Memory and Brain Health as We Age: Understanding Changes and Dispelling Myths

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An Overview:

- What is memory?
- How does memory function in the brain?
- What are some changes that all of us will experience in healthy aging?
- Dispelling myths about this journey
- Protective factors and tips for keeping our memory sharp:
  - Exercising the body and mind
  - Nutritional and dietary factors
  - Lifestyle factors
What Exactly is Memory?

• A malleable and long-lasting impression that is reflected in thought, experience, and behavior.
What Kinds of Memory Are There?

- Broadly defined into four systems:
  - Episodic
  - Semantic
  - Working
  - Procedural
Where is Memory in the Brain?
Medial Temporal Lobes and the Hippocampus

- The Temporal lobes
  - Object recognition
  - Auditory/ Spatial processing
  - Language
- **Ammon’s Horn**
- **Hippocampus**: a special structure in the middle temporal lobe
  - It combines different streams of sensory information into episodes
  - Heavily connected to frontal lobe
Why is Memory so Dynamic?

• Memories are **constantly** active and flexible
• Constant cycle of information exchanged between our external and internal worlds
• Metabolic activity is **highest** in the Hippocampus
  - Location in the brain
  - Proximity to blood vessels
• High metabolic activity also leads to high vulnerability
• Vulnerability involves interactive factors including environment, genetics, lifestyle, and cognitive reserve
Brain Changes in Healthy Aging

- Blood vessels naturally change with age
- Blood flow reduced as arteries narrow
- The brain loses weight
- Blood pressure increases (medication controlled)
- Increased blood pressure = changes in cell structure
- The communication between neurons slows
- We recruit more brain areas to do the same tasks
- Plaques develop in the hippocampus and cortex
There is some cell loss and shape change associated with healthy aging, but this by itself does not indicate significant memory loss or impending memory difficulties.
Cognitive Changes in Healthy Aging:

- Recollection becomes more difficult, yet familiarity is preserved
- Working memory slows as well
- However... equated for time, Older adults = Younger adults
Forgetfulness: Normal vs. Not Normal

**Normal Forgetfulness**
- Making a bad decision once in a while
- Missing a monthly payment
- Forgetting what day it is and remembering it later
- Sometimes forgetting which word to use
- Losing things from time to time
- Forgetting a name associated with a face when meeting someone
- Needing more salt/spices for meals

**Potentially Serious Problems**
- Making poor judgments and decisions a lot of the time
- Problems taking care of monthly bills
- Losing track of the date or time of year and not remembering
- Trouble holding a conversation
- Misplacing things often and being unable to find them
- Being unable to recognize people that are close to you
- Sudden decline of smell or taste ability

NIH National Institute on Aging
Myths we Can Comfortably Dispel

- We only use 10-20% of our brains
- Older individuals can’t learn new things
- Learning a new language is for the young
- We are stuck with the brain you are born with
- It’s inevitable that everyone will develop dementia in later life
- Older individuals are doomed to forget things
- Fancy memory supplements help

Global Council on Brain Health and AARP
Cognitive Protection and Exercise

• Learn...Learn...Learn
• Working memory increases with practice at all ages
• Semantic memory continues to grow
• Mnemonic strategies are brain tricks for maximizing episodic memory
  • Rhyming
  • Face-name associations
  • Chaining new information to prior information
  • Deliberately attending longer
  • Go for a walk and associate items with your path
  • Being mindful
Ways to Exercise your Memory

- Add to your cognitive reserve!
- Testing your own recall... Make lists and quiz yourself
- Crossword puzzles, Sudoku, Word-Finds, Memory Games, Trivia
- Lumosity, Fit Brains, Peak, Elevate, Sporcle, MindSparke
- Music... Its power cannot be understated
- Challenge your taste and sense of smell with cooking
Protective Factors
Semantic Memory Over the Lifespan

Salthouse, 2004
How do most changes happen?

• Reduction in cortical thickness
  • Cortex is the outside of the brain
  • It is responsible for higher-level thinking
  • It is very important – that’s why it’s so bumpy
Role of exercise

- High fitness older adults have a thicker cortex than low fitness older adults
  - It will not be as thick as that of a younger adult, so while staying active is important, exercise alone is not enough to fight off some of the negative effects of aging
- Something that increases respiration (like going for a walk) can help defend your brain
Reactive Oxygen Species

- Molecules that are a byproduct of the oxygen we breathe which cause damage to our cells

  - That damage is called oxidative stress
  - The nervous system is particularly susceptible to this damage
  - How do we fight against oxidative stress? With antioxidants!

  ROS | Antioxidant | Brain cell
Antioxidants in Nutrition

- Eating antioxidant rich food can protect your brain!
A Specific Example: Blueberries!

- Put rats on diet with antioxidant-rich blueberries for 4 weeks (equivalent to 1 cup a day in humans)
- Subjected them to radiation to disrupt cognitive performance
- Test for pro-oxidants
  - These foster development of harmful ROS
- Results compared to a few control conditions

Poulouse, Rabin, Bielinski, Kelly, Miller, Thangthaeng & Shukitt-Hale, 2017
Antioxidant levels in the hippocampus

Pouluse, Rabin, Bielinski, Kelly, Miller, Thangthaeng & Shukitt-Hale, 2017
Other foods suspected to help:

- Cherries
- Raspberries
- Strawberries
- Spinach
- Walnuts
- Omega-3 fatty acids
Mindfulness

“The awareness that emerges through paying attention on purpose, in the present moment, and nonjudgmentally to the unfolding of experience moment by moment”

-Jon Kabat-Zinn

(Shapiro, 2006).
I should make pasta for dinner, I also need to pay that bill and wash some laundry—oh, let’s come back to the present moment!

Mind wandering is okay, but noticing can help lessen stress.

(Sevink, G, 2021)
Tools to come back to the present:

- Breathing Meditation
- Walking Meditation
- Mindfulness Meditation
- Focused Meditation
- Body Scan Meditation

This strengthens the connection of my awareness networks, and now I have better control over my stress!

(Suddendorf, 2011; Ostby, 2012; Kucyi, 2014)
Let’s Practice Watching our Breath

- Our breath is an anchor we can use to ground us to the present when our mind is wandering or stressing about our daily to-dos.
- Let’s follow the path our breath takes or start by noticing the rise and fall of our chest.
In Conclusion

Memories and thoughts age, just as people do. But certain thoughts can never age, and certain memories can never fade.

Haruki Murakami