Is My Memory Normal?
Typical and Atypical Cognitive Decline

Me, My Brain, and I
Seminar in Cognitive Neuroscience
Stockton University

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Pre-Test!
Did You Know?

- The population age 85 and older is expected to triple by 2050 (Evans et al 1989)
- As of 2015, an estimated 5.3 million Americans across all ages have Alzheimer’s Disease (Alzheimers 2015)
- 5.1 million people with Alzheimer’s Disease are age 65 and older (Alzheimers 2015)
- Almost two-thirds of those Americans with Alzheimer’s Disease are women (Alzheimers 2015)
Objectives

● Describe and identify atypical behavioral changes in aging adults

● Explain physical changes in the brain that contribute to these behavioral changes

● Discuss ways that these brain changes are addressed and to look at possible solutions
A certain amount of cognitive decline is to be expected as a part of normal aging.

It then becomes important to be aware of this decline and how it impacts your daily-to-day behavior.

A study performed in 2014 by Schmitter-Edgecombe et al. observed, tested, and scored individuals on their performance while performing daily tasks:

- Filling medication trays
- Watering house plants

Participants included cognitively healthy younger and older adults, individuals with mild cognitive impairment and individuals with dementia.
Typical and Atypical Cognitive Decline: Behavioral Changes

- The participants were selected using neuropsychological tests and were sorted based on diagnostic criteria of the DSM-IV for each category

- Conditions of the Experiment
  - Healthy younger adults
    - Average age 22 years
  - Healthy older adults
    - Average age 72
  - Mild Cognitive Impairment (MCI)
    - “An intermediate stage between the expected cognitive decline of normal aging and the more serious decline of dementia; it involves problems with memory, language, thinking and judgment that are greater than normal age-related changes” (mayoclinic)
Types of Errors

- Participants were scored based on four types of errors they committed:
  - Inefficient action
    - Performing an action that slows the performance of the task
      - Making multiple trips to the same room, opening and closing the cabinets that aren’t related to the task, etc.
  - Omission
    - Forgetting to do a step in the process of completing the task
      - Not remembering to get a broom to sweep, not turning off TV after watching a DVD
Types of Errors

- **Substitution**
  - Using an incorrect tool for the task or incorrectly using the right tool
    - Sweeping the floor in the wrong room, using a cup instead of a watering can

- **Irrelevant action**
  - Doing something that is entirely unnecessary for the completion of the task
    - Opening the fridge when the task is dusting the floor
Cognitively normal older adults were linked with committing more inefficient actions.
- Suggesting these types of errors are associated with healthy, normal aging.

Omission errors were the most common forms of errors for the mild cognitive impairment group.

The group of participants with dementia had significantly greater amount of all four types of errors compared to the other groups.

Results

- Findings suggest that there are criteria for cognitive change that occur in individuals who are older, have a mild cognitive impairment or, on the extreme end, suffer from dementia.

- Normal aging is associated with inefficient action errors and individuals with dementia commit all types of errors more often.

- If decline is left unchecked, it can lead to further difficulties in task performance and increase atypical cognitive decline.

- What are some behaviors that might indicate atypical cognitive decline?
Early Indicators of Atypical Cognitive Decline

10 Early signs and Symptoms of Alzheimer’s Disease and atypical cognitive decline according to the Alzheimer’s Association (alz.org)

1. Memory loss that disrupts daily life
   - Typical change is sometimes forgetting names and appointments but remembering them later

1. Challenges in planning or solving problems
   - Typical change is making occasional errors balancing a checkbook

1. Difficulty completing familiar tasks at home, work, or at leisure
   - Typical change is occasionally needing help to use the settings on a microwave
Early Indicators of Atypical Cognitive Decline

4. Confusion with time or place
   - Typical change is getting confused about what day it is but being able to figure it out later

5. Trouble understanding visual images and spatial relationships
   - Typical change is change in vision due to physical changes in the eye such as cataracts

6. New problems with words in speaking or writing
   - Typical change is sometimes having trouble finding the right word
Early Indicators of Atypical Cognitive Decline

7. Misplacing things and losing the ability to retrace steps
   - Typical change is losing things from time to time but being able to retrace your steps to find them

8. Decreased or poor judgment
   - Typical change is making a bad decision once in a while

9. Withdrawal from work or social activities
   - Typical change is occasionally feeling weary of work, family, and social obligations
Early Indicators of Atypical Cognitive Decline

10. Changes in mood and personality

- Typical change is doing things your way and becoming irritated when the routine is disrupted

If one or more of these changes are noticed the best course of action is to see a doctor and be tested for possible atypical cognitive changes such as Alzheimer’s Disease
As Alzheimer's disease progresses, neurofibrillary tangles spread throughout the brain (shown in blue). Plaques also spread throughout the brain, starting in the neocortex. By the final stage, damage is widespread and brain tissue has shrunk significantly.
Longitudinal study by Morris et al. (1999) over the course of 15 years
- 21 cognitively healthy older adults
- Annually administered Clinical and Psychometric tests (which assess a number of psychological cognitive variables)
- Post-mortem assessment of their brains
- Average age of death of 84.5 years
Findings

- In 9 of the 21 subjects, NFTs were distributed throughout the hippocampus in sufficient densities to satisfy diagnostic criteria for AD. The remaining 12 subjects did not meet criteria for AD. However, NFTs were present in hippocampus in all 12 patients.

- Those 9 subjects with brain signs of AD but without the symptoms for an AD diagnosis performed more poorly overall than those without significant NFTs, but still did not fit the behavioral diagnostic criteria for AD.

- The researchers also found a striking and consistent difference in the density of plaques between subjects with brain signs of AD and those without brain signs of AD. The difference was most apparent in the neocortex but was also apparent in the hippocampus.
Neocortex: higher mental functions, general movement, perception, and behavioral responses.

Corpus Striatum (formerly basal ganglia): connection between cerebral cortex and cerebellum; helps regulate automatic movement.

Amygdala: emotional responses; aggressive behavior.

Hippocampus: memory of new information and recent events.
A curved structure nestled deep within the brain, the hippocampus (from the Greek word for sea horse) plays a major role in forming, storing, and processing memories. The hippocampus becomes somewhat smaller as a part of normal aging, as shown by the comparison between the hippocampus in a healthy 25-year-old and a healthy 75-year-old. But the structure diminishes in size even more in a person with mild cognitive impairment and is markedly smaller than normal in a person with Alzheimer’s disease.
Beta Amyloid has come to be known as one of the primary contributors of Alzheimer’s Disease.

Excessive production and build-up of this protein in the brain is linked to the onset of AD.

What’s the Solution?

*Figure 5.* Positron emission tomography (PET) example. PET images obtained with the amyloid-imaging agent Pittsburgh Compound B ([11C] PIB) in normal control (far left), three different patients with mild cognitive impairment (MCI) (three center images), and patient with mild Alzheimer’s disease (AD) (far right). Some MCI patients have control-like levels of amyloid, some have AD-like levels, and some have intermediate levels. DVR = distribution volume ratio.

Clinical Trials

- There are ongoing attempts to create vaccines to tackle beta amyloid on three levels
  - Stop production, prevent plaquing, and increase removal
  - Vaccines have been created and were effective in animal trials
- Human clinical trials were conducted after the success of animal trials

Clinical Trials

- Results showed that individuals with Alzheimer’s Disease who received the vaccine produced antibodies naturally to combat beta amyloid
  - In response to the vaccine, individuals who produced the highest levels of antibodies showed a slower rate of decline in mental functions compared to those who had lower antibody levels
- The trials were stopped however because some patients had an adverse effect of brain inflammation from the treatment
  - Brain Inflammation can cause a range of symptoms from nausea to possible seizures
Take Action!

To encourage healthy aging:

- Reduce Blood Pressure (Launer et. al. 1995)
- Exercise 3-5 times per week (Karceski 2012)
- Stop smoking and other substance abuse (Karceski 2012)
- Stay socially active (Karceski 2012)
Key Points

- Be sure to be observant in noticing atypical behaviors in yourself and your peers.
- Beta-amyloid plaquing is a primary contributor to the onset of Alzheimer’s Disease.
- Remember to take preventative measures, like exercising and staying socially active to engage in healthy aging.
Sources


http://ac.els-cdn.com/0197458096000280/1-s2.0-0197458096000280-main.pdf?_tid=c571b73e-d19d-11e4-b979-00000aab0f26&acdnat=1427143808_2f9ade7f5ed4ef6e72a055c313ddc6a7


Post Test!