

Physical Activity and Cognition

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Some Facts about Aging and Memory

- More than 6 million older adults in the U.S. suffer from Alzheimer's disease.
- 14 million older adults suffer from Mild Cognitive Impairment (MCI) or other more severe disorders affecting memory.
- An estimated 16% of people with MCI develop dementia each year. 80% of people with MCI will develop dementia within six years.

Neuropsychology has found that executive functioning is key

- Executive functioning includes:
 - Attention
 - Cognitive inhibition (controlling distractibility)
 - Behavioral (or response) inhibition
 - Problem solving
 - Reasoning
 - Planning
 - Working (or short-term) memory

There Is Hope

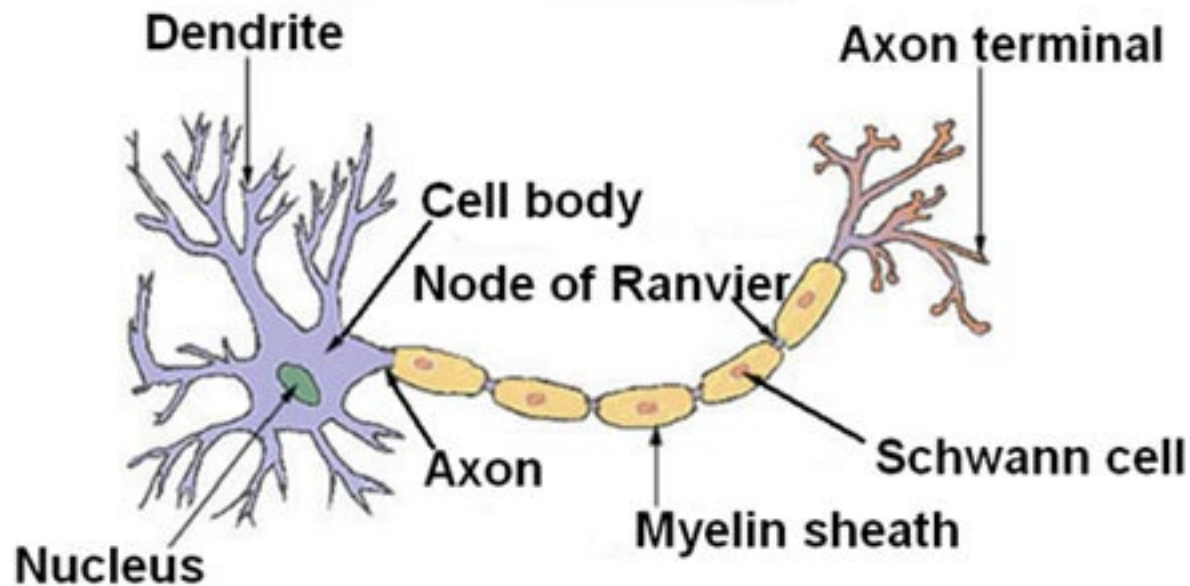
- Throughout this course, we will take a multifactorial approach to preventing dementia and maximizing memory ability. In this course we will discuss:
 - Cognitive stimulation
 - Physical exercise
 - Nutrition
 - Numerous other lifestyle factors
 - Sleep
 - Motivating clients

There Is Hope

- We can also look at reducing risk factors for cognitive impairment
 - Obesity
 - Diabetes
 - Stress
 - Isolation
 - Smoking
 - Delirium

86 Billion Neurons with up to 20,000
Connections Each (in the cortex)

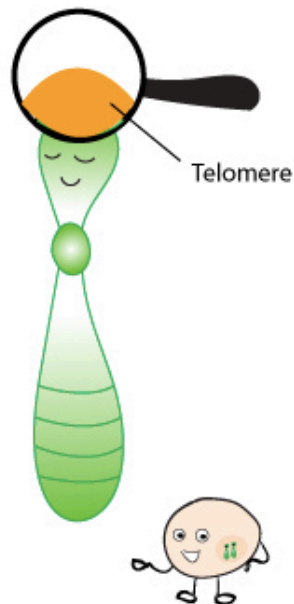
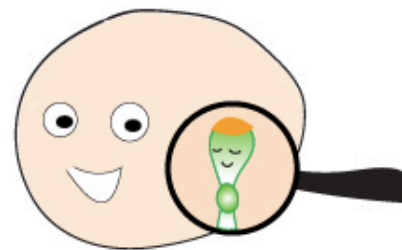
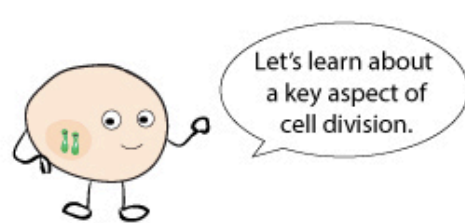
Structure of a Typical Neuron



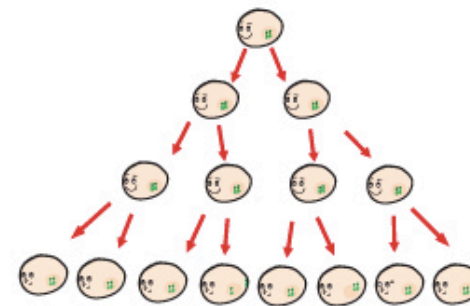
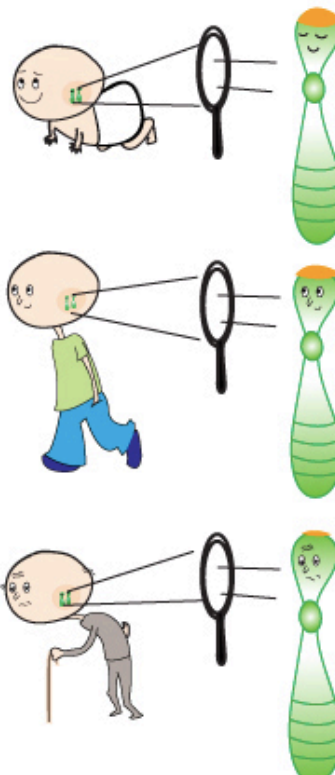
Neurophysiological Goals

- Maximize connections amongst our neurons
- Maximize the longevity of neurons
- And, even create new neurons is a key area of the brain

Telomeres and Cell Lifespan



The hat is called a "Telomere". It allows me to copy my DNA safely.

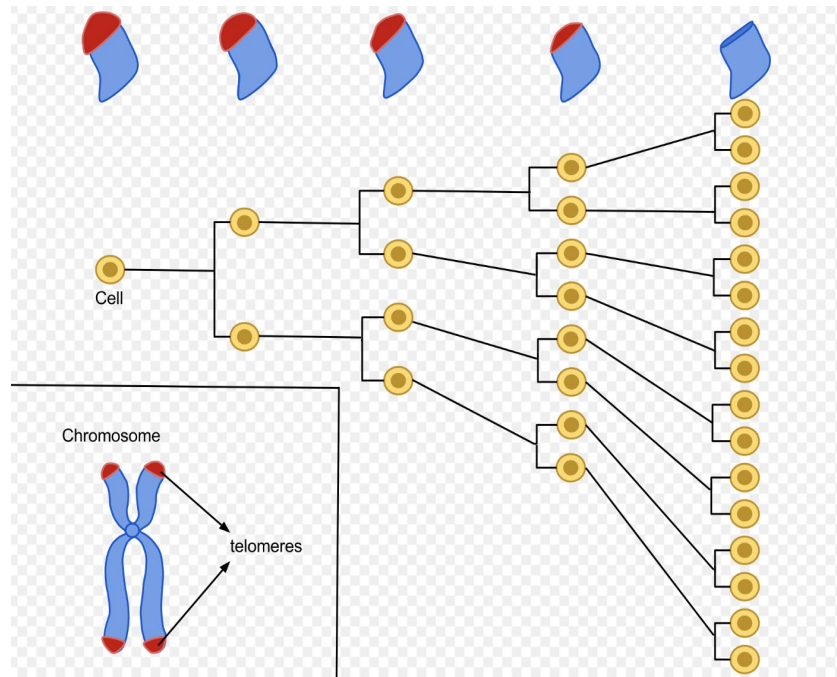


Each time I divide, my telomere gets a little shorter.

When the telomere becomes too short, I can't divide anymore.
(Short telomeres causes senescence.)

Telomeres

Hayflick Theory – Human cells can divide up to about 60 times



Telomeres

Does your diet affect the number of times your cells divide or is cell division genetically pre-disposed?

Sort of...diet and physical exercise has been shown to be related to telomere length and attrition through oxidative stress.

The Malleable Brain: Neurogenesis

- Older adults grow new neurons by a process known as neurogenesis
 - Subsequent research has shown that physical exercise can facilitate greater neurogenesis
- Older adults can make new connections and rewire their brains.
- The organization and connection among neurons is more important than the number of neurons.
- What causes us to make and maintain connections among neurons?

The Malleable Brain: Synaptogenesis

- In addition to growing new neurons in some parts of the aging brain, the aging brain can also make new connections, or synapses, amongst neurons.
- Synaptogenesis is critical for learning and is one of the primary way the brain changes and supports learning.
- There is recent evidence from animal studies that physical exercise enhances synaptogenesis and neurogenesis, after a stroke.

The Malleable Brain: Physical Activity

- Research has shown that physical activity can make the brain even more malleable through these processes:
 - Neurogenesis
 - Synaptogenesis
 - Brain Derived Neurotrophic Factors
 - Angiogenesis (creation of new capillaries or blood vessels)

Up Next

- Next, we will discuss ***Memory Basics***.