Staying Sharp: “Old Dogs-New Tricks”

Sanders-Brown Center on Aging
UKMC Department of Neurology
Successful Aging

- Chronologic age $\neq$ physiologic age
- Due to complex interactions of genetics and environment
- Individuals “age” at different rates and there is significant variability
- Prevalence of disease increases with age
Successful Aging ‘model’

- Maintain physical function
- Maintain mental functions
- Avoid disease
- Quality of life
Short-term Memory System Structures

from Budson & Price, 2005
Memory Systems & Brain Regions

from Budson & Price, 2005
The human neocortex has approximately 20,000,000,000 (20 Billion) Neurons.
The human neocortex has approximately
100,000,000,000,000,000
(100 Trillion)
SYNAPSES
Even though we have a lot we can’t afford to lose a lot!
Importance of Synapses

- Cell – Cell communication
- Release of chemicals
  - neurotransmitters (modulate)
- Uptake of chemicals (drugs)
- Synaptic decline is related to cognitive function
Learning from Animals

- Older animals show increases in synapses in enriched environments (EE)
- EEs ‘restore’ memory & learning despite atrophy
- Older EE animals show reduced amyloid in hippocampus and cortex
Learning from Animals

- Older learning impaired animals show reduced (30%) postsynaptic density
- Over expression of ROS linked to age-related LTP impairment
- Higher synaptic density with visual object recognition training in older animals (perirhinal cortex)
Learning from Human Studies

- Physical activity reduces risk of cognitive decline in those over age 65
  -(15-30 min, 3X per week)
- Fitness training leads to sustained levels of CBF and superior cognitive test scores
- Vigorous walking leads to less distractibility
- Mental activity results in better cognitive test scores over time

  -(Seattle Longitudinal Study; http://geron.psu.edu/sls/)
Prevention and blood pressure

- Multiple studies have shown systolic blood pressure as a risk factor for dementia
- Two studies with stroke prevention as a primary goal showed reduced incidence of dementia with antihypertensive drugs
  - Syst-Eur (53% reduction in dementia; 60% reduction in AD)
  - PROGRESS (34% reduction in cognitive impairment and dementia)
Diet and Dementia
Physical activity

- Multiple studies have shown an association between physical activity and decreased cognitive decline.
- Regular aerobic exercise may improve learning & memory.
- Majority of studies indicate a reduced risk of dementia with increased physical activity: moderate exercise reduces MCI risk by 32 to 39%.

Lifestyle and ‘Cognitive Reserve’

- Mental activity throughout adulthood increases synaptogenesis
- Physical activity may promote brain vasculature (e.g. angiogenesis)
- Individuals with a higher cognitive reserve may tolerate more brain pathology before showing symptoms of dementia
  - e.g. Columbia studies on education & AD
- Swedish studies support ~40% reduced risk for dementia with ‘engagement in mental, social, or productive activities’

Wang et al., Am J Epi, 2002
Lifestyle and the Vascular Hypothesis

- Cerebrovascular disease and atherosclerosis may promote the development of dementia directly or indirectly.
- Controlling vascular risk factors may reduce the risk of dementia.
- “Social, mental, and physical stimulation could act via the reported beneficial effects on cardiovascular diseases and stroke”.

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Fratiglioni et al, 2004

“What’s good for the heart..... is good for the head”
1. **Head first**
   Good health starts with your brain, and it needs care and maintenance.

2. **Take brain health to heart**
   What’s good for the heart is good for the brain.

3. **Your numbers count**
   Monitor body weight, blood pressure, cholesterol and blood sugar levels.
4. **Feed your brain**
   Eat less fat and more antioxidant-rich foods.

5. **Work your body**
   Physical exercise may encourage new brain cells – keep both body and mind active.

6. **Jog your mind**
   Keep your brain active and engaged - builds reserves of brain cells and connections.

7. **Connect with others**
   Activities that combine physical, mental and social elements.
8. **Heads up! Protect your brain**
Take precautions against head injuries. Use seat belts; avoid falls; wear a helmet.

9. **Use your head**
Avoid unhealthy habits.

10. **Think ahead - start today!**
You can do something today to protect your tomorrow.
Resources

The Memory Bible
An Innovative Strategy for Keeping Your Brain Young

Gary Small, M.D.
Director of the UCLA Center on Aging

Mind Wide Open
Steven Johnson

SEARCH INSIDE!

The Memory Prescription
Dr. Gary Small's 14-Day Plan to Keep Your Brain and Body Young
Gary Small, M.D.
with Gigi Vorgan
Resources

- Osher Institutes
  - www.usm.maine.edu/olli/national/
- UK Donovan Scholars
  - www.uky.edu
- www.alz.org
  - (Alzheimer’s Association)
- www.alzheimers.org (ADEAR)
- www.learnativity.com