IS THIS NORMAL?

WHAT TO EXPECT WHEN YOU'RE AGING

KATIE DRAGO, MD, FACP | OCTOBER 2026

TODAY'S PROGRAMMING (ALL CME ELIGIBLE)

- 9am: Aging Related Physiology
- 10am: Accelerated Aging in our Communities
- 11am: Social Isolation and Loneliness
- 12-1pm: Lunch on your own
- 1pm: Age-Friendly Health Systems
- 2pm: Late Life Depression in Older Adults
- 3pm: Managing Behaviors in Persons with Dementia

A BIT ABOUT US!

ON THE AGENDA

- Describe normal and abnormal changes to the aging sensory systems
- Explain how physiological changes in the musculoskeletal system change how older adults move
- Describe the differences between normal and abnormal brain aging
- Explore expected age-related changes in the urinary tract

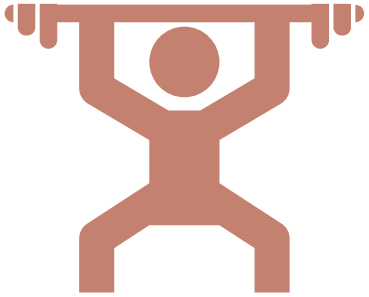
AGING IS NOT A DISEASE!

But, aging reduces the body's ability to maintain homeostasis under stress…

…thus lowering the threshold for disease…

…and making it more likely an older adult will have health and function challenges.

Sensory
(eyes, ears)



Musculoskeletal
(muscles, bones)

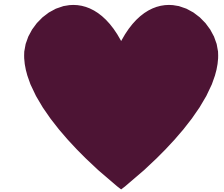
Nervous
(brain)

Urinary Tract

BUT WHY AN AGING PHYSIOLOGY CRASH COURSE?

Understanding

Advocacy



Empathy

Plus, having a positive outlook towards aging will actually help YOU live longer!

AGING EYES

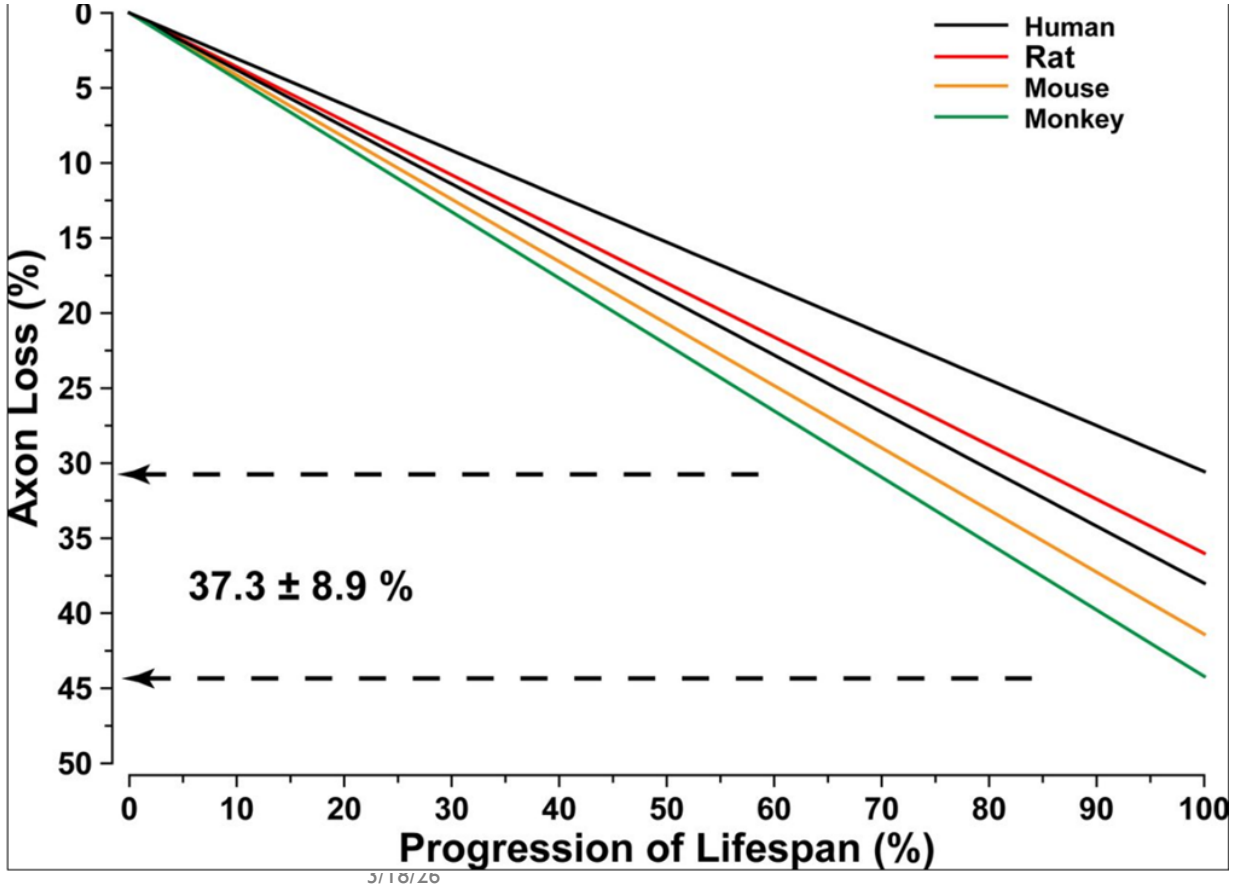
"They say eyes clear with age"
-Philip Larkin

Photo credit: Marcia Lang Canter

NORMAL VISION CHANGES

Lens is "less elastic"	• Harder to focus on objects
Loss of contrast sensitivity	• Harder to distinguish objects
Smaller pupil	• Difficulty seeing in dark
Visual scanning slows	• Harder to take in quick moving objects
Floaters become more common	• Congealing of the vitreous humor

NORMAL VISION CHANGES

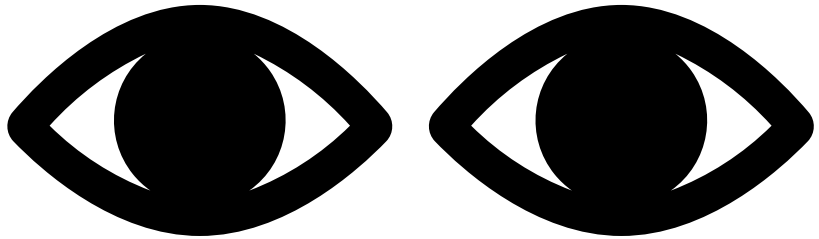


Axons (nerve cell "projection"—like circuitry wiring) decrease in the optic nerve

Calkins DJ. Age-Related Changes in the Visual Pathways: Blame It on the Axon. *Investigative Ophthalmology & Visual Science*. 2013

ABNORMAL VISION CHANGES

- Cataracts – main driver is lifetime sun exposure
- Diabetic retinopathy
- Glaucoma
- Macular degeneration
- Stroke



Same Scene Viewed By A Person With:

Normal Vision

Cataracts

Same Scene Viewed By A Person With:

Normal Vision

Diabetic Retinopathy

Same Scene Viewed By A Person With:

Normal Vision

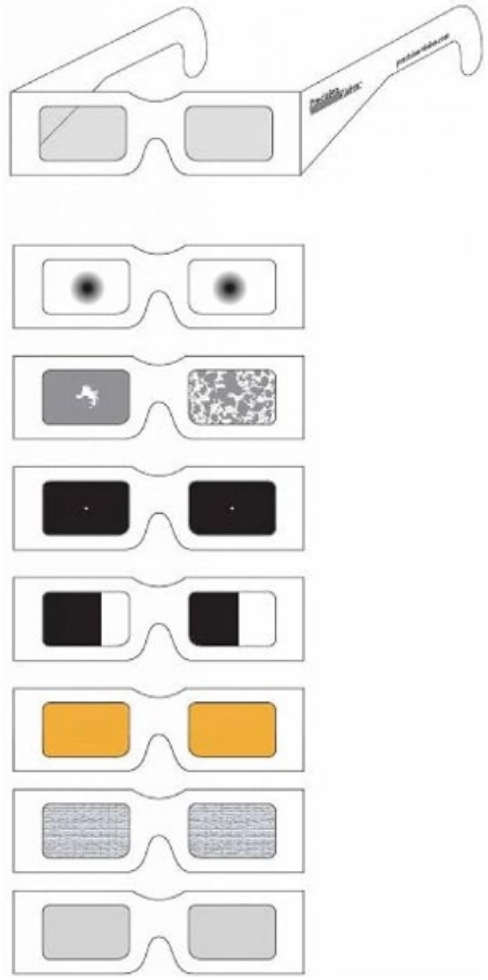
Glaucoma

Same Scene Viewed By A Person With:

Normal Vision

Age-Related Macular Degeneration

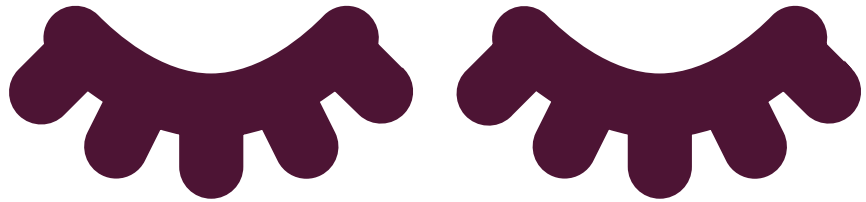
TIME TO TRY IT OUT



- Grab a pair of glasses
- Try and write and read a text message on your phone
- Switch glasses with a neighbor

HOW CAN YOU TELL IF SOMEONE CANNOT SEE WELL?

- Difficulty with coordination
- Squinting or closing one eye
- Turning head to see large field
- Impaired depth perception (stumbling, spilling)
- Mismatched clothing items



AGING EARS

There is a difference between listening and hearing, just as there is a difference between seeing and knowing

- Meg Cabot

POP QUIZ

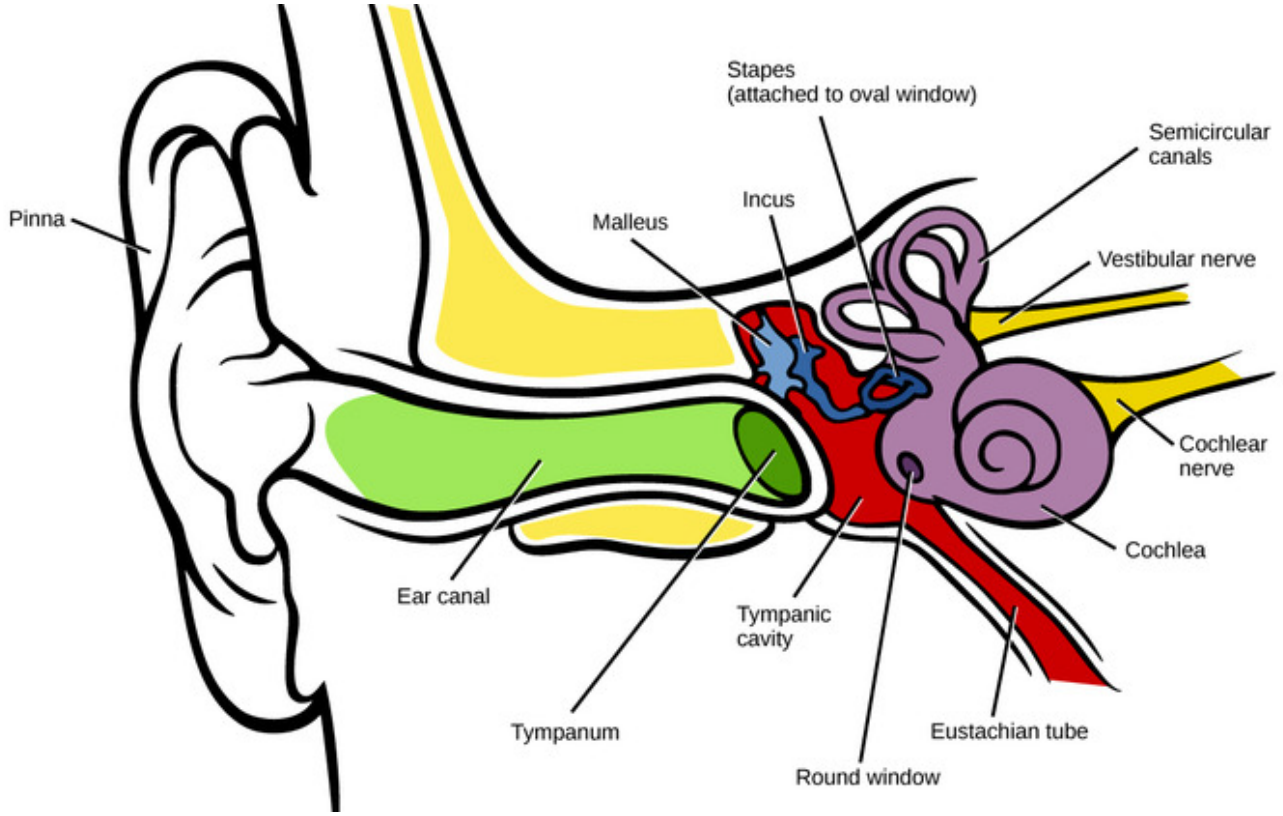
Which of the following parts of hearing do older adults most commonly **lose first?**

A: High pitched sounds

B: Low pitched sounds

NORMAL HEARING CHANGES

- High-pitched frequency loss
  - Cochlear hair cells slowly degrade and ultimately die
  - Preferentially happens to the higher pitch hair cells
- Some consonants become challenging
  - S, Z, T, F, G
  - Vowels are easier
- Word discrimination is harder



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HEARING LOSS IS EVERYWHERE

65% of adults >70 years old

96% of adults >90 years old

Only about 30% of persons with hearing challenges use hearing aids

Only 1/3 of older adults recognize their impaired hearing

HOW DOES HEARING LOSS PRESENT?

- Pitch
- Clarity
- “Cocktail party” challenges
- Volume

HEARING LOSS AFFECTS LIFE

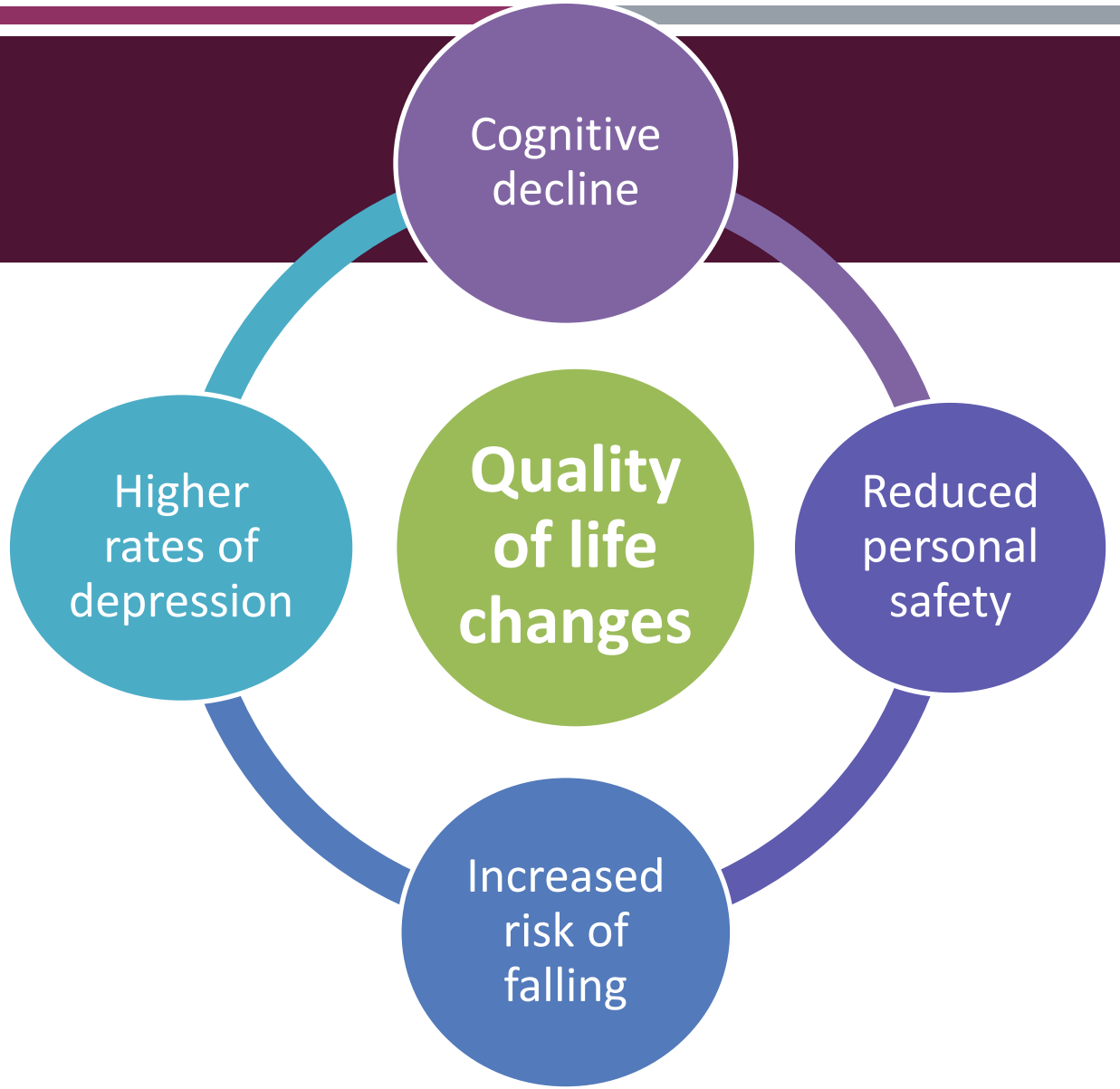
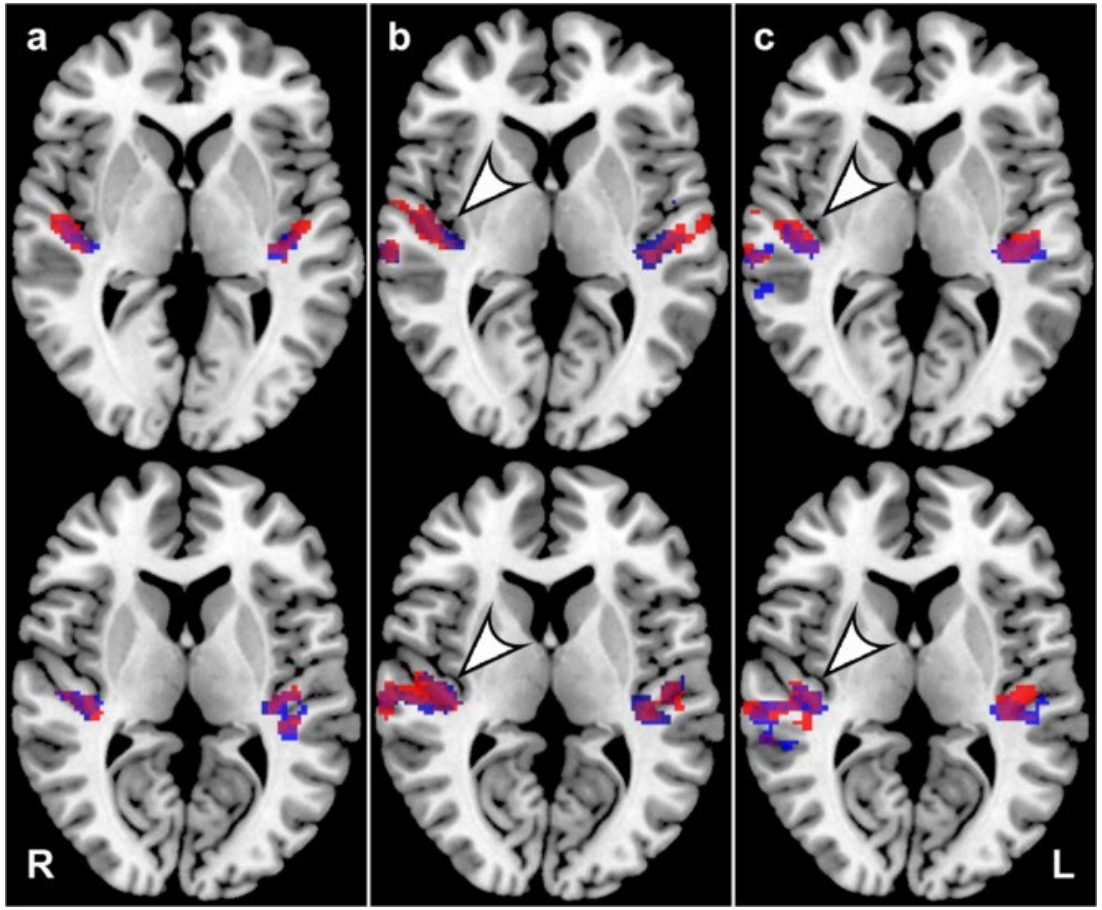
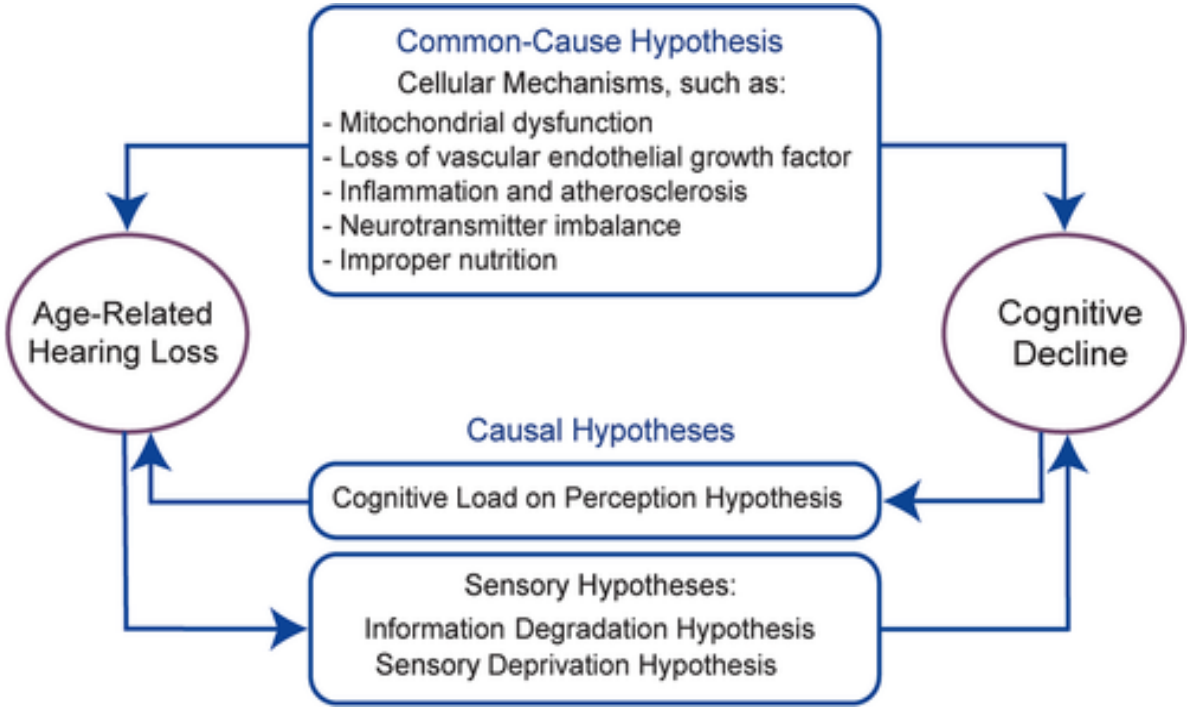


Figure courtesy of Michelle Hungerford, AuD

What does hearing loss do to the brain?





HEARING RISK AND **MEMORY**

Association with mild cognitive impairment and dementia

More severe hearing loss = higher risk of dementia

Hearing loss taxes the brain

Lots of risk factors for dementia—but this one is changeable!

HEARING LOSS AND **MOOD**

Higher risk of depression, anxiety

Contributions from social isolation/withdrawing from activities

Sudden hearing loss = highest risk

HEARING LOSS AND **FALLS**

Hearing loss associated with a **17% higher risk of falling**

Sensory impairment changes how we walk/move

Hearing loss stresses the brain and "distracts" from balance and stability

HOW CAN YOU TELL IF SOMEONE CAN'T HEAR YOU WELL?

- They speak loudly
- Turning their head towards sound
- Have blank look when asked a question
- Eyes are focused on lips
- Ask for repetition
- Answers/responses are not appropriate

COMMUNICATION TIPS WHEN SOMEONE **HAS** HEARING LOSS

- Position yourself in front of the person and keep your mouth visible if possible
- Use adequate lighting that shines on your face
- Ensure the person is paying attention before you ask a questions
- Project, don't yell
- Lower the pitch of your voice if possible
- Rephrase instead of repeating your question or statement
- Write down important information
- Remind the person to wear their hearing aid!

MUSCULOSKELETAL SYSTEM

Muscle has memory; the body knows things the mind will not admit.

- Louise Doughty

Photo credit: Elliot Burg

MUSCULOSKELETAL SYSTEM

STRUCTURAL CHANGES

MUSCLE

Mass volume ↓ by 1 - 2% per year

Strength ↓ by 3 - 4% per year

BONE

Density ↓ by 0.5% per year

Structure ↑ Fragility

- Muscle cell death
- Muscle protein imbalance
- Impaired regeneration
- Impaired neuromuscular transmission

FUNCTIONAL CHANGES

MUSCLE

↑ Sarcopenia = Atrophy

↑ Dynapenia = Weakness

BONE

Alterations on architecture and strength

↑ Risk for developing:

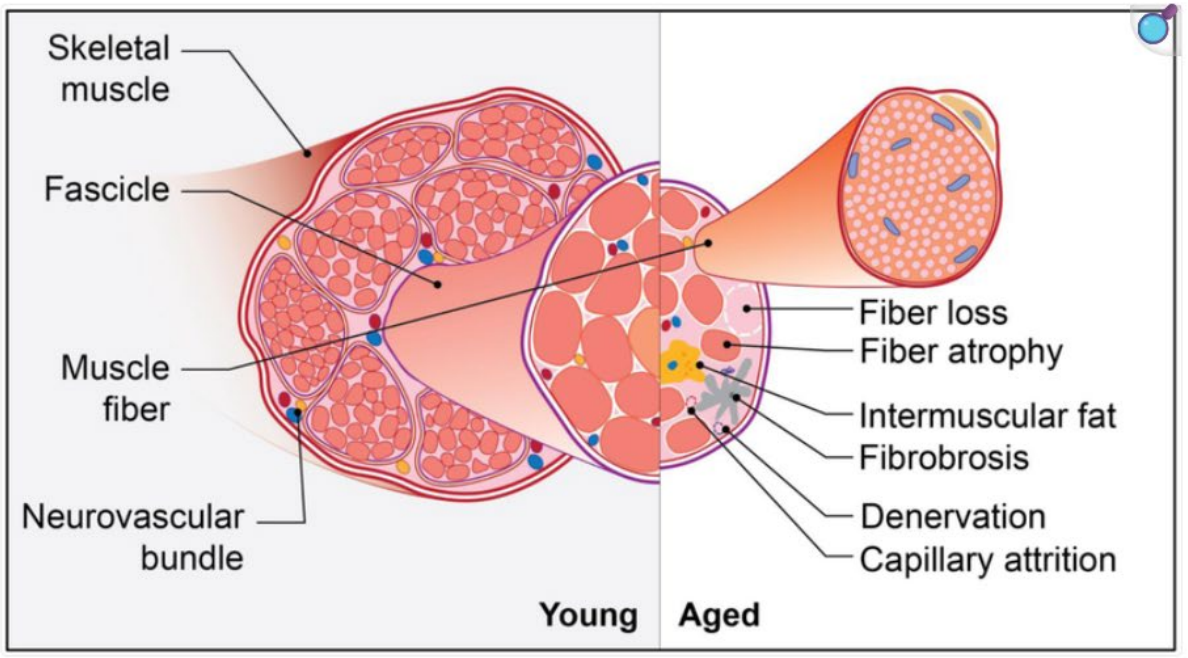
- Gait instability → Falls
- Osteoporosis → Fractures

Fonseca Valencia, C., Schwartz, A.W. Aging physiology Infographic. 2022

NORMAL MUSCLE CHANGES

- Muscle strength **peaks at age 28**
- Muscle strength decreases by ~ 3% per year >70yo
- Decreased number of muscle fibers
- Fewer nerve endings to muscles
- Less blood flow to muscles

Figure 1. Age-related changes in skeletal muscle.



Aversa et al, Clinical impact and biological mechanisms of skeletal muscle aging, Bone. 2019. 127. 26-36

SLOWING MOTOR CONTROL

- Adults >65 exhibit a 43% volumetric **reduction in the premotor cortex** compared to adults <45 years
- Primary sensory systems for balance **lose sensitivity** with normal aging (e.g., proprioception, vision)
- Fewer neurotransmitters to help "make things go"
- Punchline: **Brain works HARDER to make the body work as it wants, with LESS material**

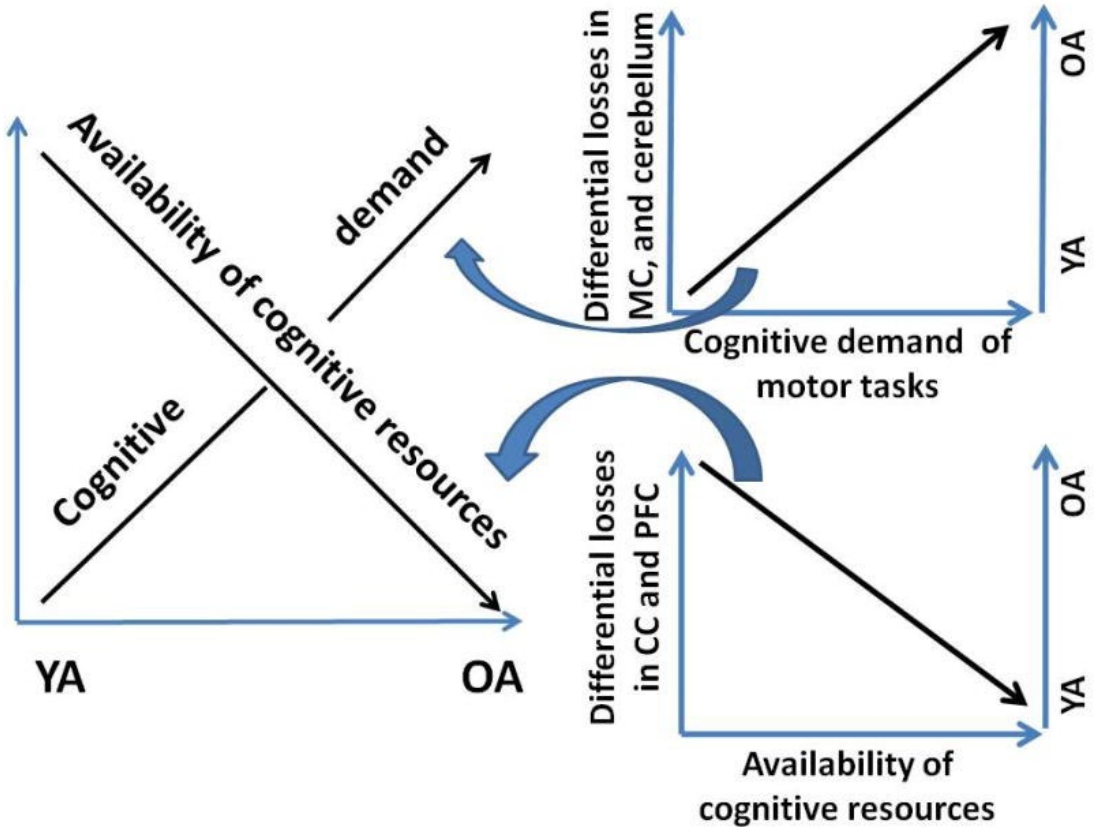
Photo credit: Elliot Burg

Clark BC, Taylor JL. Age-Related Changes in Motor Cortical Properties and Voluntary Activation of Skeletal Muscle. Current Aging Science. 2011;4(3):192-199.

SLOWING MOTOR CONTROL

Motor slowing leads to debility and frailty

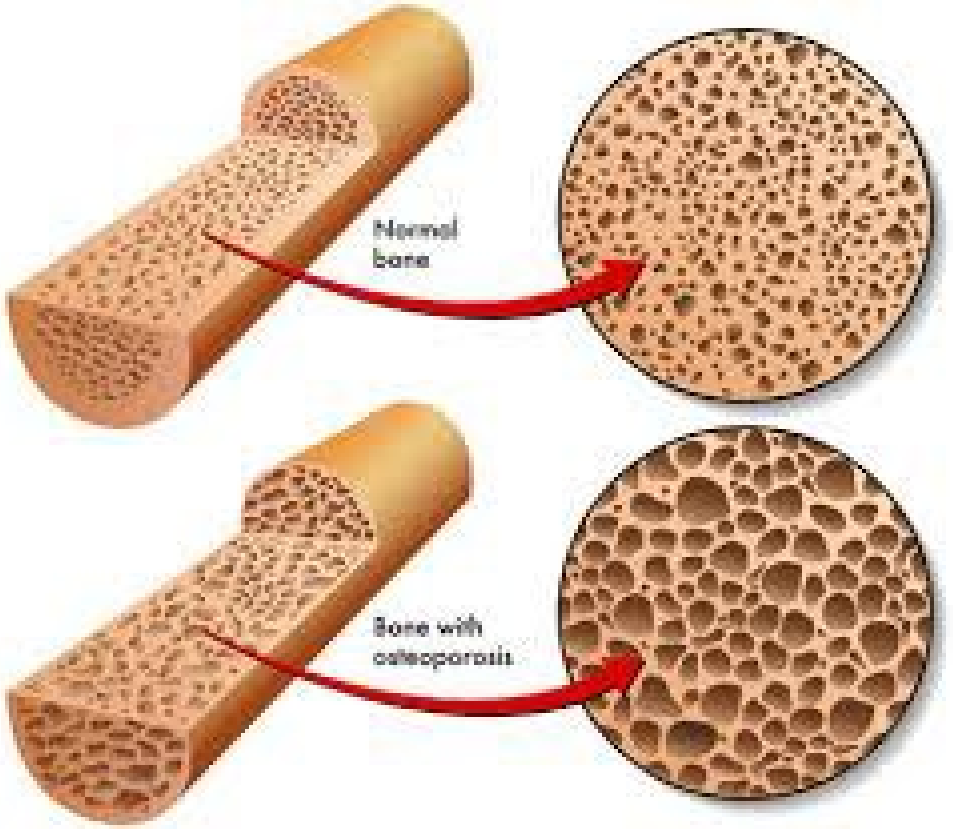
- **Coordination** difficulty
- Increased **variability** of movement
- Decreased **response times**
- Difficulties with **balance and gait**



Seidler RD, et al Neurosci Biobehav Rev, 2010 Apr;34(5):721-33

NORMAL BONE CHANGES

- **Decreased estrogen** (post-menopause or secondary cause) and/or **testosterone** (andropause or secondary cause)
  - ↑bone "breakdown" activity
  - ↓bone "building" activity
- Increased **bone resorption**
- More likely to be Vitamin D deficient
- Thinner bones = more **likely to fracture**



NORMAL JOINT CHANGES

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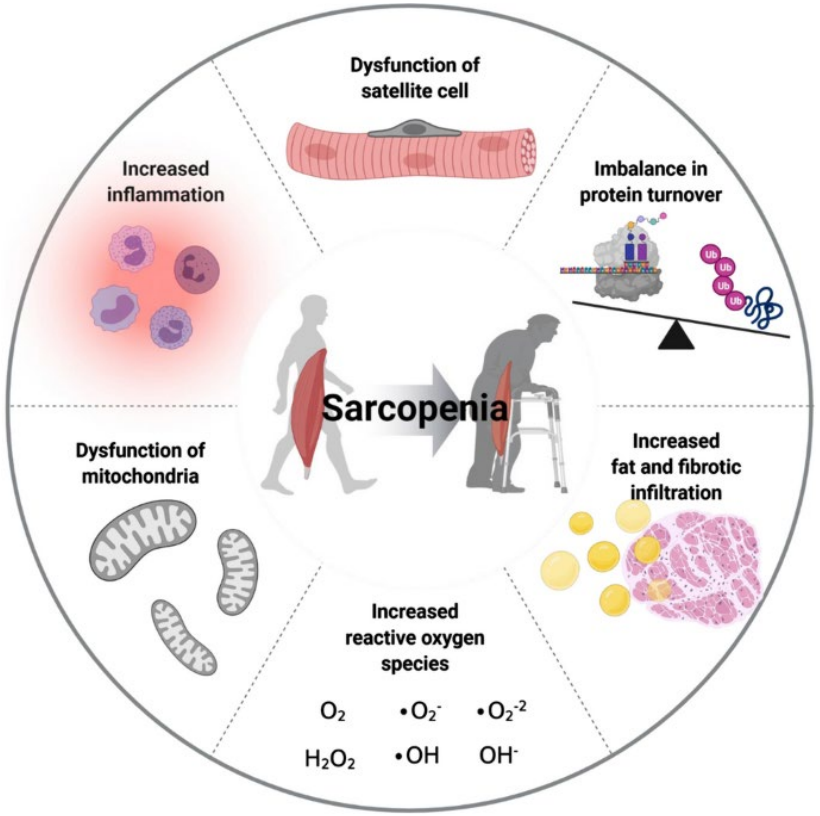
- Breakdown of cartilage
- Decreased synovial fluid ("motor oil")
- Thickening of "joint capsules"
- Increased risk of **osteoarthritis and pain**
- May move more **stiffly and slowly**

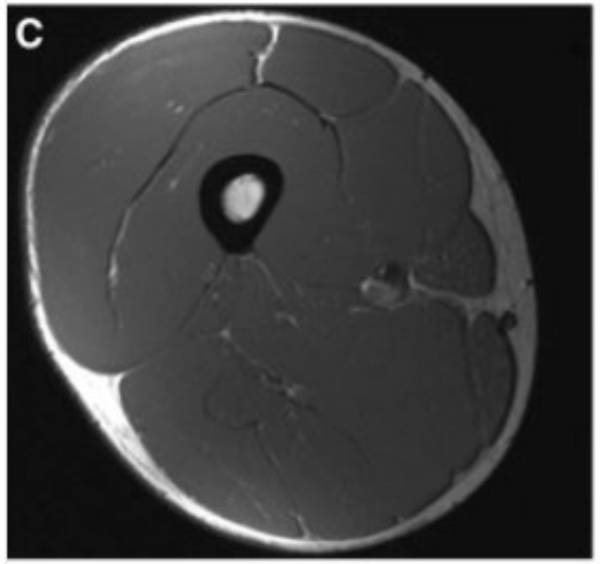
SARCOPENIA

- Age related muscle loss that progresses to the point of physical frailty (lack of resiliency & vulnerability to minor insults), impact on independent function
- Driven in part by sedentary lifestyle, poor protein intake BUT driven more by chronic inflammation ("inflamm-aging")
  - Overlapping with other inflammatory conditions → diabetes, heart failure, chronic kidney failure, anemia of chronic disease

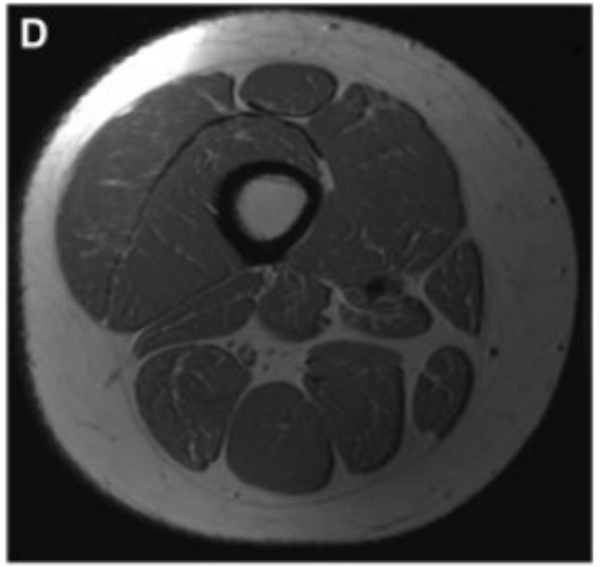


Prokopidis K, Exmann CJC, Morwani-Mangnani J, et al. Differences in Circulating Inflammatory Markers in Older Adults With and Without Sarcopenia: A Systematic Review and Meta-Analysis. J Am Med Dir Assoc. 2026; https://doi.org/10.1016/j.jamda.2026.106312

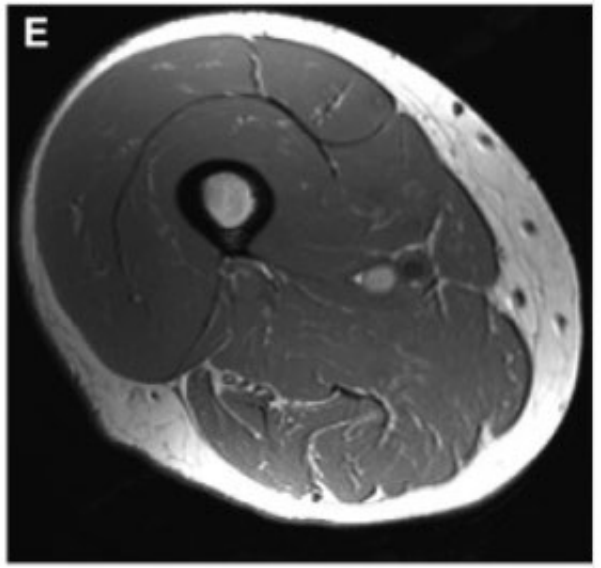
EXERCISE PARTIALLY REDUCES SARCOPENIA



Male – 24 yrs
Body mass – 76kg
Fat mass – 10kg
Fat free mass – 57kg



Male – 66 yrs
Body mass – 81kg
Fat mass – 57kg
Fat free mass – 13kg
Average daily steps = 3141
PA >3MET per/day = 22mins



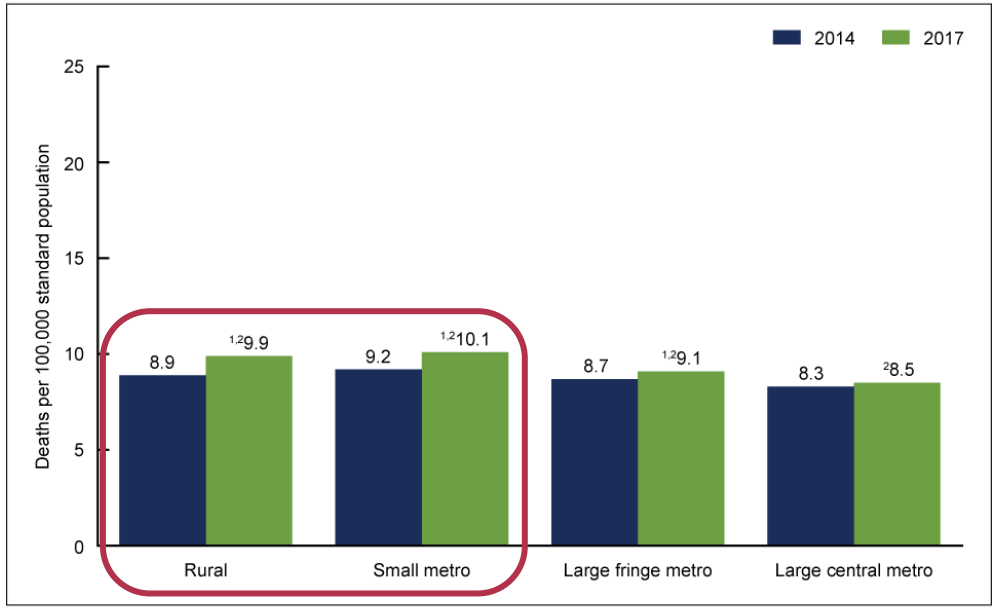
Male – 66 yrs
Body mass – 79kg
Fat mass – 34kg
Fat free mass – 36kg
Average daily steps = 12445
PA >3MET per/day = 130mins

McLedo et al, Live strong and prosper, Biogerontology, 2016

FALLS…HOW BIG OF A PROBLEM CAN IT BE?

- Between **30-40%** of community dwelling people >65yo fall each year
  - Half of those people fall more than once
  - Rates go up with age
- Only 25% will discuss falls with PCP
- Falls related hospitalizations are in the top 20 most common reasons for older adults to be hospitalized
- Rural older adults are at higher risk of dying from a fall

Figure 4. Age-adjusted death rates for unintentional falls, by urbanization level: United States, 2014 and 2017



[1]Significant increase between 2014 and 2017 ($p < 0.05$).
[2]Significant differences among all urbanization groups ($p < 0.05$) except for the difference between rural and small metro.
NOTES: Unintentional fall deaths are identified using *International Classification of Diseases, 10th Revision* underlying cause-of-death codes W00–W19. Classification of the decedent's county of residence is based on the 2013 NCHS Urban–Rural Classification Scheme for Counties. Access data table for Figure 4 at: https://www.cdc.gov/nchs/data/databriefs/db343_tables-508.pdf#4.
SOURCE: NCHS, National Vital Statistics System, Mortality.

CDC Home and Recreational Safety https://www.cdc.gov/homeandrecreationalsafety/falls/adultfalls.html; https://www.cdc.gov/nchs/products/databriefs/db343.htm

NERVOUS SYSTEM CHANGES

Nonsense wakes up the brain cells. And it helps develop a sense of humor, which is awfully important in this day and age.
- Dr. Seuss

BRAIN HEALTH: TRUE OR FALSE?

- It is normal for your brain to change as you age
- Dementia is inevitable as you age
- You will have dementia if your parents had dementia

CENTRAL NERVOUS SYSTEM

STRUCTURAL CHANGES

Volume & weight ↓ 5% every decade

Synapse ↓ number & Δ morphology

Cytoskeletal protein Δ structure

Vasculature development of atherosclerosis & arteriolosclerosis

- Oxidative damage
- Impaired energy & metabolism
- Intra & extracellular protein aggregate accumulation

FUNCTIONAL CHANGES

↓ **Attention** (due to difficulty in multitasking)

= **Executive function** No change

↓ **Memory** (difficulty learning new information)

= **Language**

↓ **Visuospatial skills**

↓ **Psychomotor**

↑ **Risk for developing:**

- Mild cognitive impairment
- Dementia
- Delirium

Fonseca Valencia,C., Schwartz, A.W. Aging physiology Infographic. 2022

THE AGING BRAIN BY WEIGHT

- Age 0-3, the brain increases 4x in weight
- Slower growth through age 19
- Stable until about age 40
- **Slow decrease after age 40**
- By age 86, reduced by 11% of its peak weight

- This is loss of neurons and neuronal connections

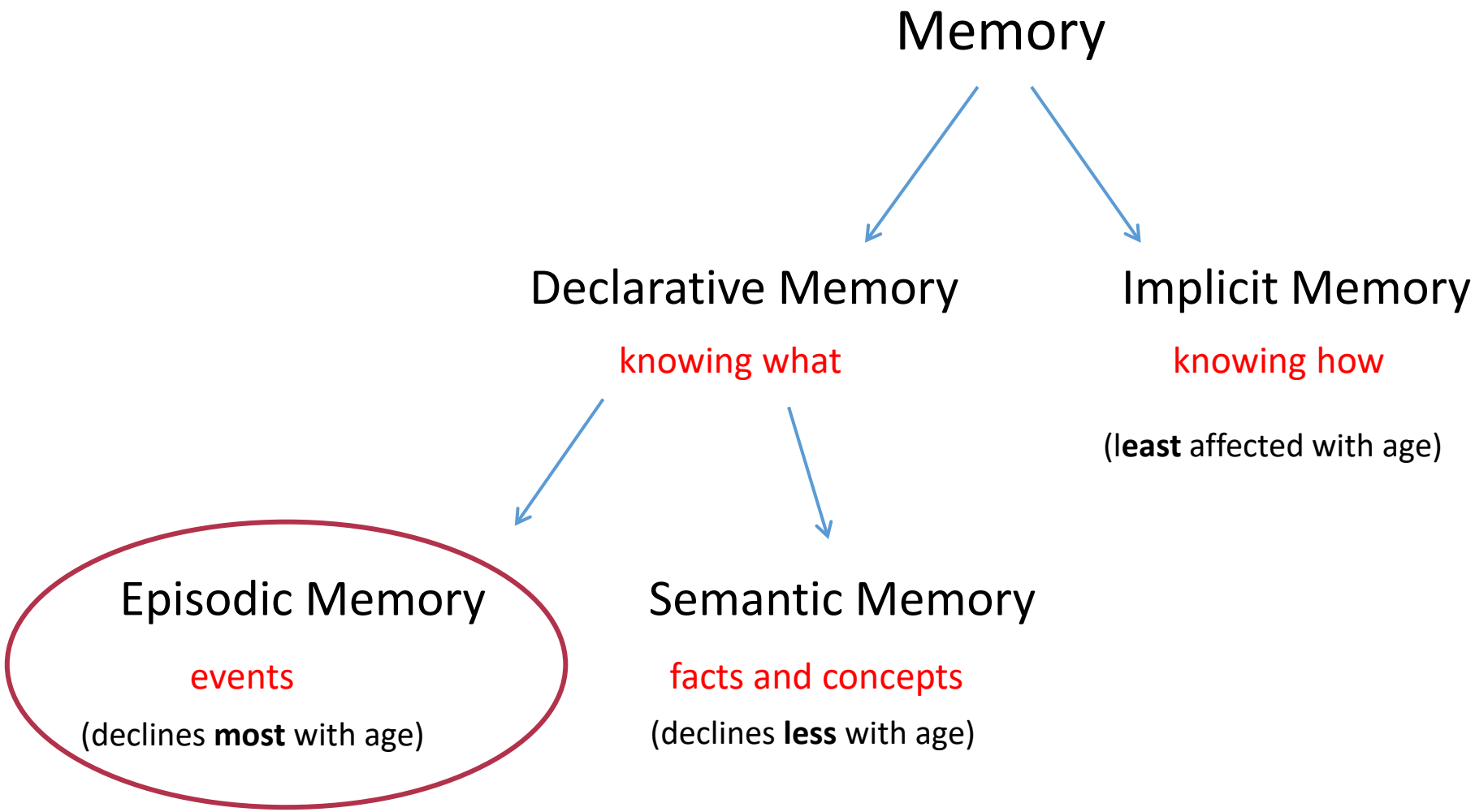
WHAT IS "NORMAL" BRAIN AGING?

COGNITIVE DOMAIN	LIKELY "NORMAL"
Short Term Memory	Forgetting names/appointments/plot lines → remembering them later
	Misplacing things (keys, glasses) and finding them later
Planning, problem-solving and decision-making	Difficulties with multitasking when distracted, takes more focus to resist distractions
	Occasional mistakes managing money/bills
Language Skills	Occasional difficulties finding the "right word" or name (comes back later)
	Losing train of thought if distracted or if many people are speaking at once
Orientation	Mistaken about the day or the week but figuring it out later
	Forgetting initially why you came into a room
Navigation	Getting lost in new or unfamiliar environments but able to figure it out

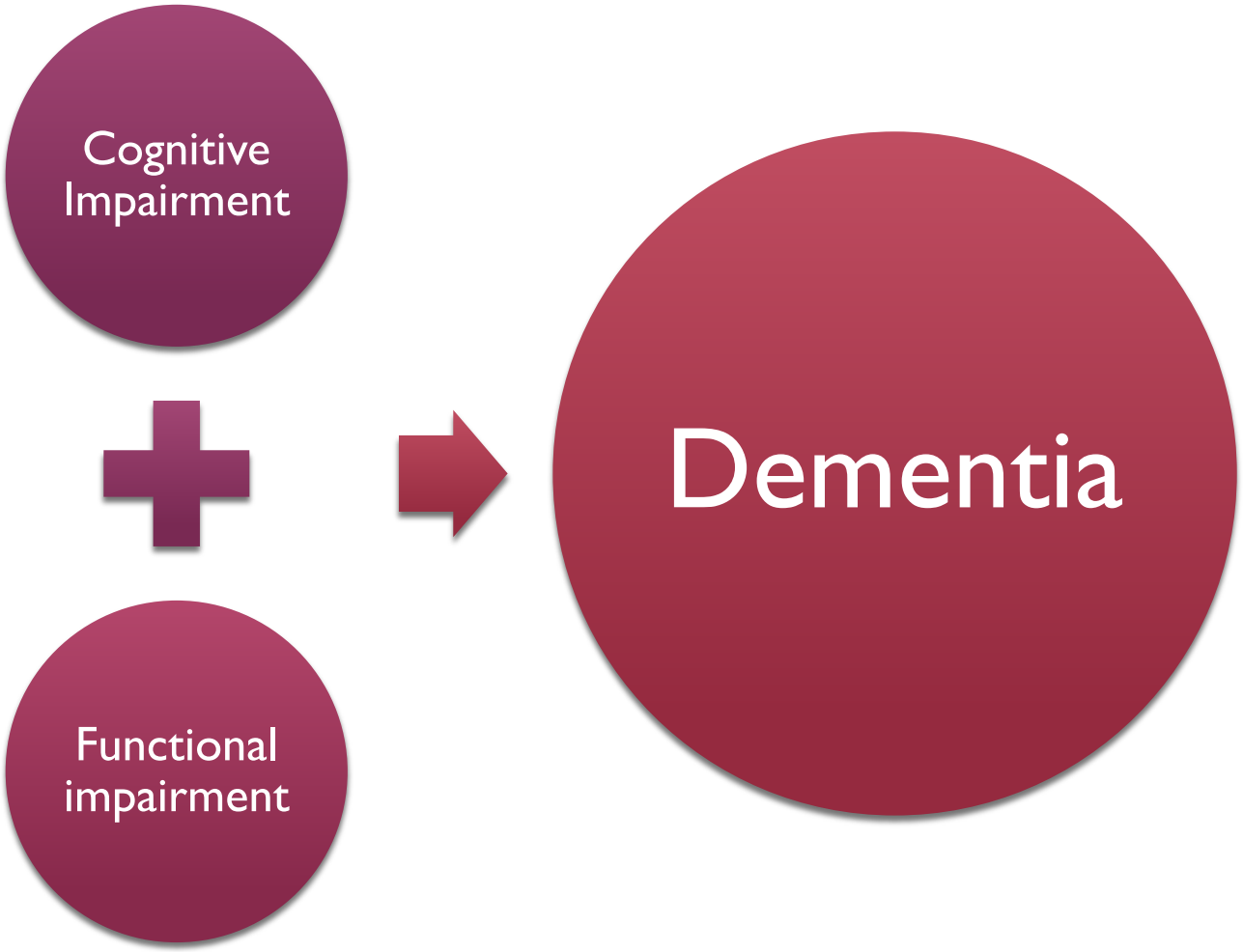
WHAT IS NOT "NORMAL" BRAIN AGING?

COGNITIVE DOMAIN	LIKELY "ABNORMAL"
Short Term Memory	Forgetting close friend/ family names or recent events
	Putting keys/glasses in unusual places (oven); not able to find on own. Misplacing objects impacts daily life
Planning, problem-solving and decision-making	Having a lot of difficulty concentrating
	Having trouble keeping track of monthly bills, not paying bills or taxes, difficulty making decisions while driving
Language Skills	Frequent difficulties finding the right word; using "that thing"
	Regularly losing track of what someone is saying
Orientation & Navigation	Losing track of months, seasons, and the passage of time
	Getting lost or not knowing where you are in a familiar place

MEMORY CHANGES ARE NOT THE SAME



WHEN IS IT DEMENTIA?



When there are both ***cognitive*** *problems* AND a ***functional*** *problem* because of cognitive impairments

NUMBERS DO NOT MAKE A DEMENTIA DIAGNOSIS

- Score on a 30-point inventory (ie. SLUMS, MoCA) is only a data point
  - Low score with normal ADLs / IADLs = probable mild cognitive impairment
  - Low score with IADL impairments (driven by cognitive symptoms) = may be dementia

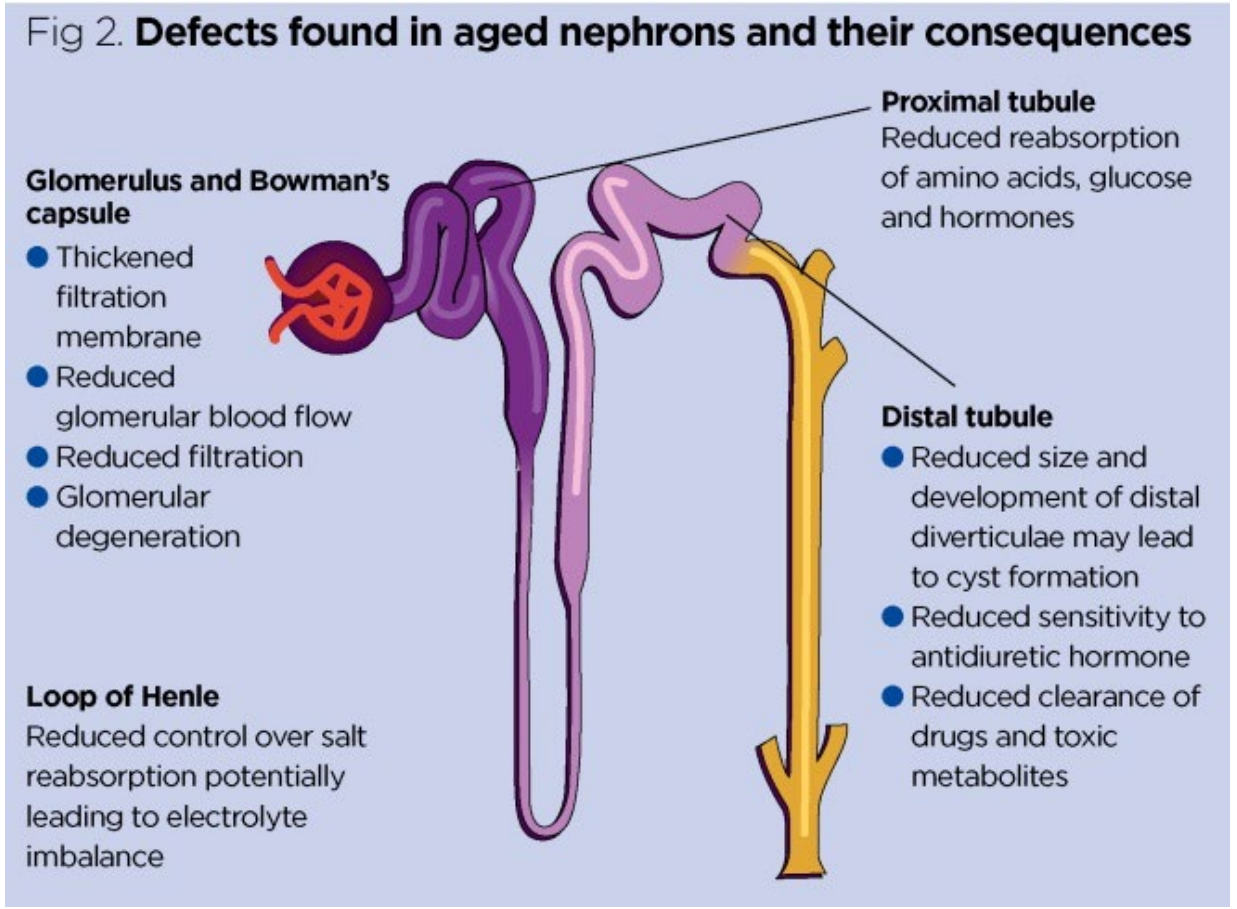
- Context of that score matter!
  - DO NOT test (or use a score) during an acute illness, hospitalization, any period of clinical instability
  - They are not reliable reflections of the person's true ability on a normal day

URINARY TRACT CHANGES

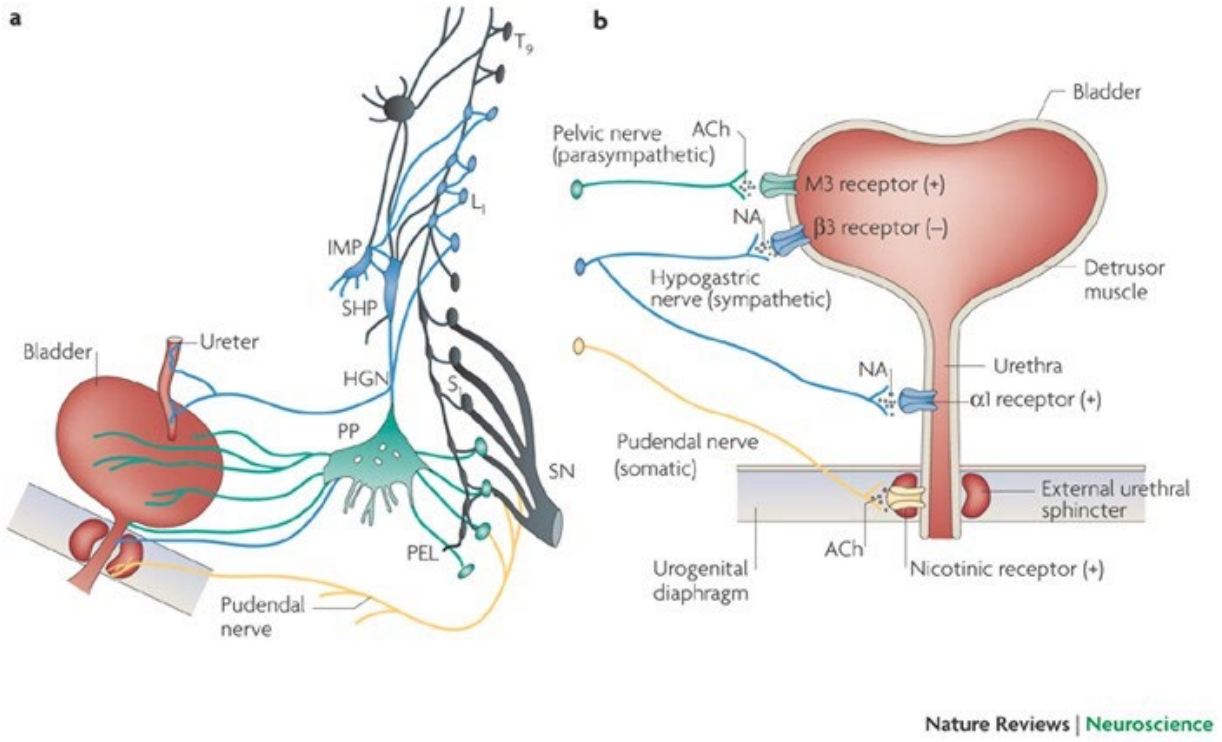
TWO MAIN AREAS OF CHANGE

Kidneys

- Lose filtering capacity due to glomerular thickening
- Less effective concentrating ability (max SG ~1.015) due to lower sensitivity to ADH
- Overall loss of nephron number → renal atrophy



TWO MAIN AREAS OF CHANGE



Bladder

- Bladder wall thickens → holds overall less volume
- Detrusor muscles contract more often due to less effective suppression by the brain
- Muscle contractions are LESS efficient → slightly higher PVRs / incomplete emptying

IN REAL LIFE

- More feelings of incomplete emptying
- Slightly more urgency and frequency
- Nocturia → driven by a positional increase in renal blood flow while supine
- More susceptibility to clinical dehydration

WHEN DOES IT BECOME INCONTINENCE?

- When these expected changes are severe enough to intrude on function, social activity, quality of life
- Incontinence is NOT an expected part of getting older but it is very common
  - Often driven by multiple intersecting issues → impaired mobility (difficulty getting to the bathroom), pelvic organ prolapse / pelvic laxity, BPH, cognitive impairment
  - Different types of incontinence reflect different individual balances of these various drivers

Aging Means Improvement, Not Just Decline

45% of Adults 65+ Improve Over Time

Yale study: 45% improved cognitively or physically over 12 years

32% Show Cognitive Improvement

One-third demonstrated measurable cognitive gains with age

28% Improve Physical Function

Better walking speed and physical performance over time

Your Beliefs Shape Your Health!

Positive attitudes predict better function and longevity

Source: Levy, B.R., et al. (2024). Journal of the American Geriatrics Society. Yale longitudinal study (N=11,246).