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SUCCESSFUL AGING & THE MOVING BODY

Financial Disclosure

- ⦿ I have no affiliation with or support of any pharmaceutical company.
- ⦿ I do not have any financial arrangements or affiliations with any of the corporate organizations offering financial support or educational grants for this continuing medical education program.

Learning Objectives

- ⦿ The need for aerobic exercise, music and dancing for successful aging without disease.
- ⦿ Reduction of carbohydrates 20-40% intake to postpone aging.
- ⦿ Addition of antioxidants to the diet to improve learning
- ⦿ To bring about neurogenesis.
- ⦿ To postpone aging of the brain.
- ⦿ To prevent or postpone the onset of neurodegenerative disorders.

Successful Aging & the Moving Body



- In the face of dramatic demographic changes occurring in the developed countries, the increased probability of reaching a very old age is high.

Aging of the Brain

1. Physiological process
2. Endogenous and progressive
3. Associated with decline in sensory, motor and cognitive functions
4. Does not seem to be genetically programmed
5. Results from molecular events that cause an accumulation of damaged cellular components.
6. Due to an increase in oxidative stress free radicals
7. Mitochondrial instability resulting in lower production of ATP
8. Less energy available for maintenance and repair of the organism

Longevity (long lifespan)

- Is in part governed by genes that promote antioxidant activity and control the damage induced by the free radicals.
- Increase in longevity appears to rely more on genes that become activated by different lifestyle factors.
- These lifestyle factors are of crucial importance in:
 - determining how long we will live
 - how healthily we will age
 - maintain an independent lifestyle with full physical and emotional involvement.

Current Research

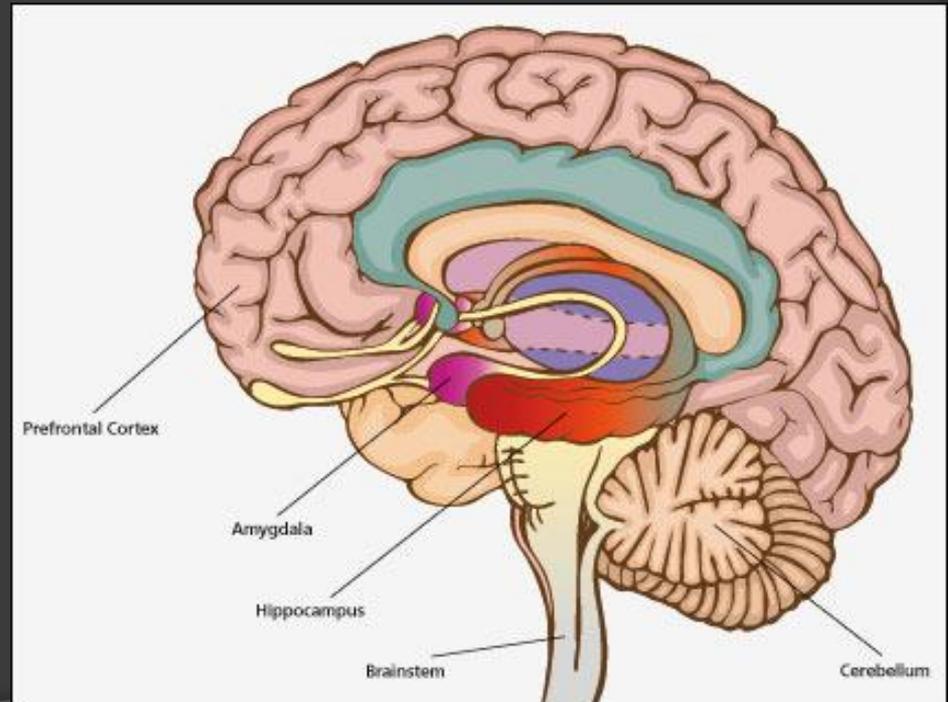
- indicates that the aging brain retains considerable plasticity (molding) which is dependent on the lifestyle of the individual (physical, psychological and cultural factors).
- These factors can change the biochemistry, anatomy and physiology of the brain during the lifespan or determine the clinical expression of a disease.

Anatomical & Functional Changes in the Aging Brain

- During aging, the brain changes its structure and function these changes are modulated by the interaction of the individual with their environment.
- The changes seen are in:
 - The morphology and tissue density are not homogenous throughout the brain but are specific to different areas of the brain.
 - Some areas of the prefrontal cortex and hippocampus suffer a volume decline.
- Alteration in the calcium homeostasis is reported.
 - Sustained elevations of intracellular calcium concentrations have been shown to cause neuronal degeneration and cell death and may be related impairments in learning and memory.
- Neurotrophic factors such as the brain derived neurotrophic factor (BDNF) has been reported to decrease with age.
 - This decrease may contribute to age related cognitive decline
- Deficits of genes that promote cell survival have been shown to be associated with neurodegenerative disease.

Neurotransmission and Aging

- In the prefrontal cortex and the hippocampus; the release of dopamine induced by a mild stressor decreases with age.
- The increase of dopamine and GABA in the cells of the hippocampus appear to decrease with age.



Evidence of Plasticity

- ⦿ The experimental data has shown that environmental enrichment enhances cognitive, social and motor abilities that potentiate learning and memory.
- ⦿ This enrichment attenuates the age related changes and improves performance in different learning tasks.
- ⦿ The data reinforces the idea that the aged brain is highly responsive to challenges and may help to explain why physical and cognitive exercises makes individuals resistant to developing Parkinson's disease, Alzheimer's and other types of Dementia's.

Intimate Relationship between Lifestyles and Successful Aging

◉ Healthy diet

- Caloric restriction, composition and quality of diet.
- A reduction of food intake by 20-40% has shown to **decrease the rate of aging** of the brain.
- Probably due to a reduction of the accumulation of free radicals and their detrimental effects on cellular molecules including proteins, lipids and DNA.
- Caloric restriction has been shown to have a **protective effect on the brain**.
- Improvement in motor and cognition has been seen in Alzheimer's, Parkinson's Disease and neurodegenerative diseases.
- Improvement in metabolic functions, insulin sensitivity and glucose homeostasis.
- Reduction in the appearance of tumors
- Reduction in the incidence of cardiovascular disease

◉ Role of Antioxidants for normal brain function

- Omega 3 fatty Acids – essential for maintaining synaptic function and plasticity.
 - Dietary supplementation with this fatty acid elevates the level of BDNF in the hippocampus and counteracts rat learning disabilities after traumatic brain injury.
- Vitamin E – has been shown to have specific capacity to protect synaptic membranes from oxidative damage. (nullifies the free radicals)
- Flavonoids - contained in fruits and vegetables may counteract the aging process by improving cognitive functions.

Aerobic Exercise

- Frequent Aerobic Physical Exercise is a way of maintaining brain health and plasticity throughout life and particularly during aging.
- Exercise has the capacity to stimulate neurogenesis and synaptogenesis via mediators such as nerve growth factors especially BDNF.
- In Dementia's such as Alzheimer's, Parkinson's disease and psychiatric diseases such as depression, exercise has shown to improve cognition and also to delay the onset and slow down the course of the disease.
- Physical exercise has been shown to improve motor impairments that occur in Parkinson's disease and patients with other neurodegenerative diseases.



Stress Reduction

- Human beings experience various forms of stress.
- During a stressful situation various hormones are released from the brain, other organs and glands
- Of the various hormones that are released Glucocorticoids are the most important.
- These glucocorticoids enter the brain through the blood brain barrier and are distributed throughout the brain including prefrontal cortex, amygdala and hippocampus.
- The glucocorticoids interact with neurons and astrocytes producing changes at the functional and neurotransmitter levels.
- The effects mediated by the elevated levels of glucocorticoids in the hippocampus seems to be neurotoxic affecting learning and memory and has been correlated with the decline in cognitive functions.
- Environmental enrichment is effective in attenuating the increase in glucocorticoids produced by acute stress in the prefrontal cortex of adult rats.
- For chronic stress, no experimental data are available.
- Many have proposed that a permanent increase of the “basal” glucocorticoids that result from a stressful lifestyle could contribute to the neuronal damage that occurs in these areas of the brain during aging.

The Moving Body



Festival OF THE Moving Body

Dance

- Dance is an activity performed to music, which engages the brain's sensory and learning processes in a way unique among the arts.
- Neuroimaging technique using functional MRI on action observation has identified brain regions including premotor, inferior parietal and temporal regions that are similarly active when performing actions and when observing others perform the same.
- In a study conducted by conducted at the University of California at Santa Barbara, physically rehearsing one set of sequences and the other half passively watching a different set of sequences.
- The critical outcome of this research, is that there is a strong link between learning by doing and learning by observing and may be of benefit. As such exposure to dance at an earlier age has been recommended.
- Dancing makes the brain dance and music makes the brain sing by activating the subcortical nuclei by releasing Dopamine from the striatum.
- Recent studies indicate that dance maybe an effective alternative to traditional exercise for individuals with Parkinson's disease.
- As Parkinson's disease patients have difficulties with gait, balance and posture.
- Dance corrects body posture, improves balance and walking thereby alleviating depression and improving cognition.
- Dance therapy should be considered as an adjunct to medical and surgical treatment of Parkinson's disease.

How to change lifestyle and habits

- Current research is providing powerful evidence for the concept that many diseases can be prevented or diminished by a healthy diet and a lifestyle that includes regular cognitive and aerobic exercise with stress management.