Aging Gracefully:
Insights from Neuroscience Research

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An Aging Population

- People are living longer than ever before
- >85 years = fastest growing segment of the U.S. population.

“[The] challenge for the 21st century will be to make these added years as healthy and productive as possible” – National Institutes of Aging

Executive Function

Reasoning, Planning, Multi-tasking, Maintaining attention in the face of distraction

from Hedden & Gabrieli, 2004
An example of an executive function task (the Stroop Task):

Name the color of the FONT

GREEN
GREEN

BLUE
Why was this difficult?

- Word reading is automatic
- Thus, the word is distracting, especially because the meaning of the word conflicts with the color of the font
- But can improve with practice...

The Aging Brain

- Why might memory and executive functions become more challenging with increasing age?
- The brain changes / “matures” as we age, and affects some regions more than others
The Aging Brain

Prefrontal Cortex
Executive Function

Hippocampus
Memory
Hippos = horse
Campus = sea monster

Measuring Brain Structure & Function

Magnetic Resonance Imaging

Structural MRI
White matter

Functional MRI
Measuring Brain Structure & Function

Magnetic Resonance Imaging

Structural MRI

Functional MRI

Brain Structure

The brain loses some of its volume as we age

Hippocampus

Prefrontal Cortex

from Hedden & Gabrieli, 2004
Brain Function

Some brain regions are **under-utilized** in aging
Others are **over-utilized**
Sometimes, **additional** brain regions are recruited

Brain Connectivity

The brain is composed of many **NETWORKS** of interconnected regions
Measuring “Structural” Connectivity

These regions communicate with each other through white matter pathways.

Measuring “Functional” Connectivity

Can use functional MRI to measure the brain’s ability to communicate.
Functional Connectivity in Aging

Older adults, on average, have weaker network communication between regions important for memory and executive function

Aging Gracefully

The brain is malleable throughout our lives (brain plasticity). There are many ways to combat detrimental effects of aging...

1) Stay mentally active
   - Get out and about
   - Do things that are challenging (e.g. multi-tasking)
   - Cross-word puzzles, soduku
Aging Gracefully

2) Spend time with others
   - Friends, family, grandchildren
   - Play games

3) Sleep well

4) Maintain a Healthy Diet
   - Eat nutritious foods high in omega 3s and antioxidants
5) Maintain a Healthy Lifestyle
- Avoid smoking / excessive drinking
- EXERCISE!!!

Benefits of Exercise

- Lowers risk for Alzheimer’s disease and vascular dementia
- Improves cognitive function, including executive function and memory

Exercise thought to promote:
- Angiogenesis (growing new blood vessels)
- Neurogenesis (growing of new neurons), especially in hippocampus
- Synaptogenesis (forming new connections between neurons)

Exercise strengthens long-range connectivity between brain regions

Bherer et al., 2010
Ongoing Study

**Fitness, Older adults, and Resting state Connectivity Enhancement Study**

@ CU Boulder (with Profs. Angela Bryan, Marie Banich, Doug Seals & Kent Hutchison)

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**Aging Gracefully**

6) Minimize Stress
   - Yoga
   - Meditation
Mindfulness Meditation

Mindfulness = an open and receptive attention and awareness of the present moment.

- Positive effects on health & well-being
- Helps us accept and let go of negative emotions
- Promotes brain plasticity (structural and functional integrity)
- Improves attention by boosting attention brain networks
- Mindful individuals engage in more positive, constructive thought

Mindfulness Meditation

Brief demo:

http://marc.ucla.edu/mindful-meditations

Useful Apps:

Headspace
RelaxMelodies
Participate in Research!

https://play.google.com/store/apps

Thank you!

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