of daily living
- Unable to live independently

# Stage Five of Parkinson's Disease

**Most advanced stage of Parkinson's Disease**

- Rigidity limits ability to stand
- Walker, wheelchair or gait belt are needed
- 24 hour care is required
- Hallucinations and/or delusions are common

# Parkinson's Disease vs. Atypical Parkinson's What is the difference?

## Common Atypical Parkinson's Diseases

- Vascular Parkinsonism
- Multiple System Atrophy (MSA)
- Dementia with Lewy Body (DLB)
- Progressive Supranuclear Palsy (PSP)
- Corticobasal Ganglionic Degeneration (CBD)
- Other disorders to consider:
  - Drug Induced Parkinsonism
  - Essential Tremor
  - Wilson's Disease

## Traits of Atypical Parkinson’s

- Symptoms are similar to Parkinson's Disease
- Not responsive to Parkinson's Medication
- Currently not considered to be a genetically linked

# Is there a cure for Parkinson's Disease?

# Living with Parkinson's Disease


# Advice for the client who is on the Parkinson's Disease journey

- Maintain an open dialogue with your entire care team
- Learn as much as possible about Parkinson's Disease
- Live! Love! Laugh!
- Rest and ask for help!
- Remember that your loved ones are scared, too, but you're in this together
- Make the most of every day

# Advice for the care-partner who is on Parkinson's Disease journey

- Care-partners are heroes!
- Each kind thing you do will grow the bond between you and your loved one.
- Don't beat yourself up for needing/wanting a break. Take one!
- Find the beauty in each day.
- Continue your hobbies, community service, book clubs, those activities that bring you joy.
- Frustration  is normal. Seek counseling as needed.
- Exercise!

# Glossary

**Axon-** A wire-like extension from the neuron that transmits an electrical signal from the cell body to the terminal, where the neurotransmitter is released.

**Basal Ganglia-** a term for the combination of Striatum, Globus Pallidus and interconnected nuclei (including substantia Nigra and Subthamlamic nucleus)

**Brainstem**-Lowest end of the brain that interfaces with the spinal cord. Contains nuclei that control breathing and eye movement

**Cerebellum-** A brain structure located just above the brainstem. Damage to this area causes ataxia (incoordination, imbalance)

**Cortex**-Outermost layers of the brain, which are most highly developed in humans. Complex human thought, language and behavior are conceived and programmed here.

**Dendrites**- Short, wire-like processes on neurons that receive neurotransmitter signals from axon terminals.

**Dopamine**- The neurotransmitter that is deficient in PD.

# Glossary – (Continued)

**Neurons-** contain a cell body with a nucleus and an axon extending from that cell body.

**Spinal Cord-** Together with the brain, makes up the Central Nervous System. Tracts from the cortex and sub -cortex pass through the brainstem to the spinal cord, which is the final common pathway controlling movement. Sensory information (touch, pain) passes in the opposite direction via other tracts, up to the brain.

**Striatum**- The region of the brain that receives the dopaminergic projections from the substantia Nigra. The Striatum is comprised of two components: Putamen and caudate.

**Substantia Nigra-** Neurons containing a black pigment and located at the upper end of the brainstem, in the midbrain – most affected by Parkinson's Disease

# Acknowledgements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