



The Aging Brain

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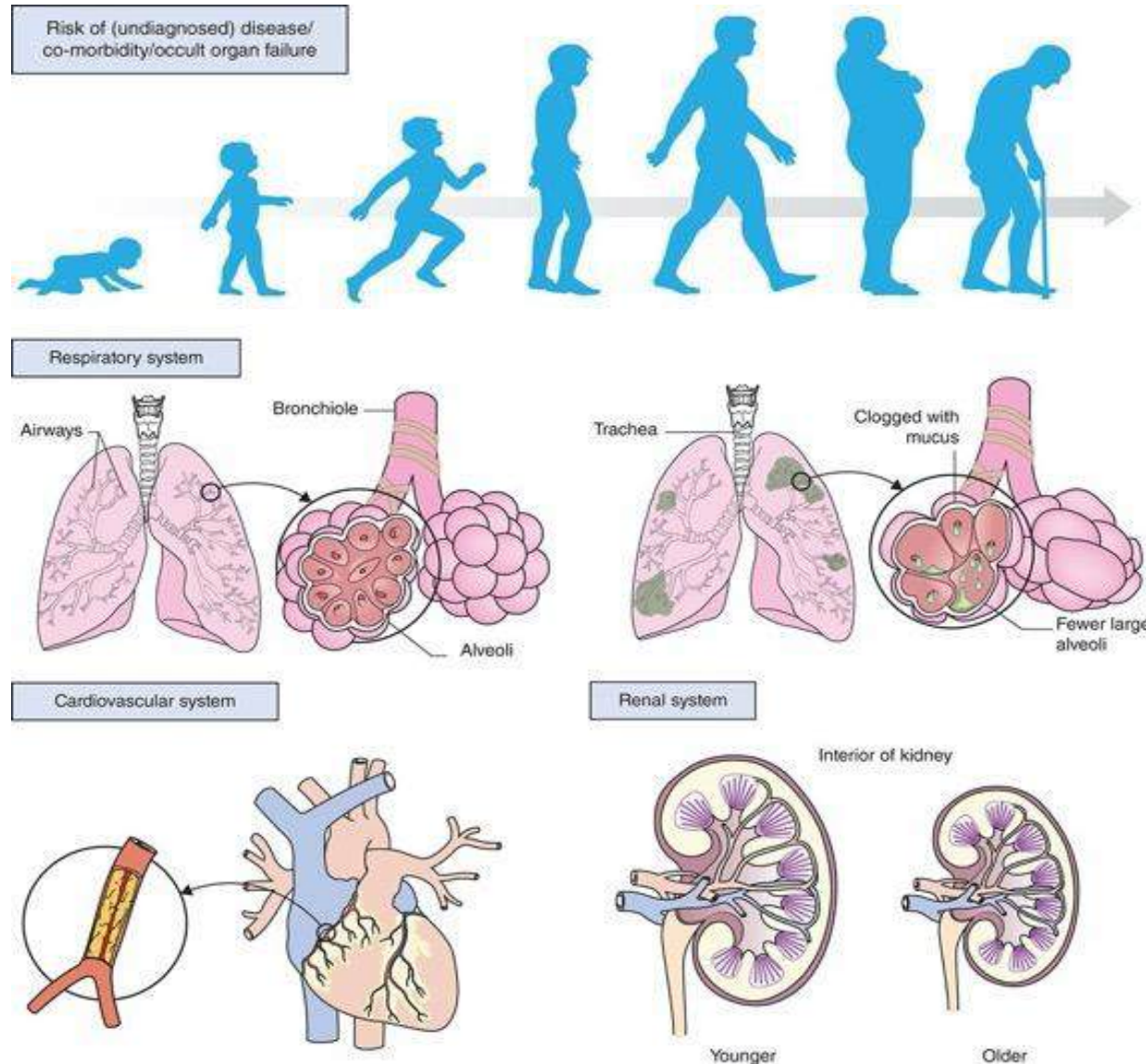
Aging: life's inevitability



- Aging is guaranteed
- Aging is associated with changes to our body that affect function and performance
- Aging is a major risk factor for stroke and other neurological disorders
- Both genetics and lifestyle choices impact how we age



With age comes wisdom and physiological changes to our bodies

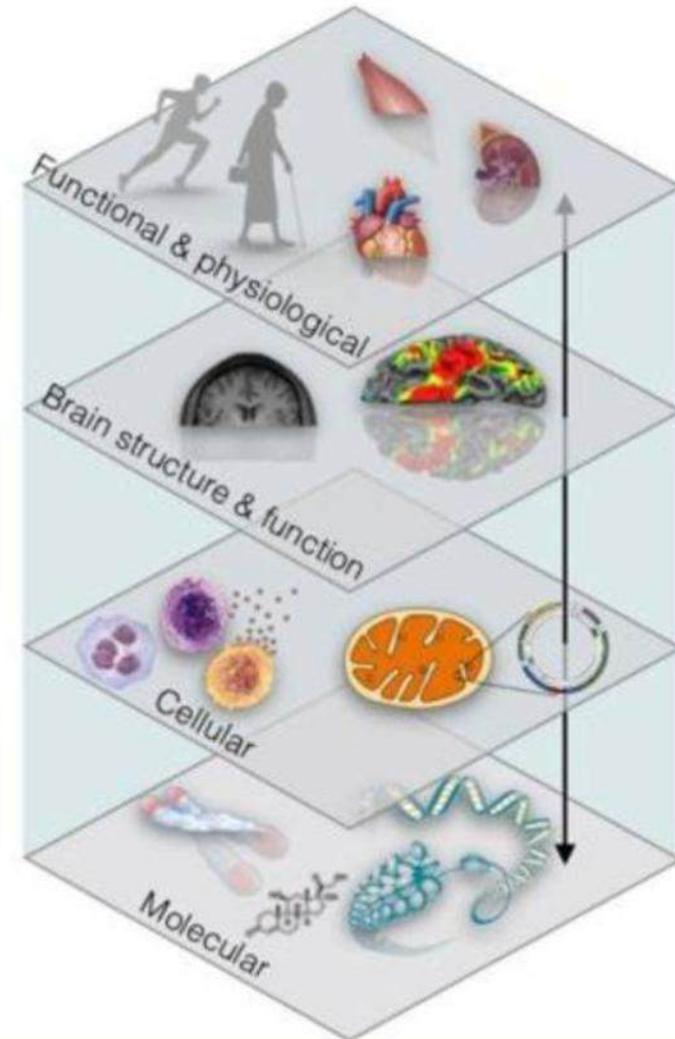


- Initially, aging gives us our independence
- Eventually, aging threatens to take independence away
- Every organ system is impacted by age- heart, lungs, kidneys, muscles

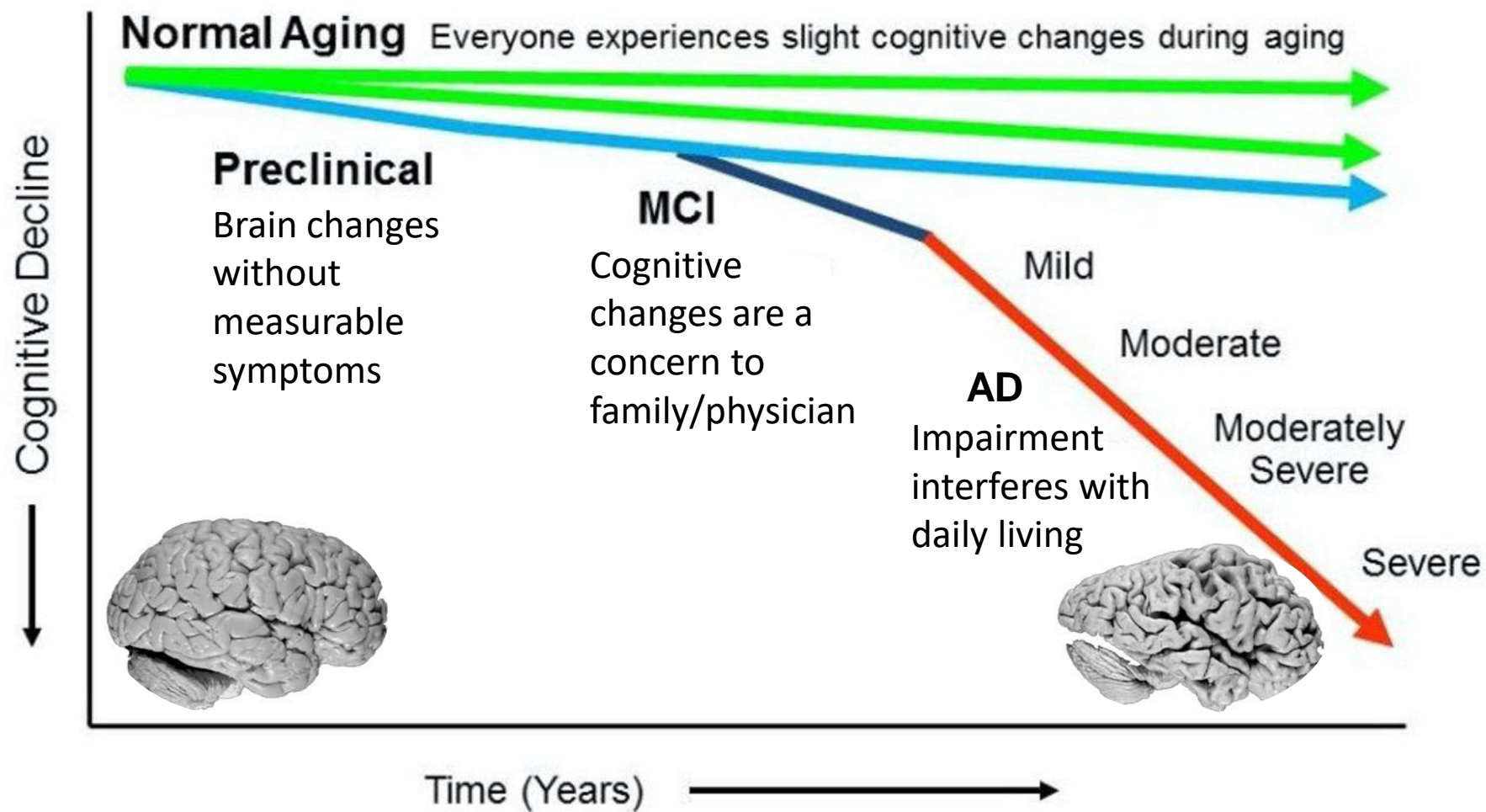
Aging impacts function at all biological levels



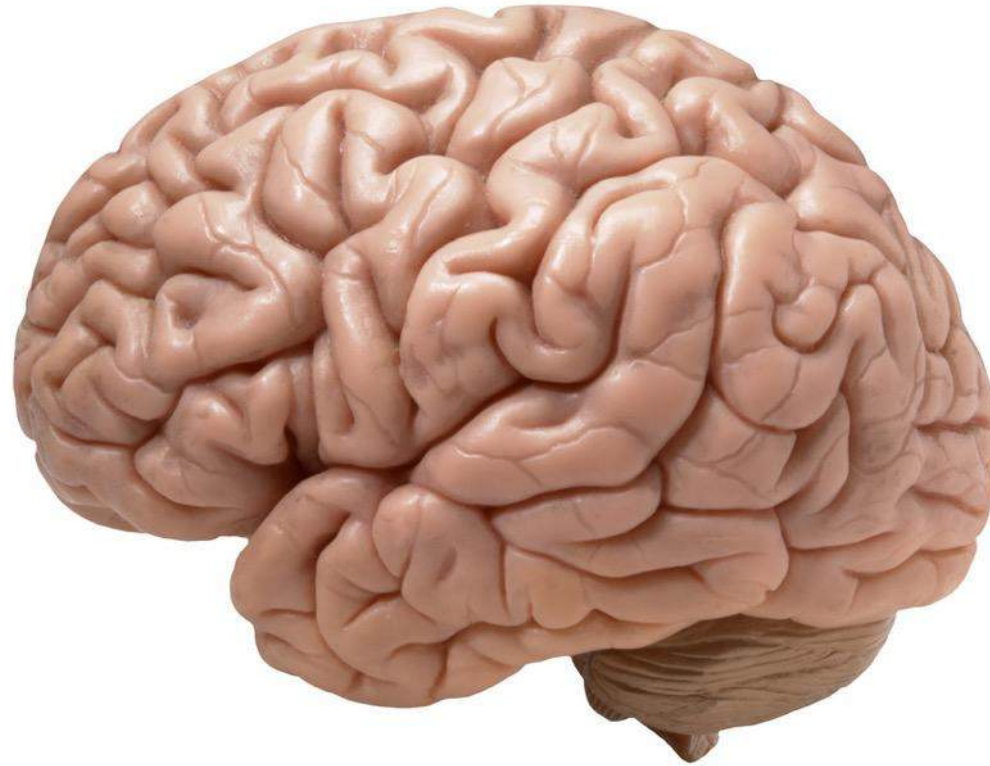
Biological age indicators *MULTI-LEVEL*



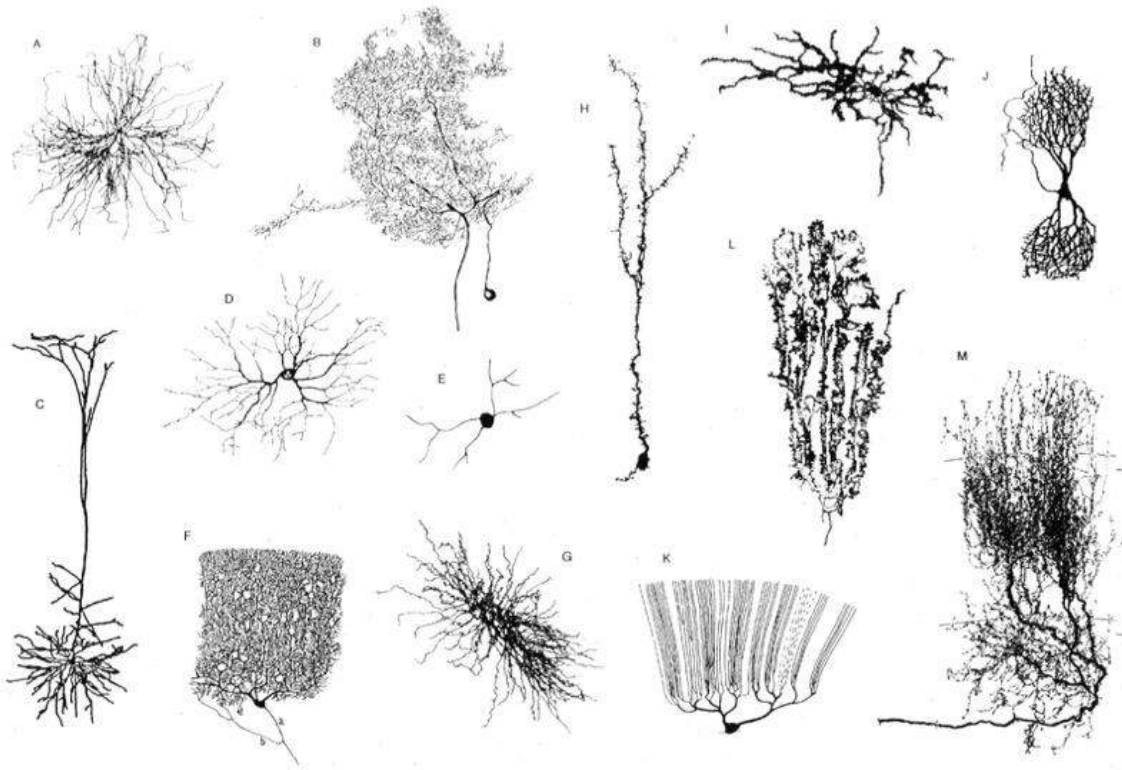
Our brain ages with the rest of of our bodies



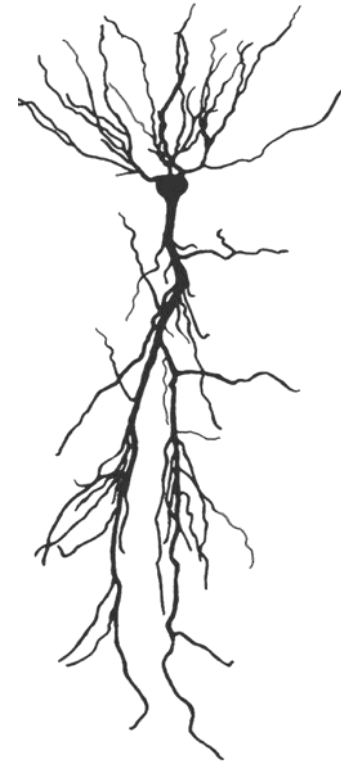
Healthy human brain



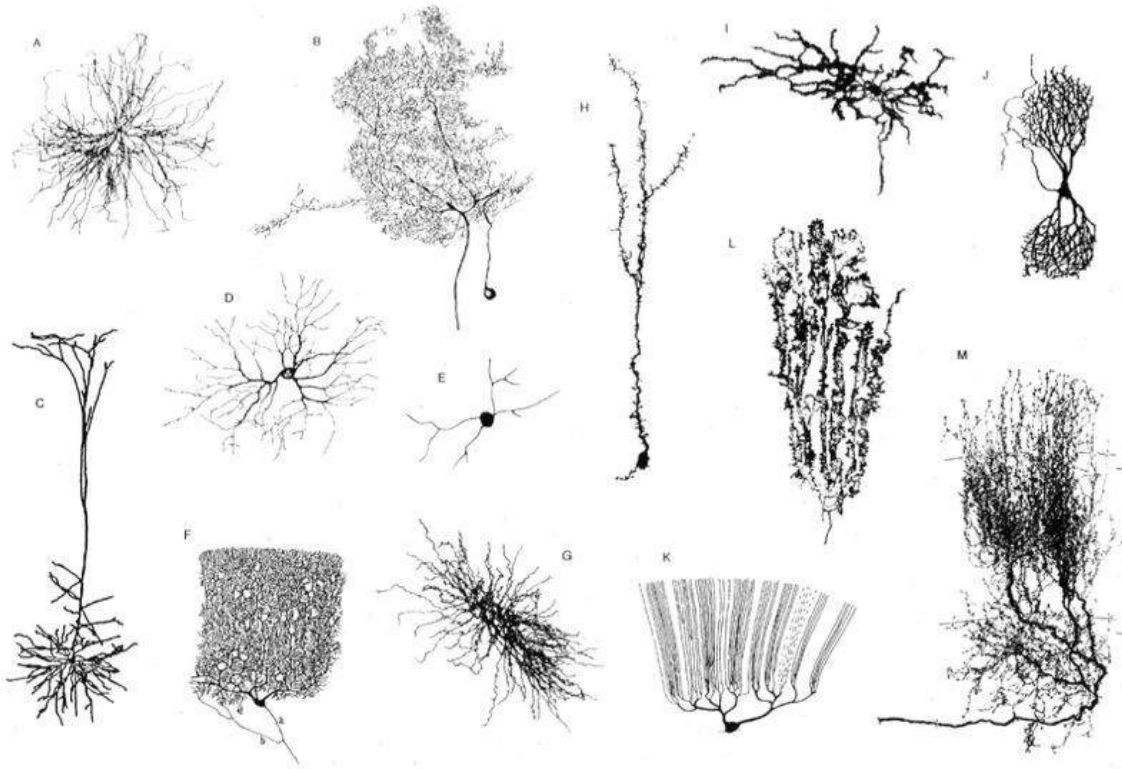
Brain cells are complex branched structures



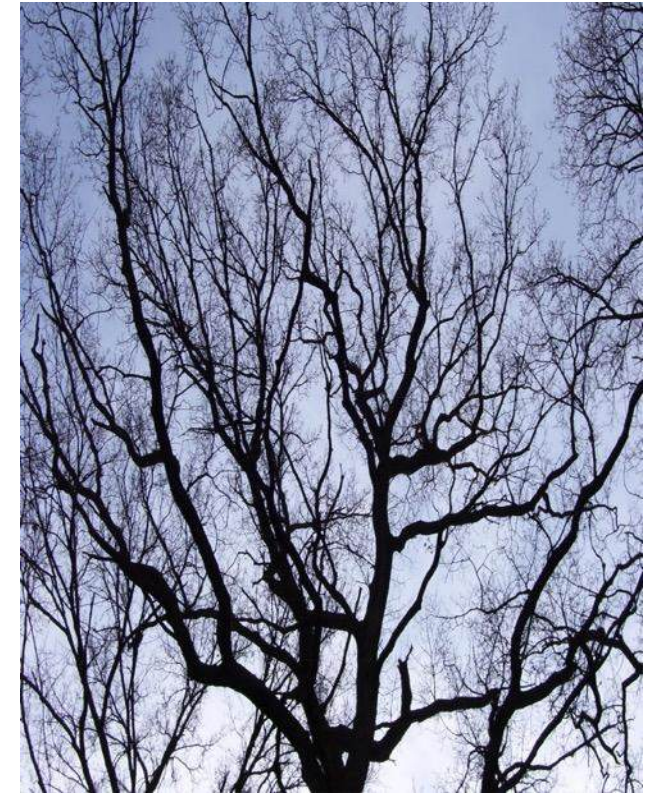
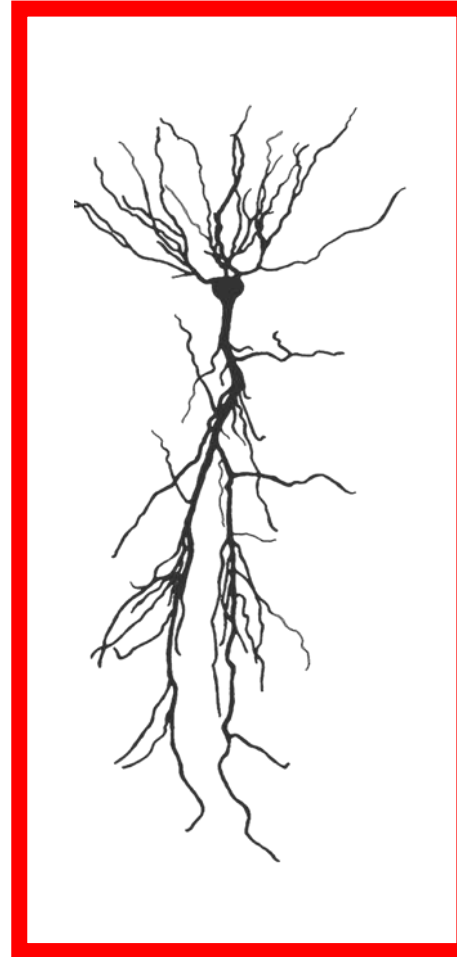
Dendrites, Oxford University Press, 2015; Modified from Mel, B.W. Neural Computation, 1994.



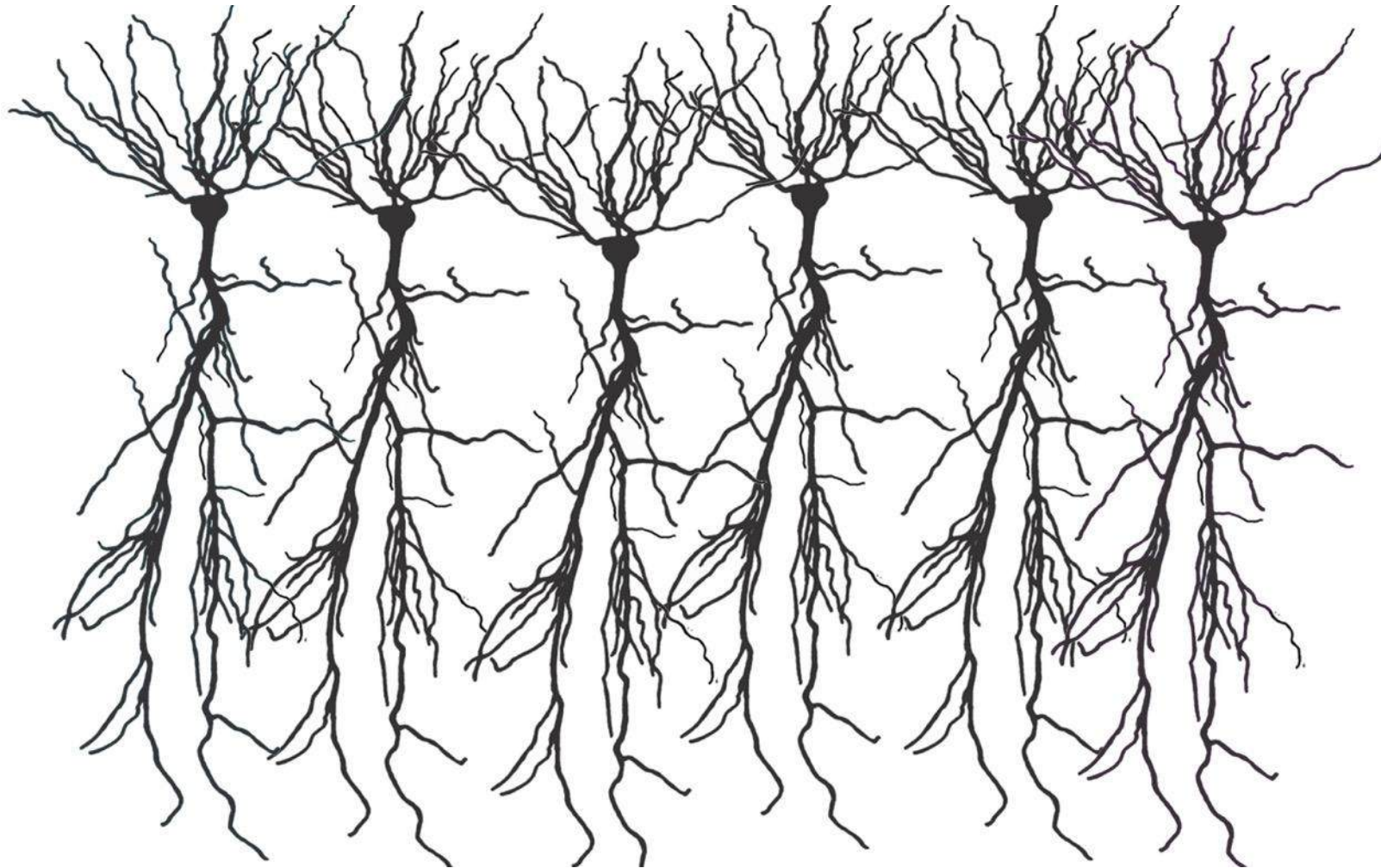
Brain cells are complex branched structures



Dendrites, Oxford University Press, 2015; Modified from Mel, B.W. Neural Computation, 1994.



Billions of brain cells are in a human brain

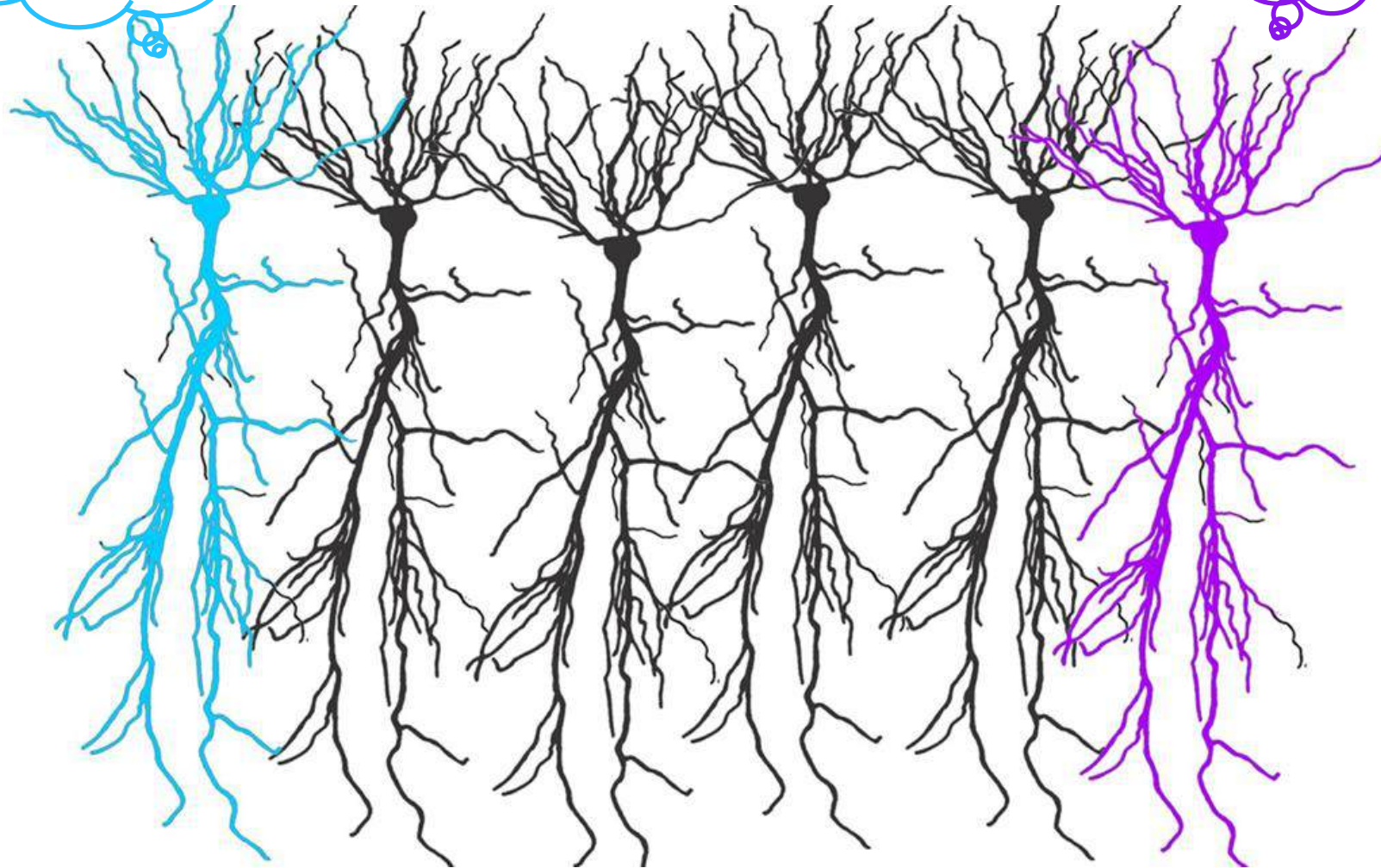


Millions of brain cells are in a human brain

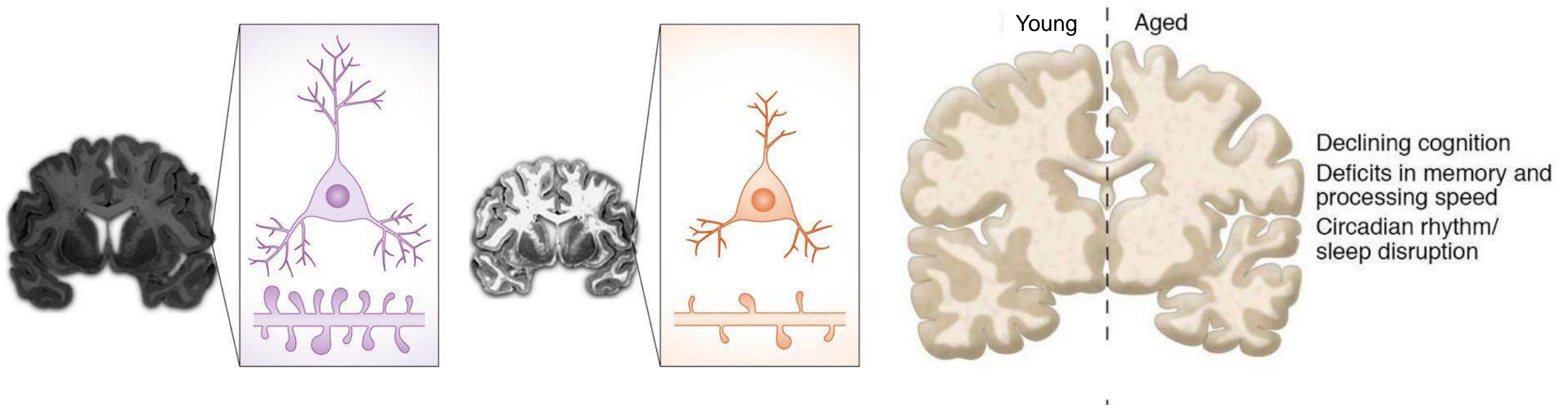


Hello Friend

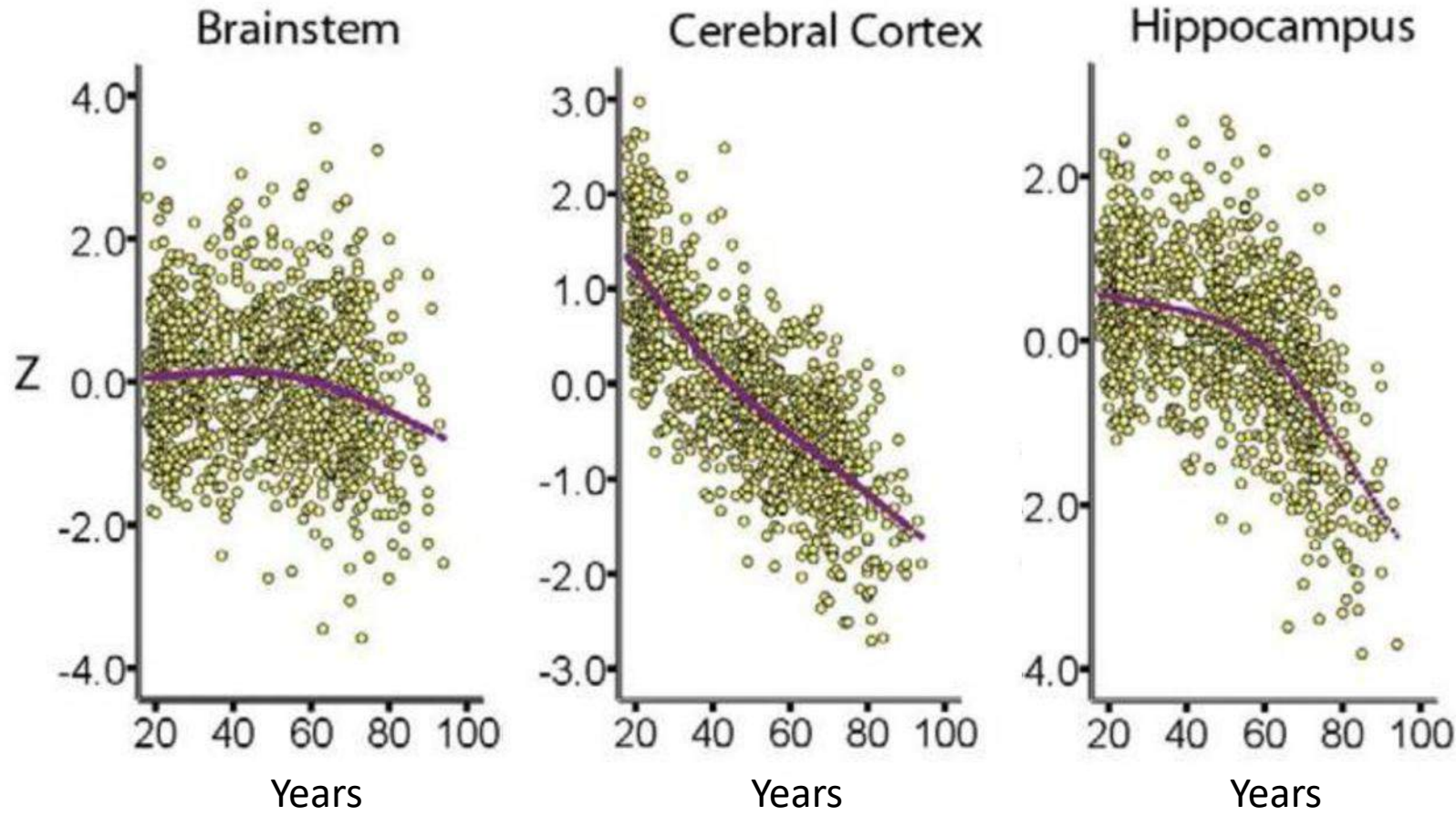
Hi!!



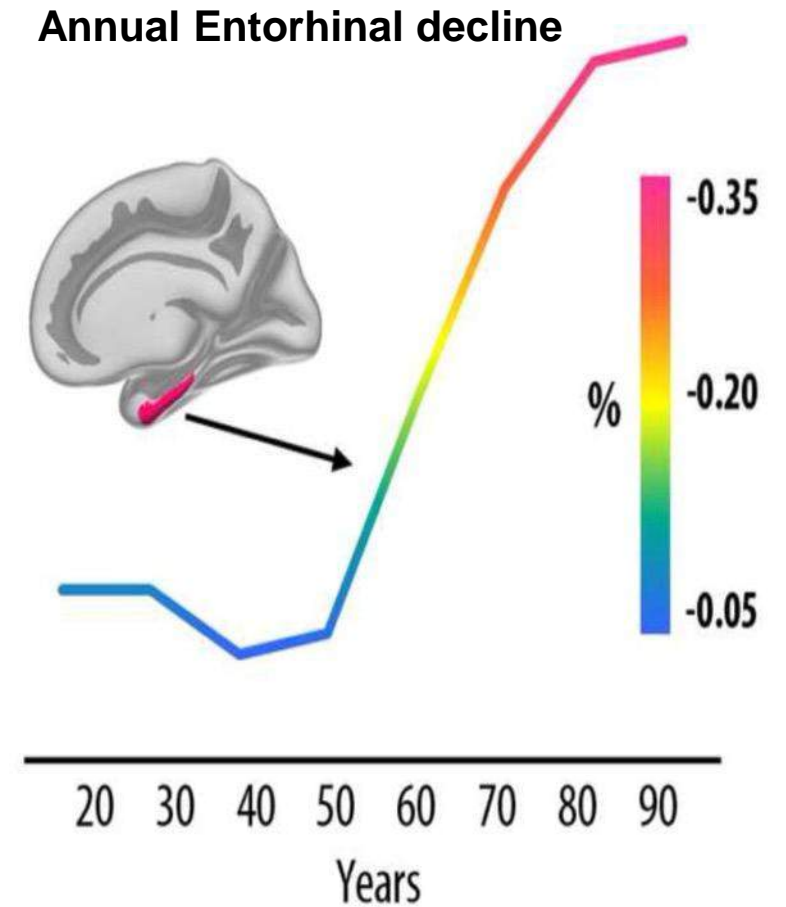
Aging induces changes to cells in the brain and their function



Brain volume is reduced with age

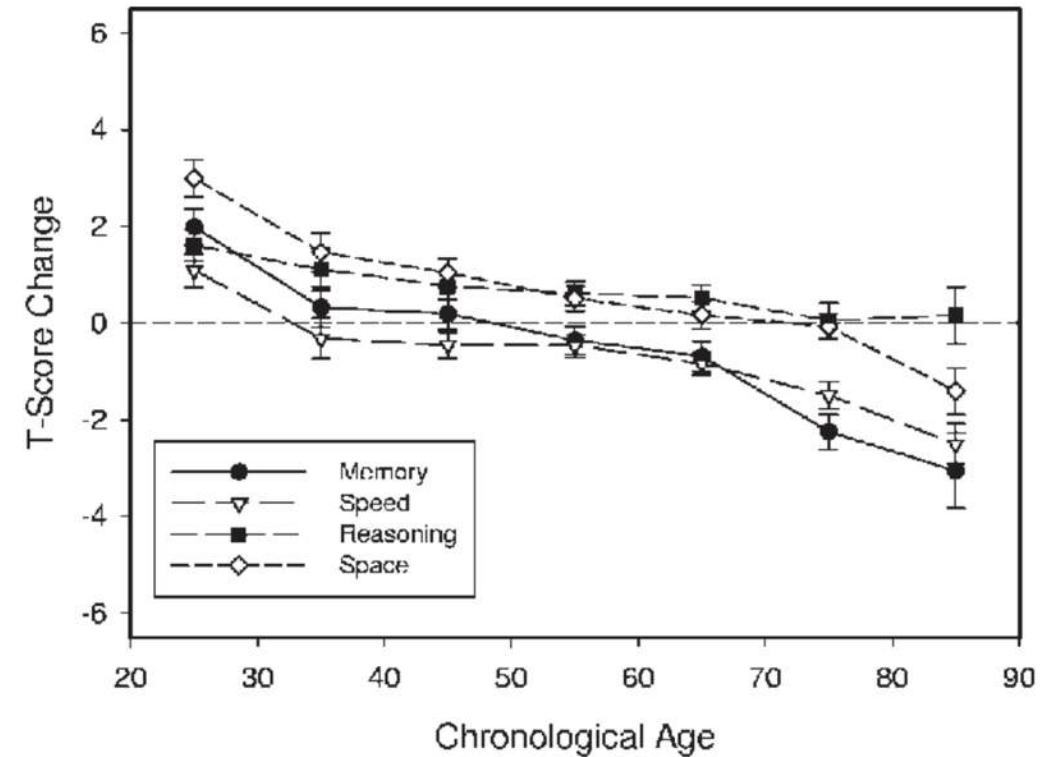
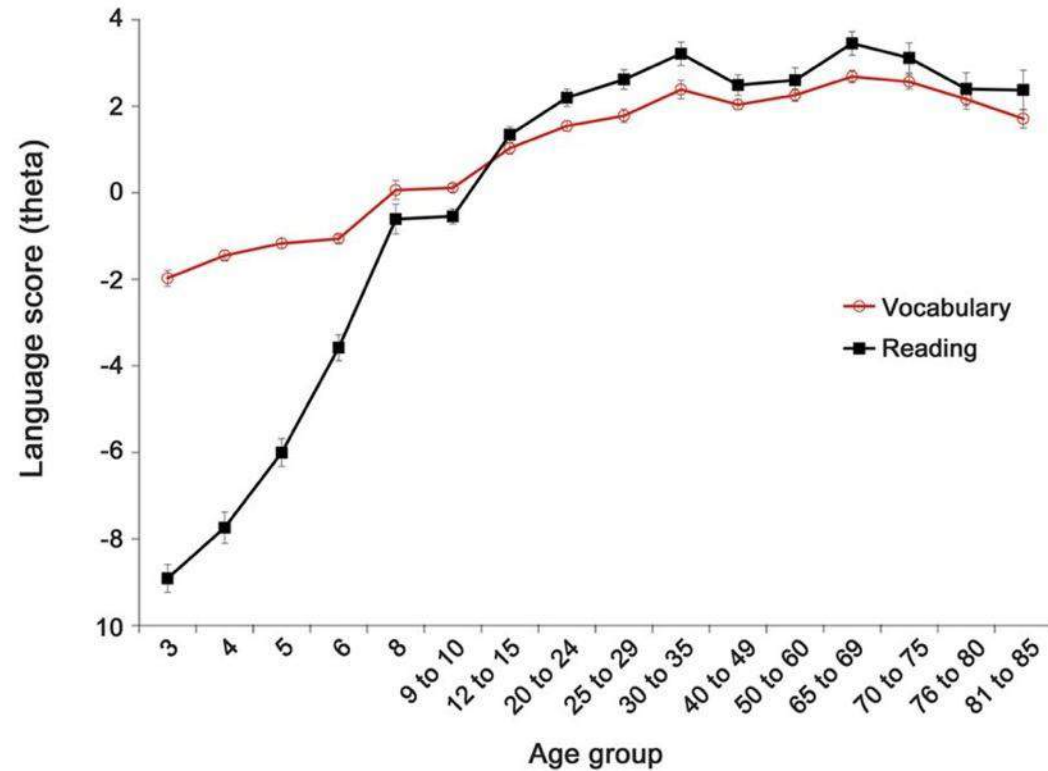


<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3706494/>

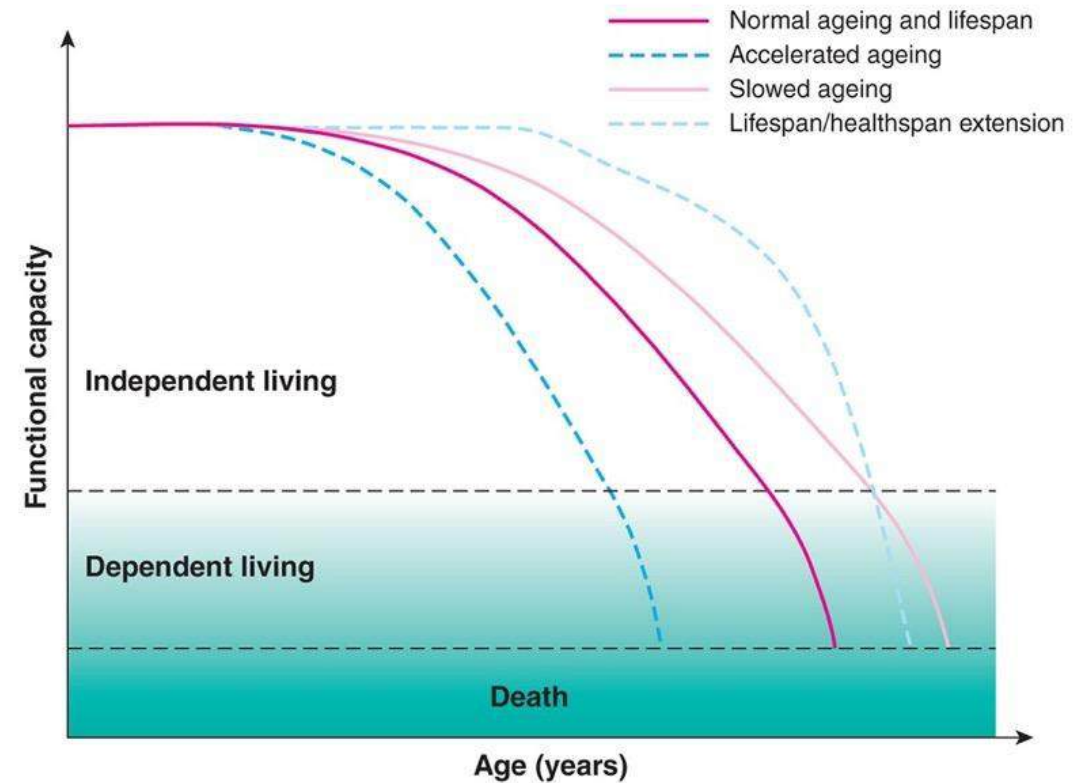
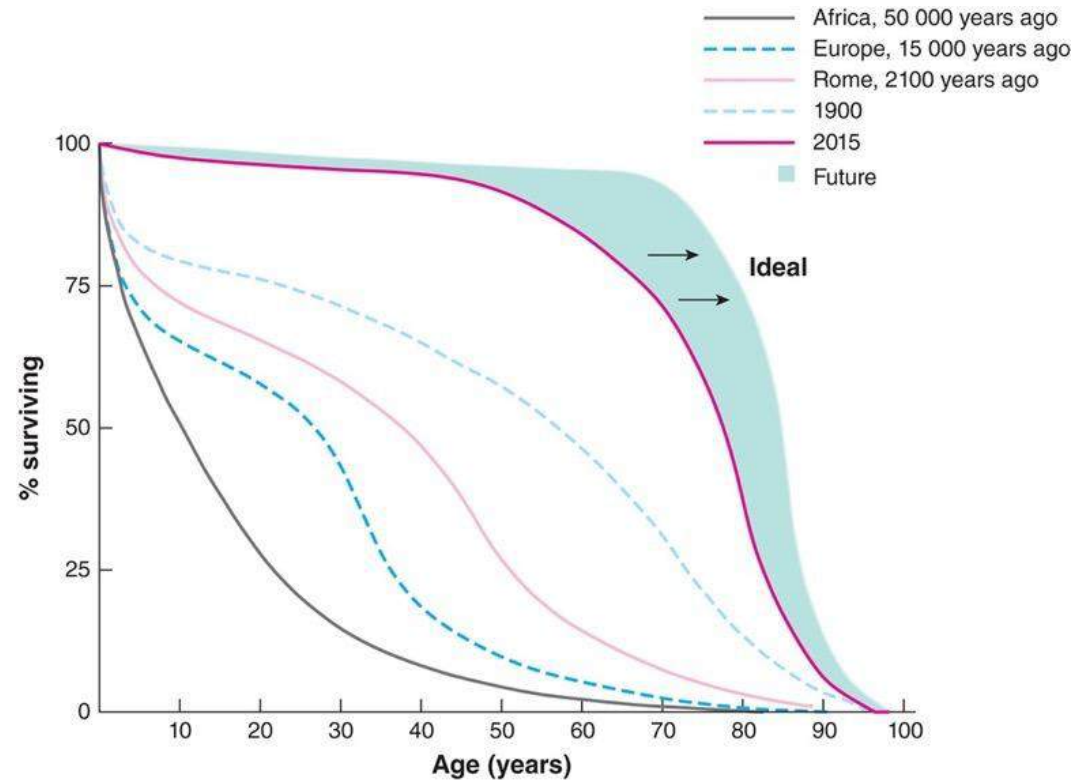


<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4343307/>

Changes to cognitive function are a normal part of aging



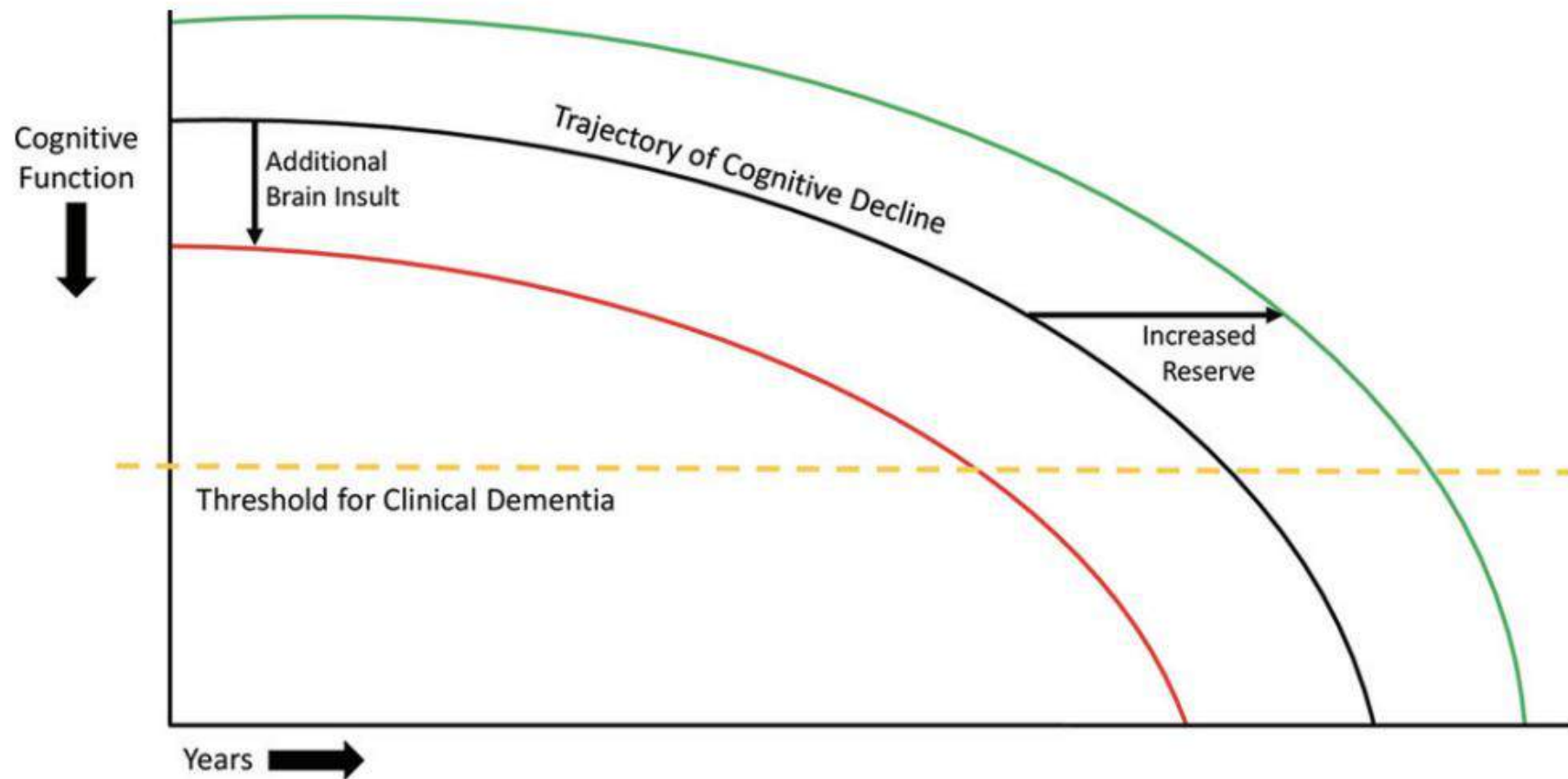
Advances in nutrition and medical care is increasing our life expectancy



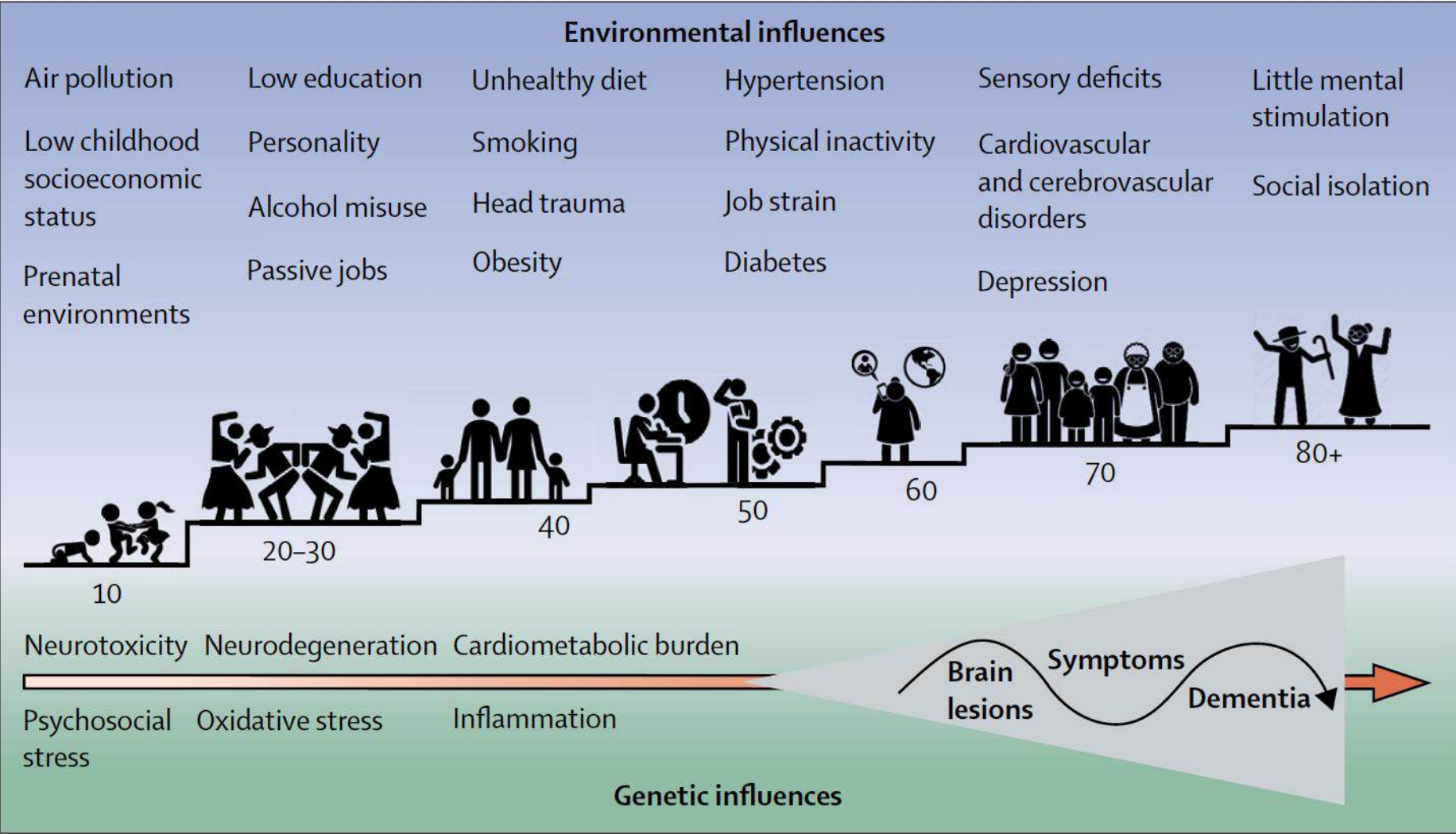
<https://doi.org/10.1002/bjs.10053>

It is imperative that we protect our body and brain health

We can change our aging trajectory



Factors throughout life impact aging



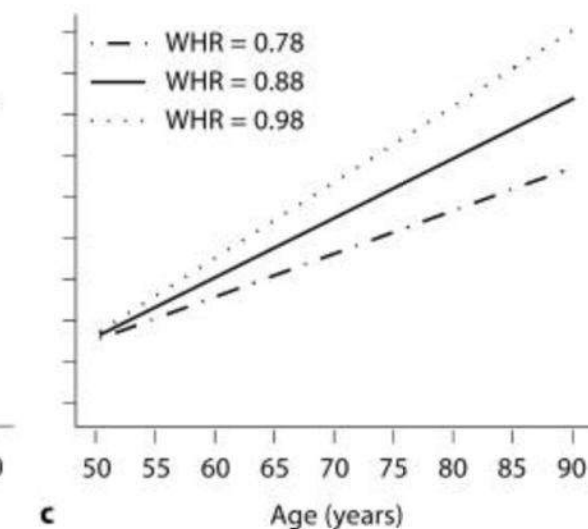
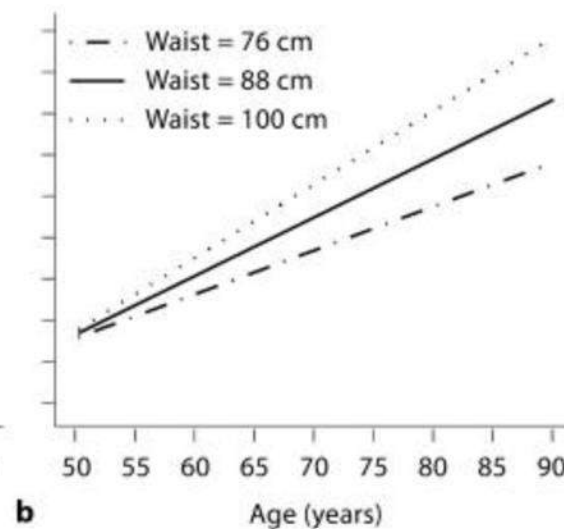
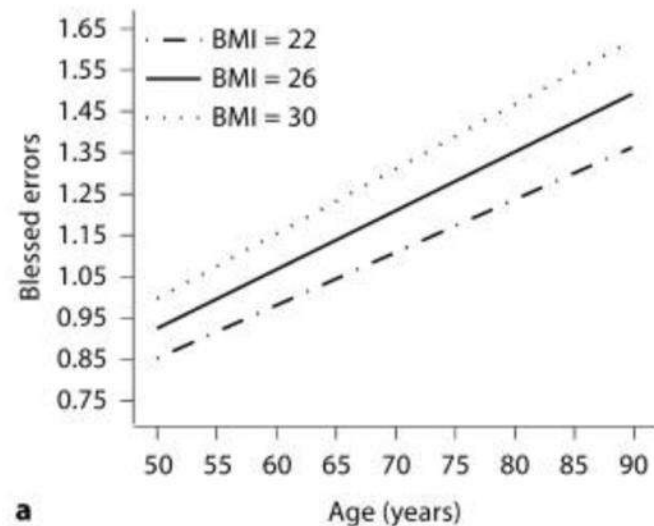
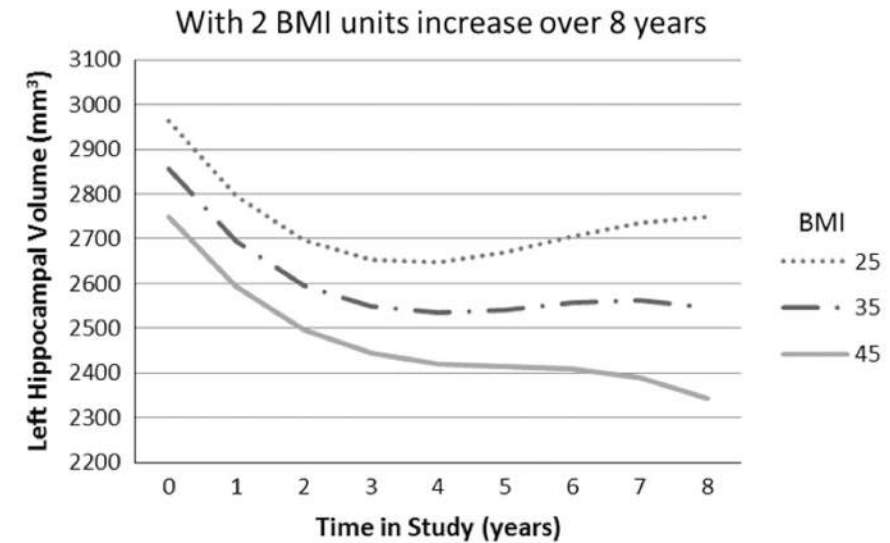
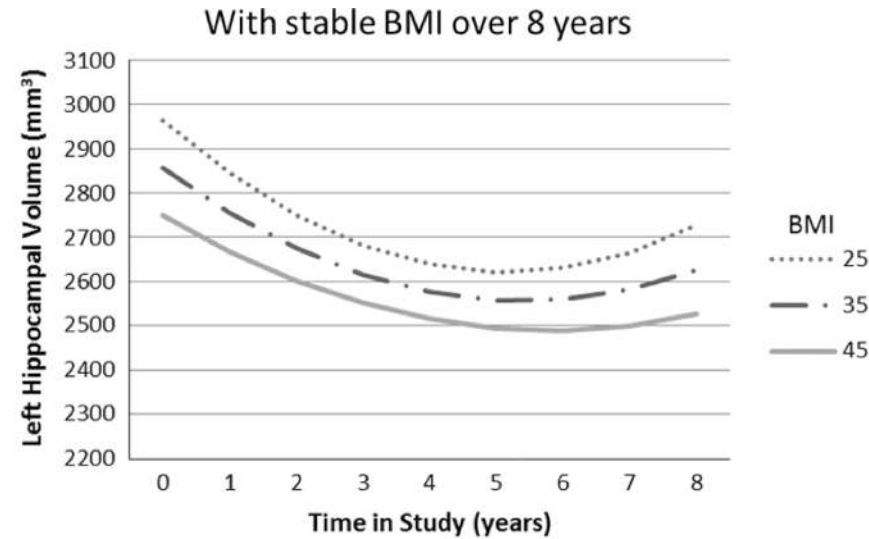
There are positive and negative influences on aging



There are positive and negative influences on aging



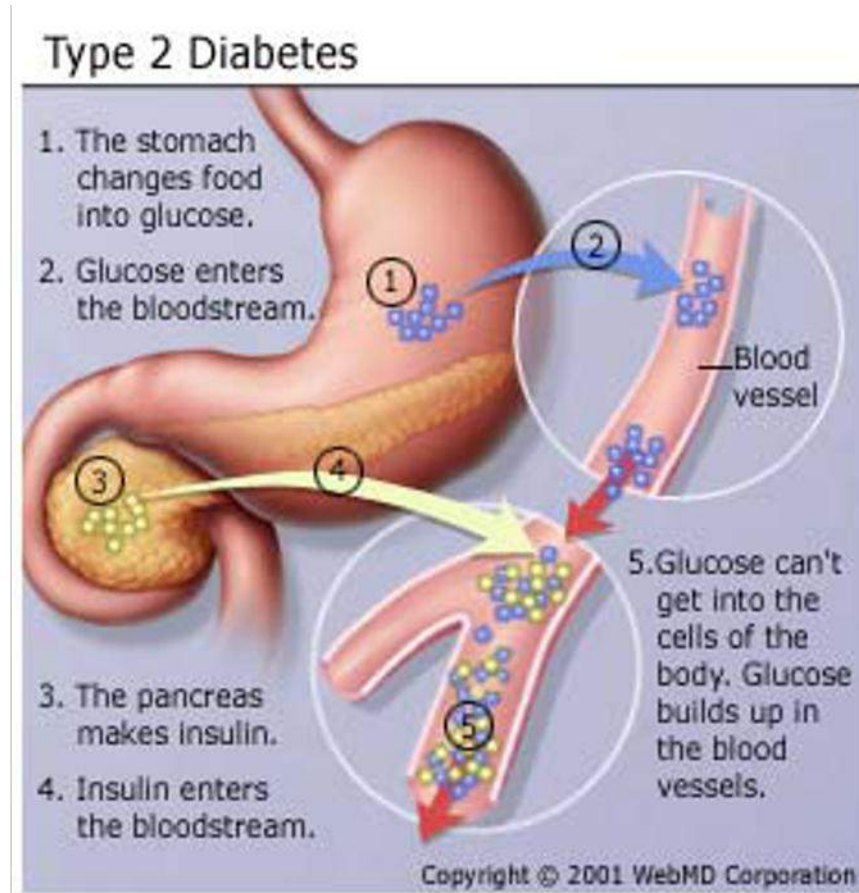
Higher BMI is associated with reduced hippocampal volume and poorer memory performance



There are positive and negative influences on aging

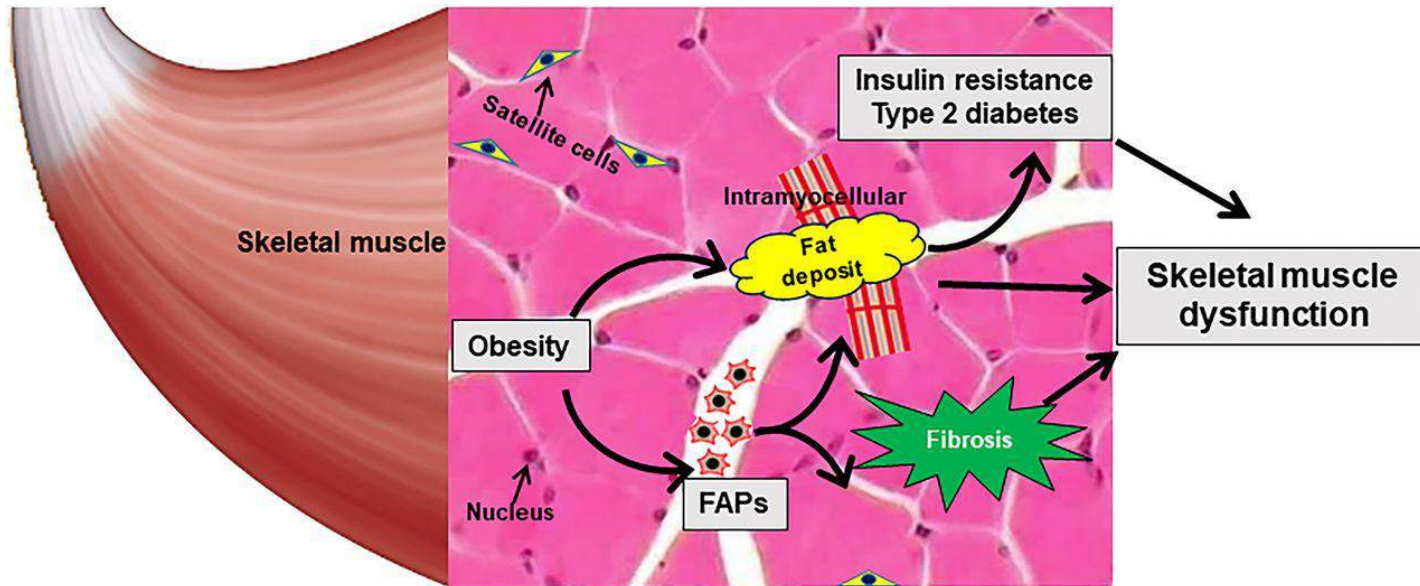


Type 2 diabetes (T2D) affects the way your body metabolizes sugar



- The cells in your body use glucose (sugar) for energy
- Insulin helps glucose enter into cells
- In T2D your body can not use insulin properly and sugar builds up in your blood

Type 2 diabetes impacts skeletal muscle function

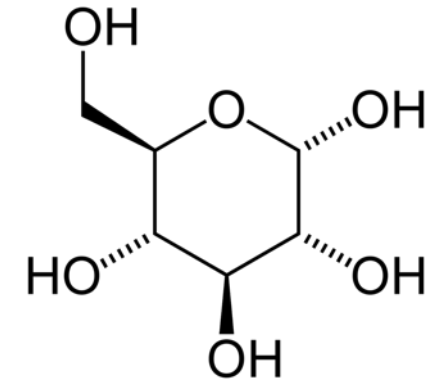
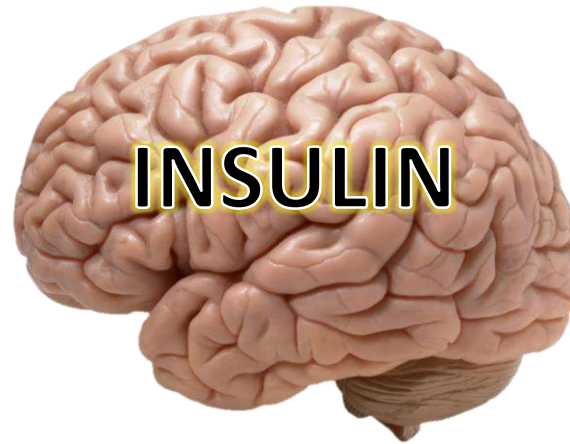


- Changes within muscle can contribute to type 2 diabetes
- Type 2 diabetes reduces muscle quality and function
- Some studies suggest that type 2 diabetes can reduce muscle mass

Insulin impacts brain function



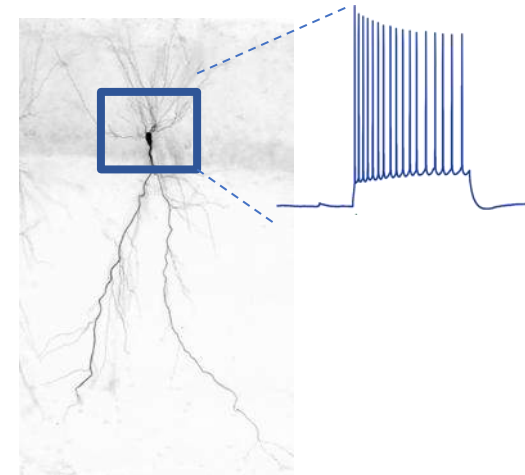
**Food intake and
body weight**



Glucose metabolism

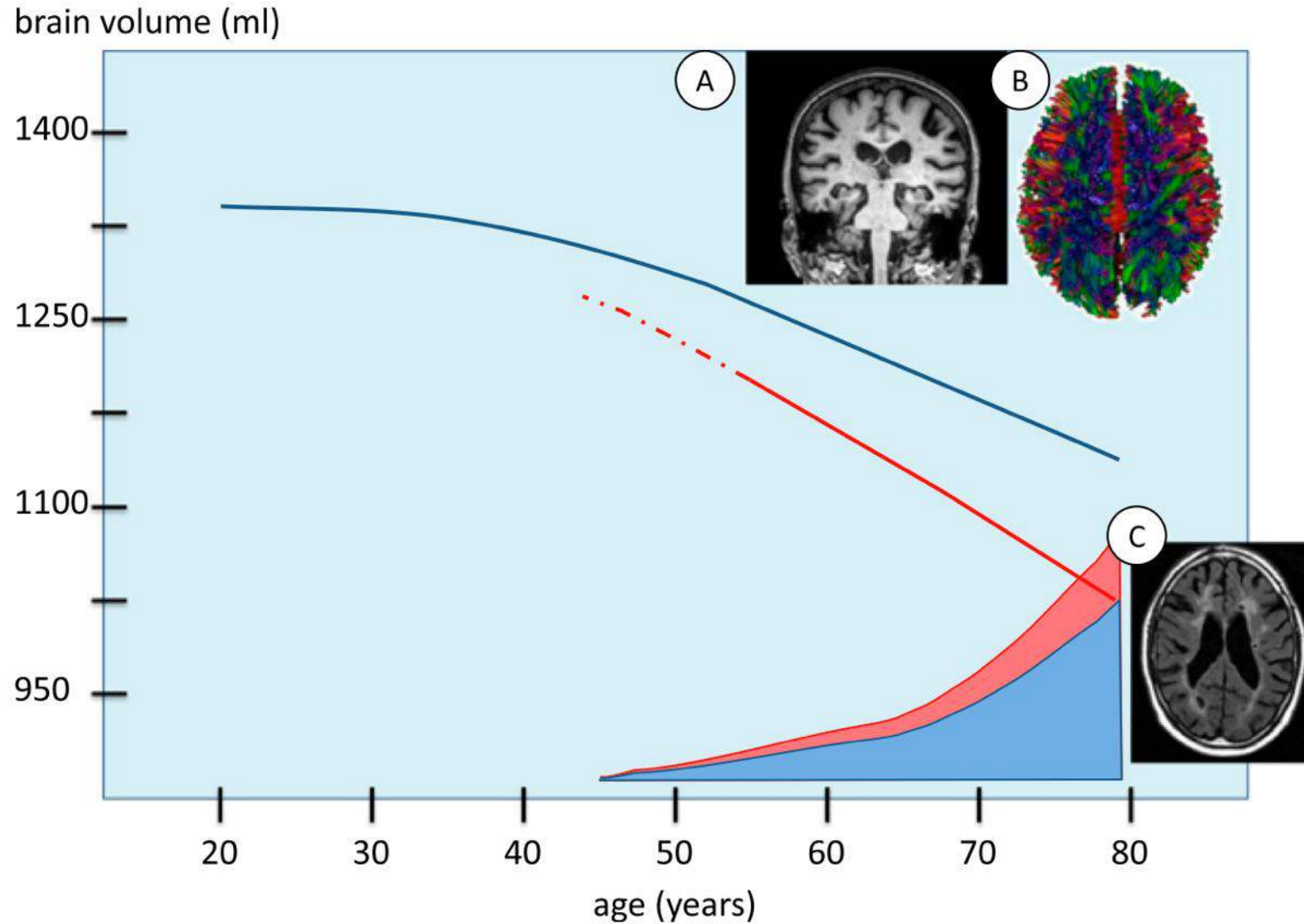


Learning and Memory



Cellular function

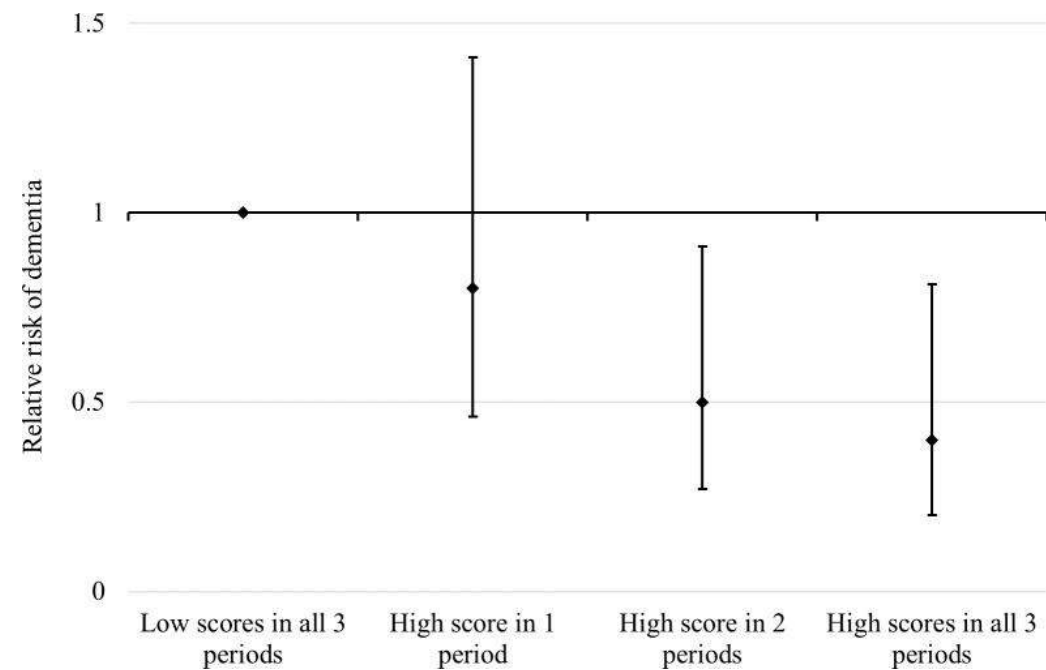
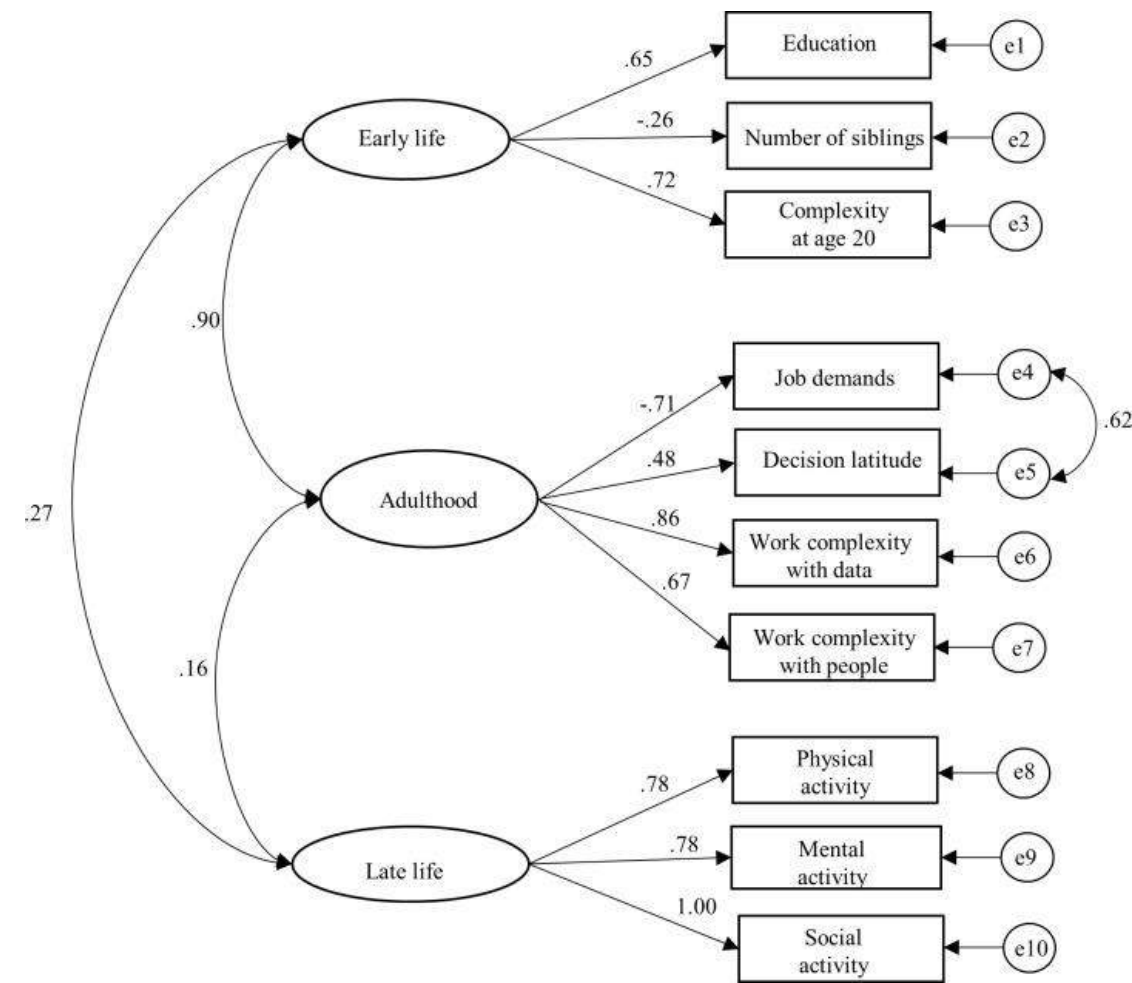
Type 2 Diabetes decreases brain volume and connectivity over time



There are positive and negative influences on aging



Cognitive reserve reduces dementia risk



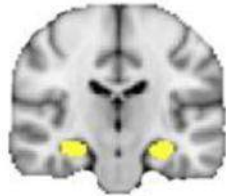
There are positive and negative influences on aging



Exercise increases brain volume and correlates with improved memory

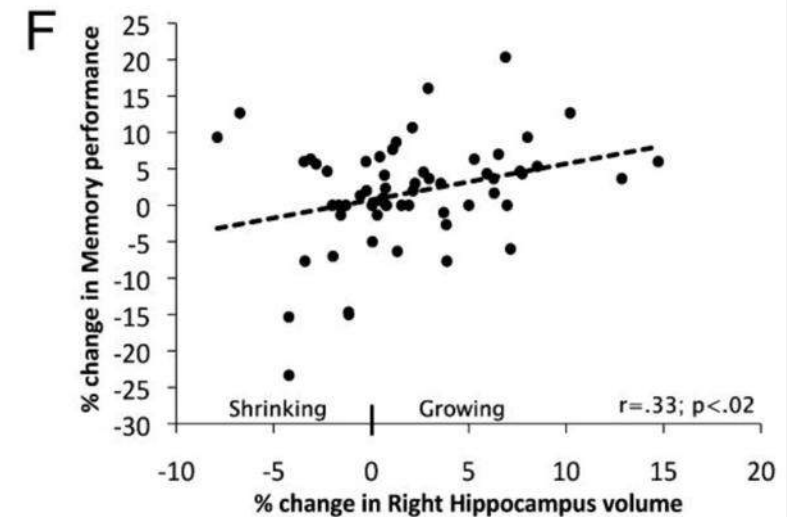
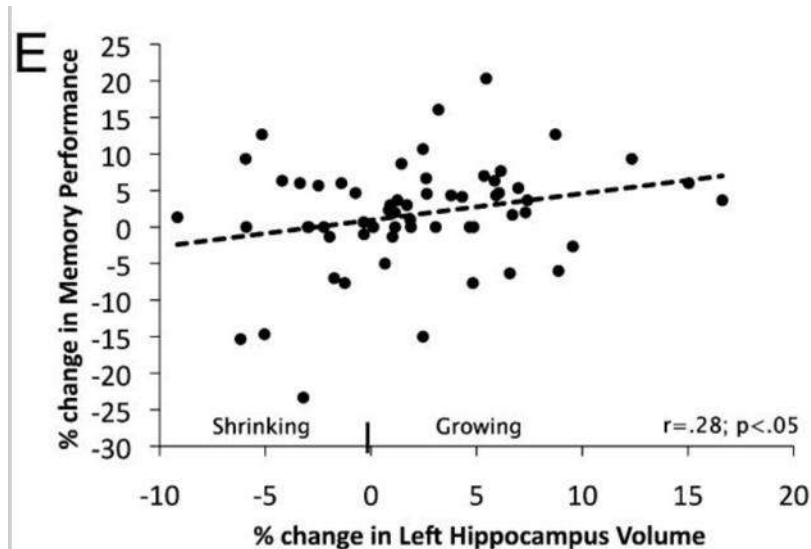
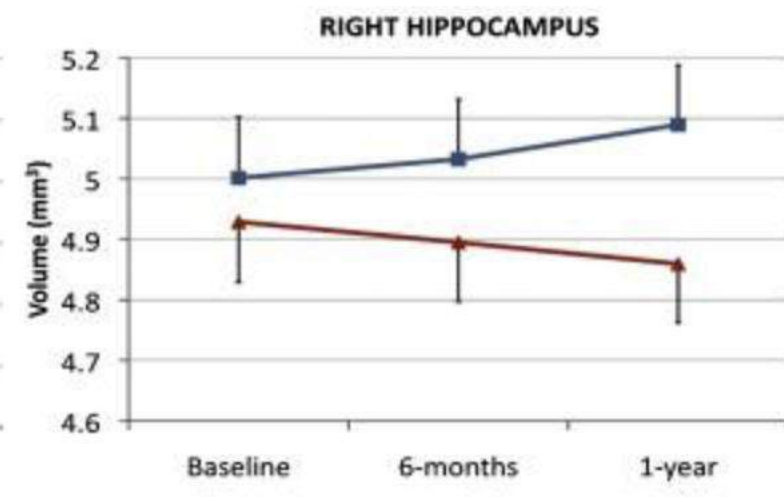
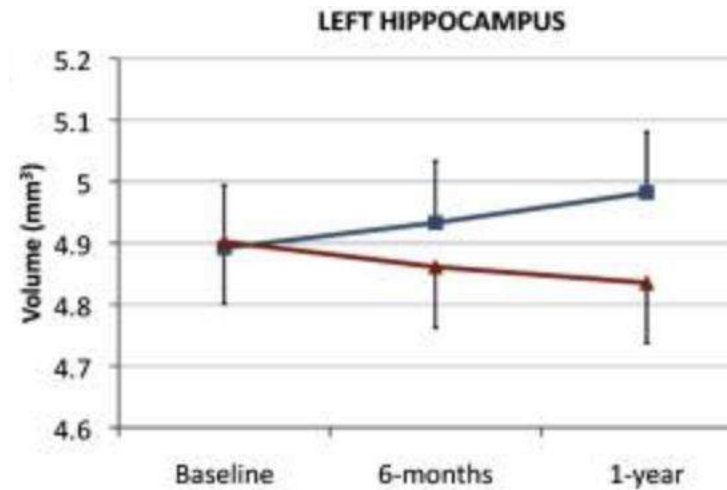


A Hippocampus



■ Exercise
▲ Stretching

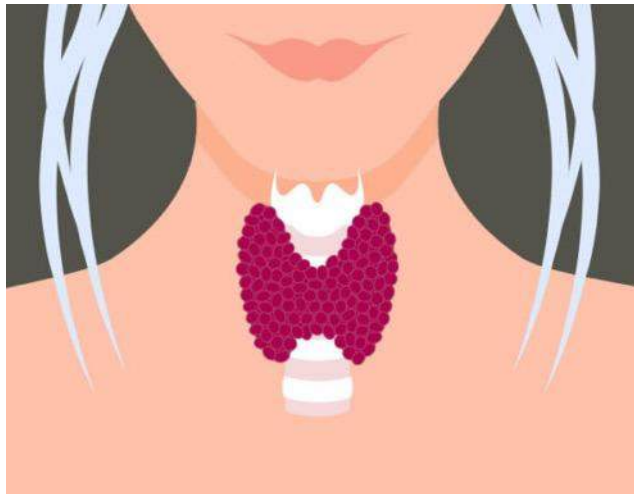
Show Panorama View



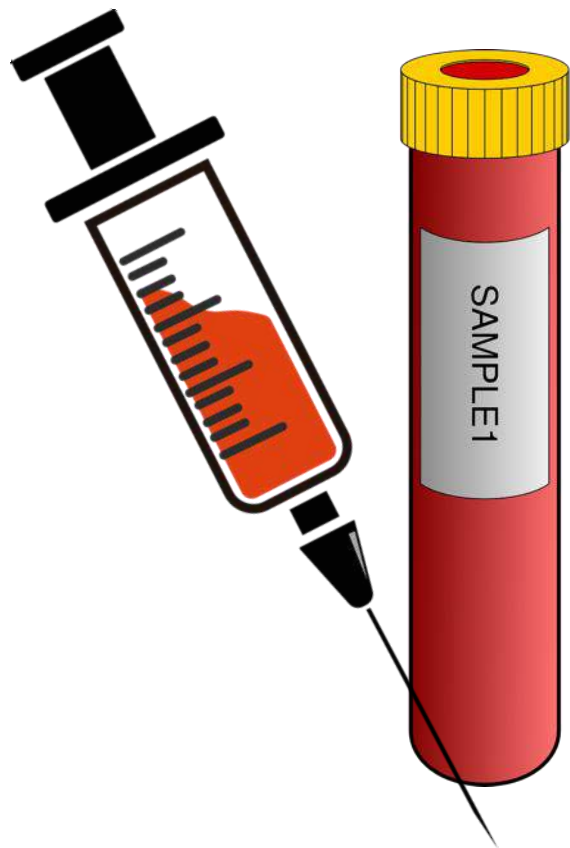
Normal aging or something more?



Not all issues with memory and thinking are dementia



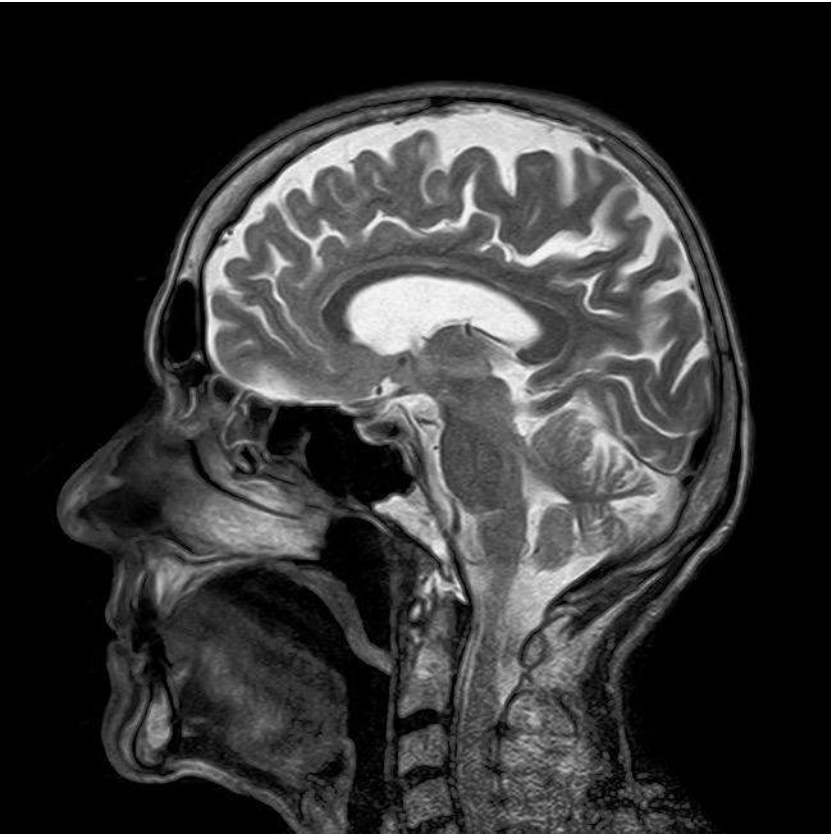
Testing can help determine if there is a concern



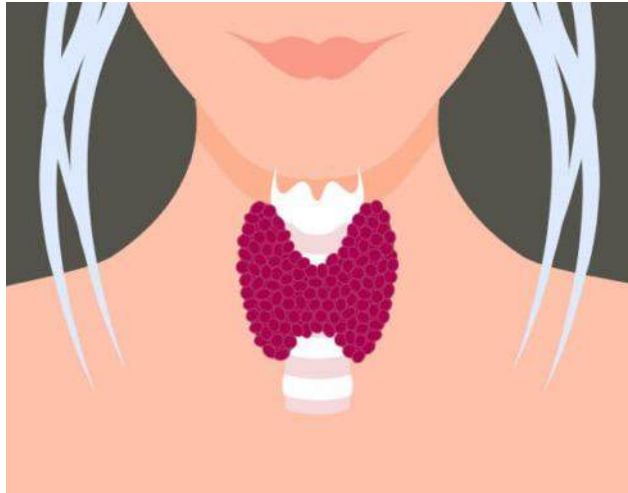
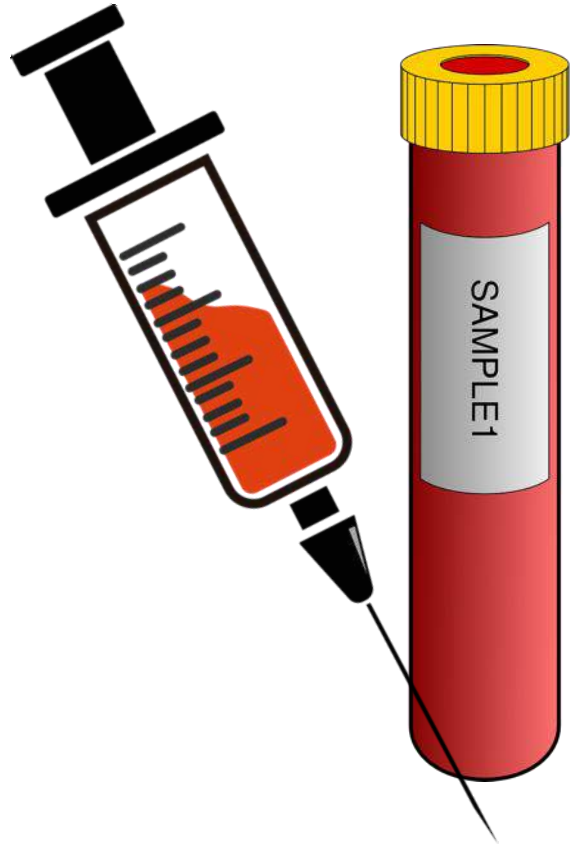
MONTREAL COGNITIVE ASSESSMENT (MOCA)
Version 7.1 Original Version

NAME: _____ Education: _____ Date of birth: _____
Sex: _____ DATE: _____

VISUOSPATIAL / EXECUTIVE		Draw CLOCK (Ten past eleven) (3 points)		POINTS		
 []	 []	Contour	Numbers	Hands		
				___/5		
NAMING						
 []	 []	 []	___/3			
MEMORY						
Read list of words, subject must repeat them. Do 2 trials, even if 1st trial is successful. Do a recall after 5 minutes.	FACE	VELVET	CHURCH	DAISY		
1st trial						
2nd trial						
No points						
ATTENTION						
Read list of digits (1 digit/ sec). Subject has to repeat them in the forward order	[]	2	1	8	5	4
Subject has to repeat them in the backward order	[]	7	4	2		
___/2						
Read list of letters. The subject must tap with his hand at each letter A. No points if ≥ 2 errors	[] FBACMNAAJKLBAFAKDEAAAJAMOFAB					
___/1						
Serial 7 subtraction starting at 100	[] 93	[] 86	[] 79	[] 72	[] 65	
4 or 5 correct subtractions: 3 pts. 2 or 3 correct: 2 pts. 1 correct: 1 pt. 0 correct: 0 pt						
___/3						
LANGUAGE						
Repeat: I only know that John is the one to help today. [] The cat always hid under the couch when dogs were in the room. []					___/2	
Fluency / Name maximum number of words in one minute that begin with the letter F	[] _____ (N ≥ 11 words)				___/1	
ABSTRACTION						
Similarity between e.g. banana - orange = fruit	[]	train - bicycle	[]	watch - ruler	___/2	
DELAYED RECALL						
Has to recall words WITH NO CUE	FACE	VELVET	CHURCH	DAISY	RED	
Category cue	[]	[]	[]	[]	[]	
Multiple choice cue						
Points for UNCUE recall only						
___/5						
Optional						
Add 1 point if ≤ 12 yrs old						
ORIENTATION						
[] Date	[] Month	[] Year	[] Day	[] Place	[] City	___/6
© Z.Nasreddine MD						___/30
www.mocatest.org						
Normal ≥ 26 / 30						
Administered by: _____						



Testing can help determine if there is a concern




Cognitive tests provide objective measurement of function



MONTREAL COGNITIVE ASSESSMENT (MOCA)
Version 7.1 Original Version

NAME: _____ Date of birth: _____
Education: _____ Sex: _____ DATE: _____

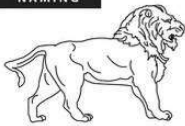
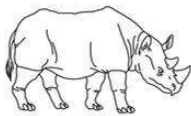
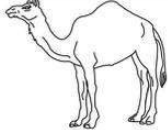
VISUOSPATIAL / EXECUTIVE

Copy cube:  []

Draw CLOCK (Ten past eleven) (3 points) []

Points: [] / 5

NAMING

 []  []  []

Points: [] / 3

MEMORY

Read list of words, subject must repeat them. Do 2 trials, even if 1st trial is successful. Do a recall after 5 minutes.

	FACE	VELVET	CHURCH	DAISY	RED
1st trial					
2nd trial					

Points: No points

ATTENTION

Read list of digits (1 digit/ sec.). Subject has to repeat them in the forward order [] 2 1 8 5 4
Subject has to repeat them in the backward order [] 7 4 2

Points: [] / 2

Read list of letters. The subject must tap with his hand at each letter A. No points if ≥ 2 errors.
[] F B A C M N A A J K L B A F A K D E A A A J A M O F A A B

Points: [] / 1

Serial 7 subtraction starting at 100 [] 93 [] 86 [] 79 [] 72 [] 65
4 or 5 correct subtractions: 3 pts, 2 or 3 correct: 2 pts, 1 correct: 1 pt, 0 correct: 0 pt

Points: [] / 3

LANGUAGE

Repeat: I only know that John is the one to help today. []
The cat always hid under the couch when dogs were in the room. []

Points: [] / 2

Fluency / Name maximum number of words in one minute that begin with the letter F [] (N ≥ 11 words)

Points: [] / 1

ABSTRACTION

Similarity between e.g. banana - orange = fruit [] train - bicycle [] watch - ruler

Points: [] / 2

DELAYED RECALL

Has to recall words WITH NO CUE

	FACE	VELVET	CHURCH	DAISY	RED
Category cue					
Multiple choice cue					

Points for UNCUED recall only

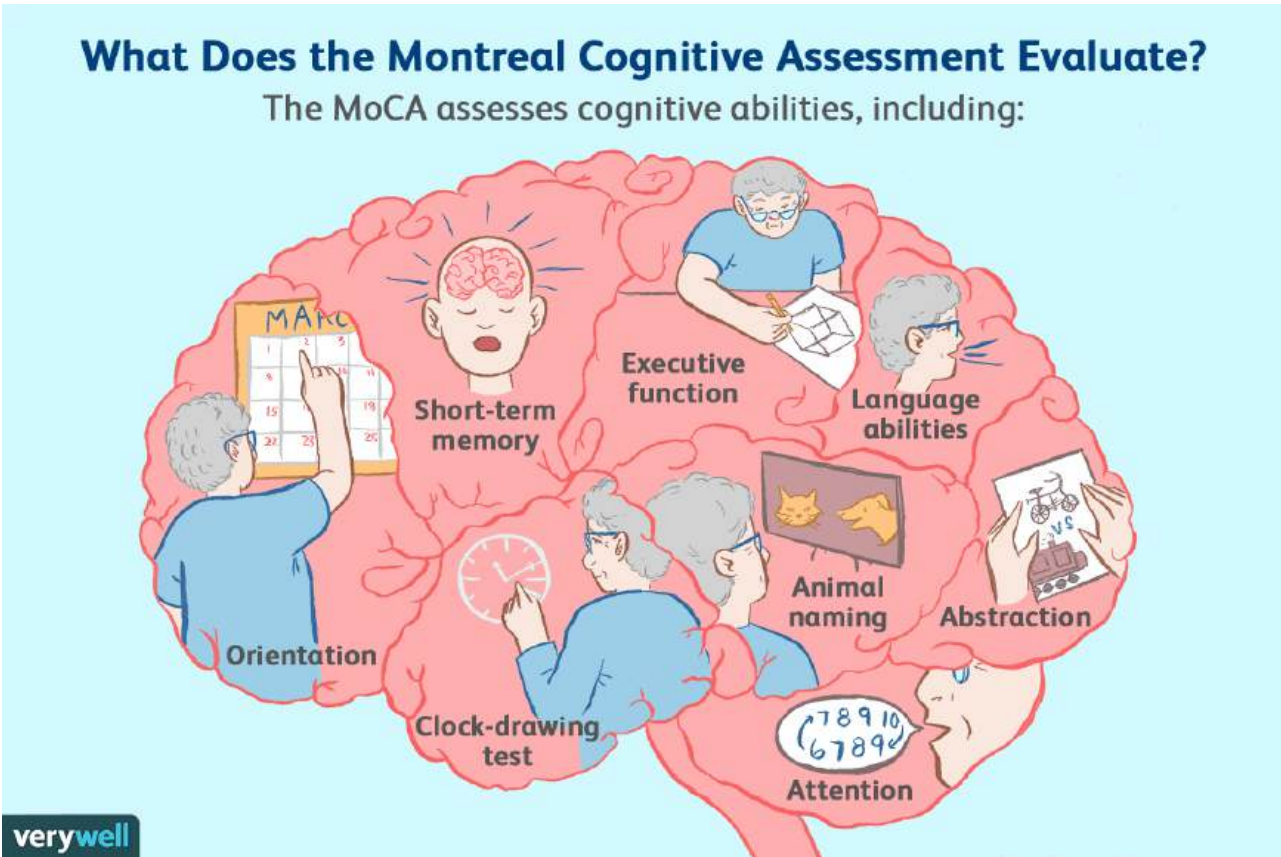
Optional

ORIENTATION

[] Date [] Month [] Year [] Day [] Place [] City

Points: [] / 6

© Z.Nasreddine MD www.mocatest.org Normal $\geq 26 / 30$ TOTAL [] / 30
Administered by: _____ Add 1 point if ≤ 12 yr edu



This is a memory test

This is a memory test

Book

Goat

Church

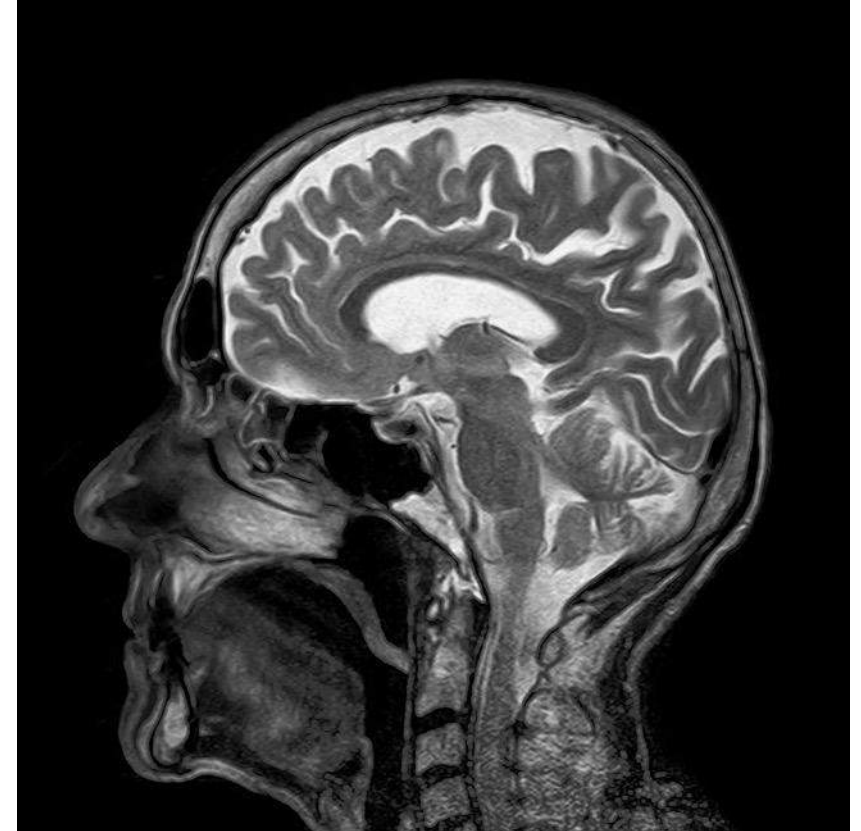
Happy

Square

This is a memory test

Try to remember those 5 words.

Magnetic Resonance Imaging



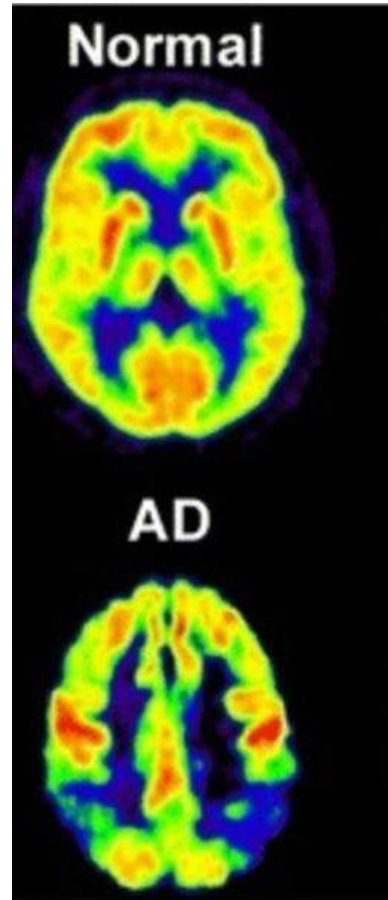
Positron Emission Tomography



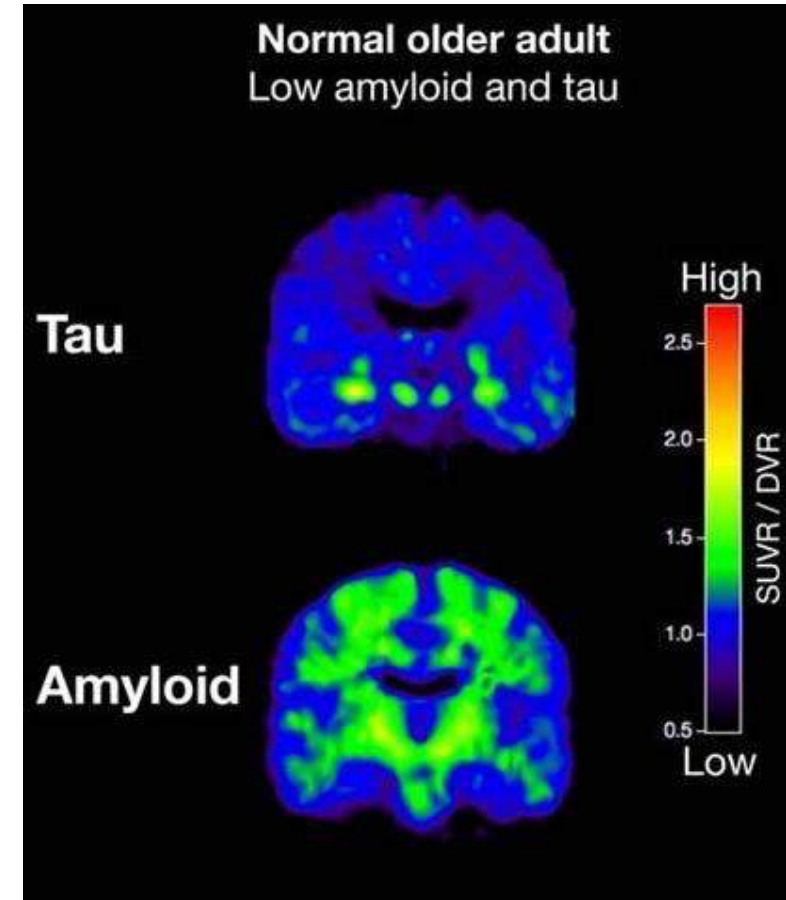
PET scanner



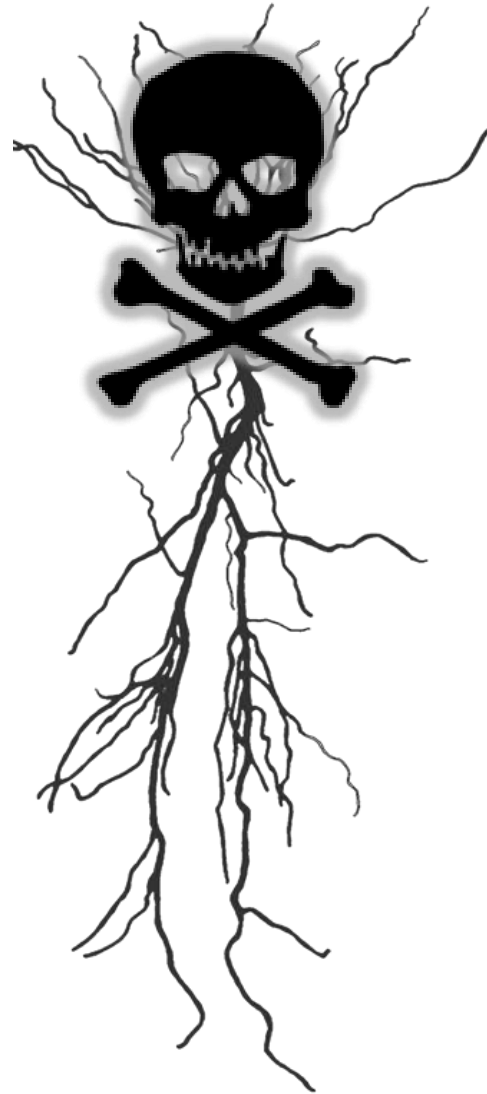
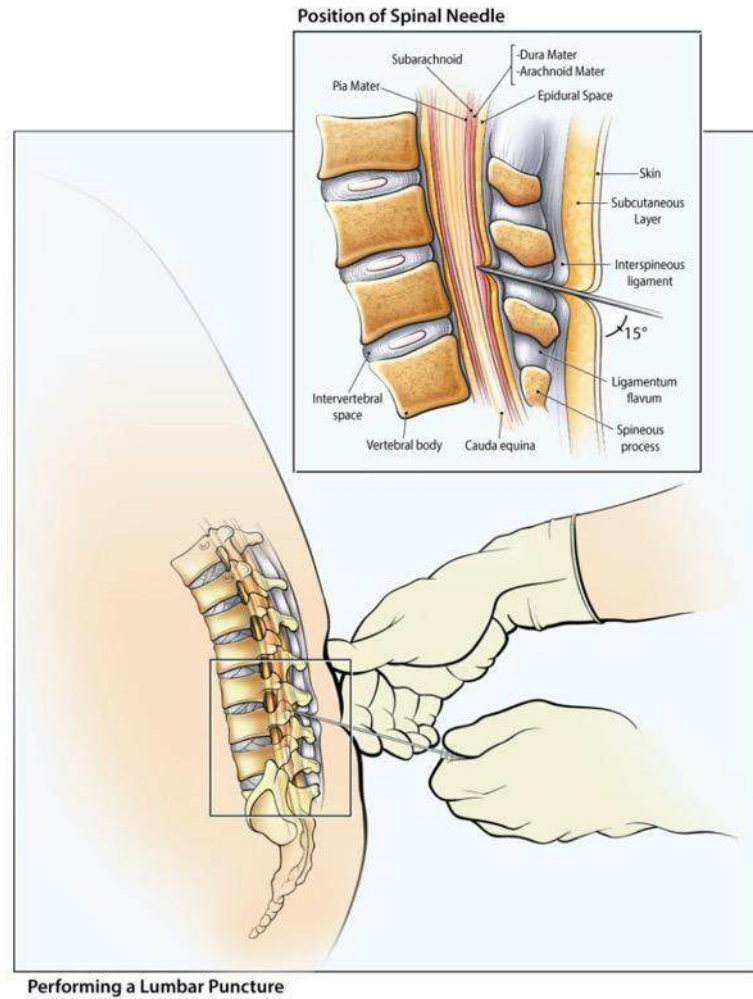
Glucose Metabolism



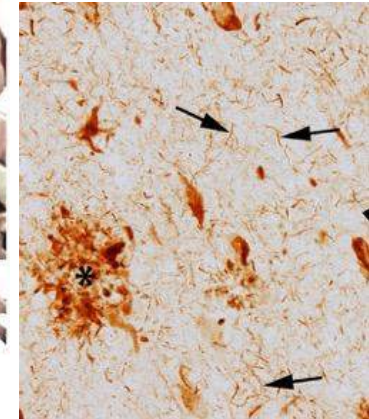
AD pathology



Cerebral spinal fluid gives information about the brain



AD pathology



Neuroinflammation





**What were those five words
that I asked you to remember??**



**What were those five words
that I asked you to remember??**

Book

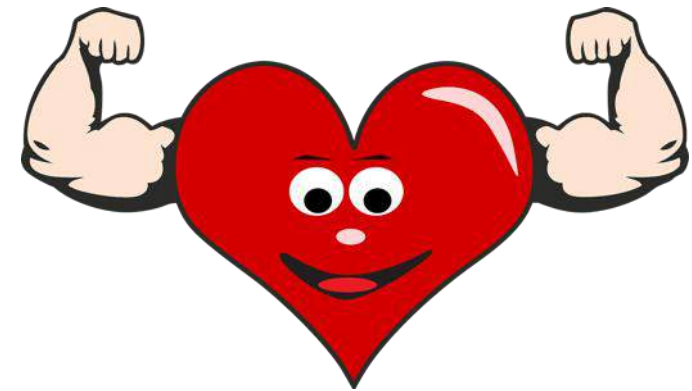
Goat

Church

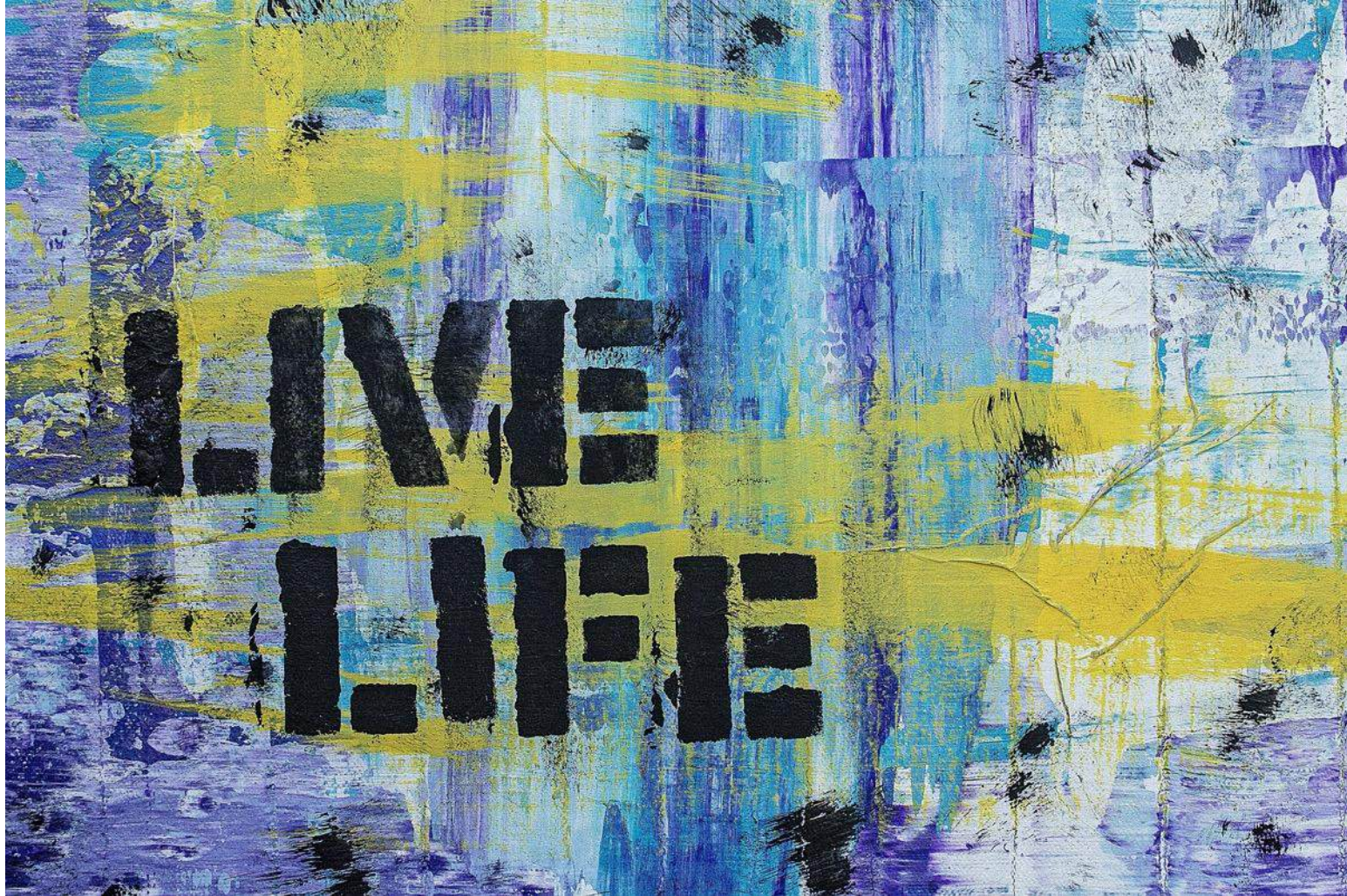
Happy

Square

Take control of your aging process



Focus on the positive



The background is a vibrant, abstract composition of overlapping geometric shapes, primarily circles and squares, in a variety of colors including shades of orange, yellow, purple, blue, green, and brown. The shapes are semi-transparent, creating a layered effect. Centered on this background is the text "THANK YOU!" and "QUESTIONS?" in a bold, black, sans-serif font.

THANK YOU!
QUESTIONS?