



**HARVARD**  
MEDICAL SCHOOL



MASSACHUSETTS  
GENERAL HOSPITAL

# **The brains that refuse to age**

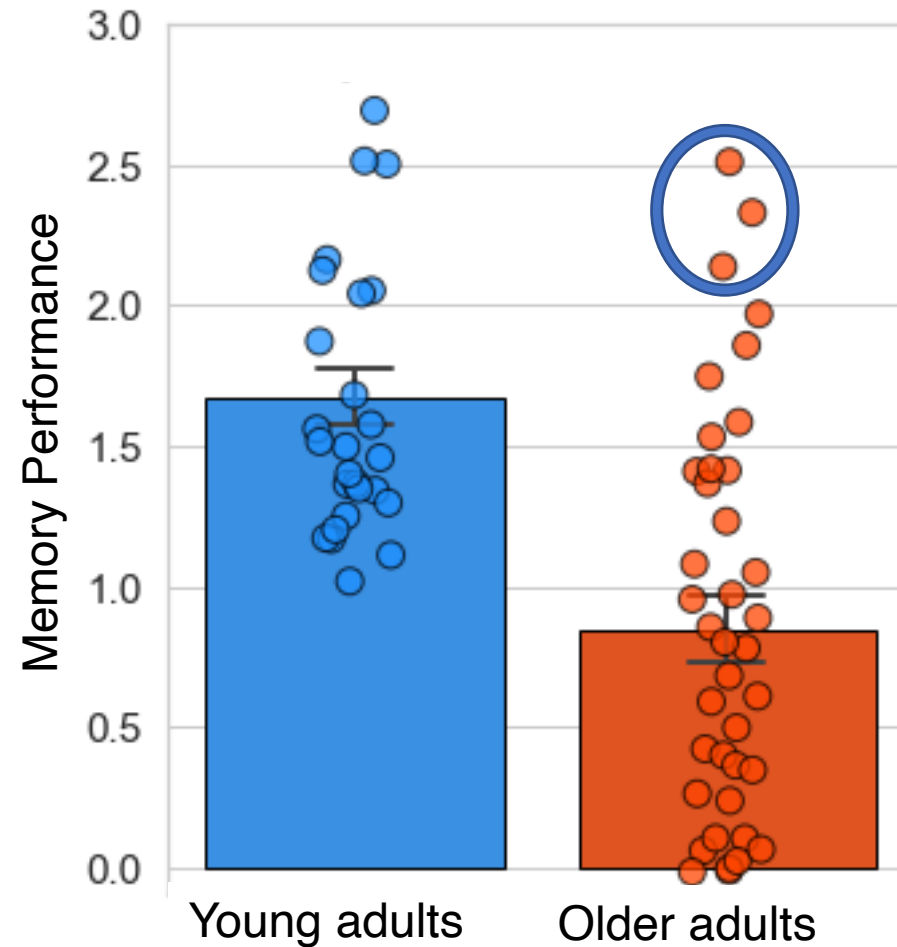
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United Nations Public Health Conversation Series

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# Memory decline may be common but not inevitable



Some older adults appear *youthful* in their memory abilities

Sun, Touroutoglou et al. (2016). J Neurosci.

# **The elite brains of Super Agers: *Brain structure***

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# Brain structure of Super Agers vs Typical Older Adults

## Measure:

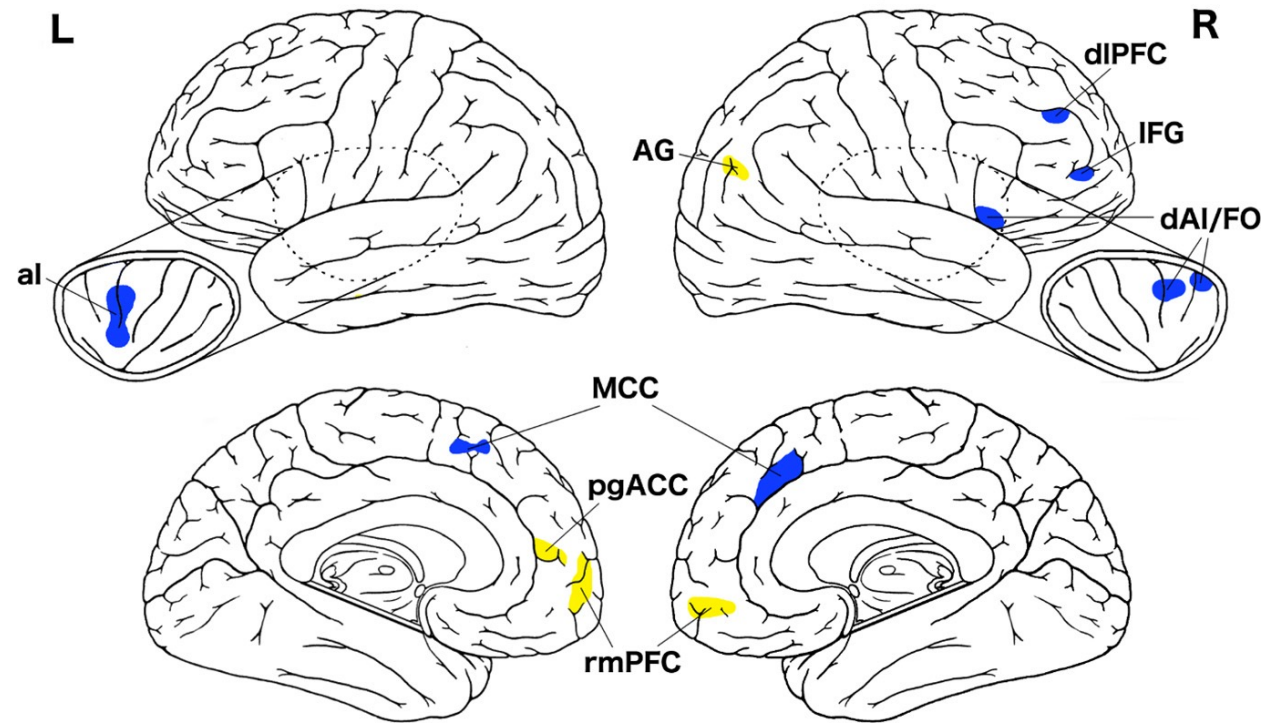
- Structural MRI measure of cortical thickness.

## Question:

- Do Super Agers resist “normal” age-related atrophy?

## What we found:

- Super agers have thicker cortex than older adults their age.



Sun, Touroutoglou et al. (2016). J Neurosci.

# **The elite brains of Super Agers: *Brain connectivity***

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# How well-connected are brain networks in Super Agers?

## Measure:

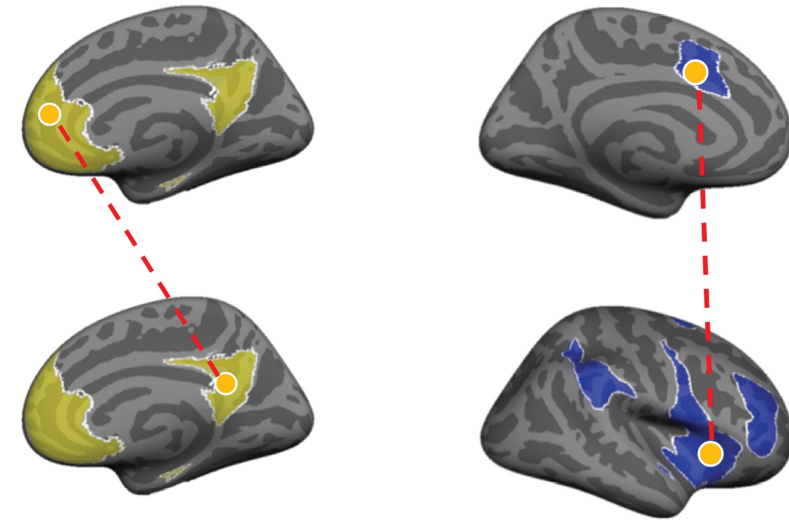
- fMRI of neural connections

## Question:

- Do Super Agers resist age-related disruption in communication between brain regions?

## What we found:

- Super agers have stronger connectivity in brain networks involved in memory and attention



Cortical-hippocampal  
Memory neural network



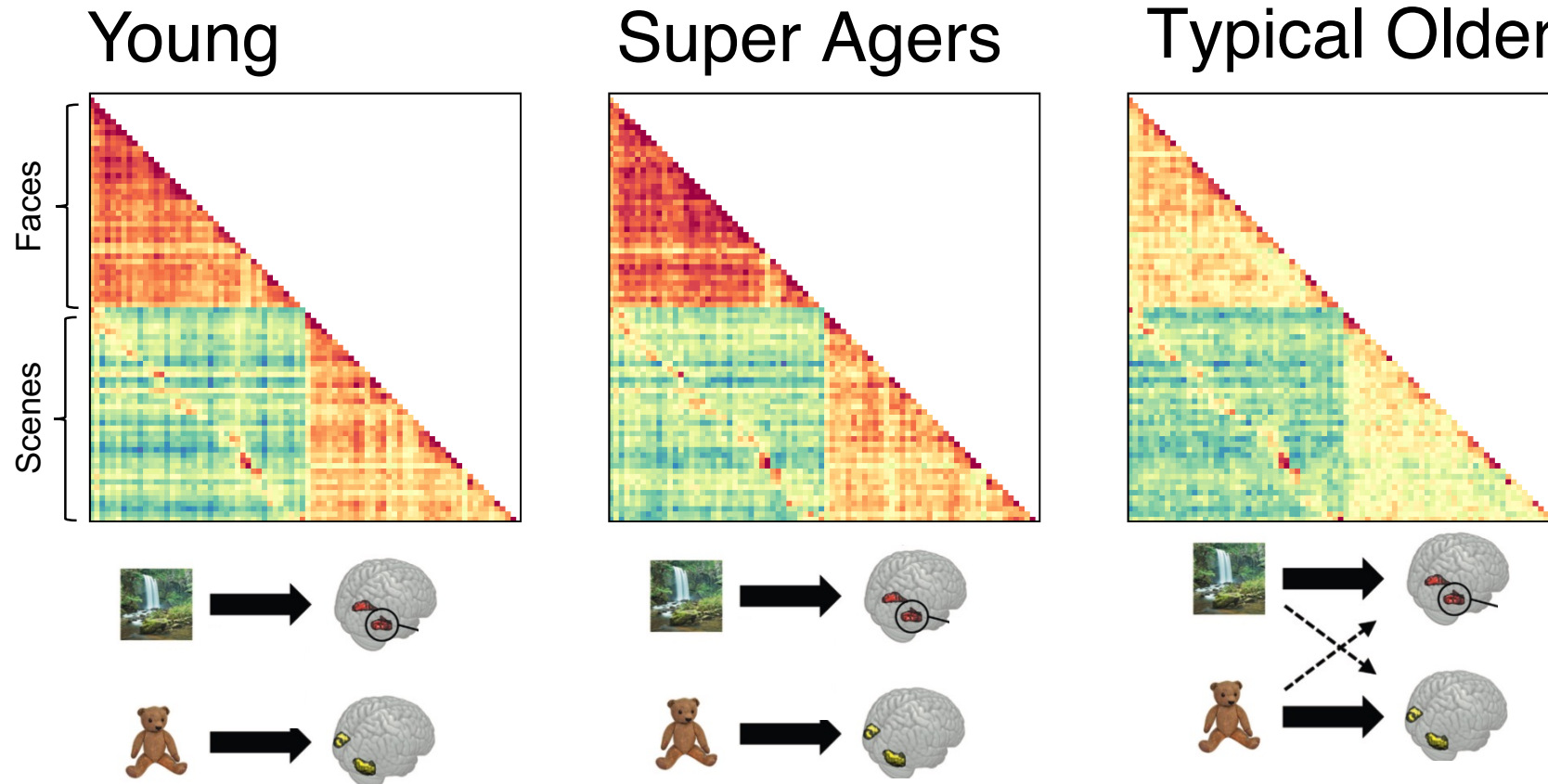
Frontoparietal  
Attention neural network

Zhang, Touroutoglou et al. (2019). *Cer. Cortex*

# **The elite brains of Super Agers: *Brain activation***

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# Super Agers visual cortex maintains youthful activity



Katsumi, Touroutoglou et al. (2021). *Cerebral Cortex*



# Super Agers, Who are they? Can they defy the inevitable?

## Less “normal” age-related brain shrinkage:

- Super Agers avoid brain shrinkage.
- Brains of Super Agers look decades younger

## More connected brains

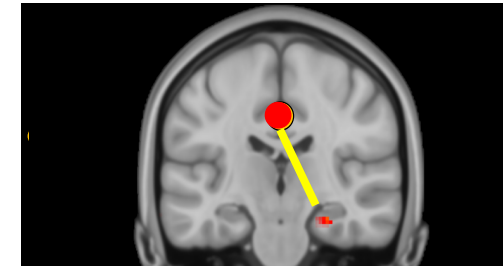
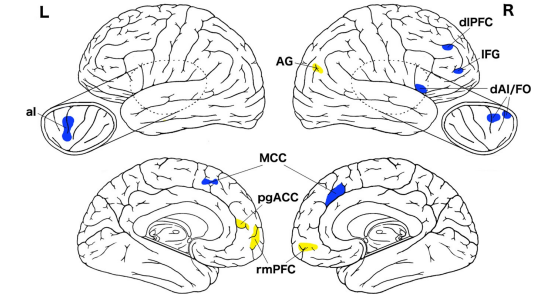
- Better communication between neurons
- Brain connections as strong as in the young brains

## More efficient brain activity

- Youthful activity patterns in visual cortex
- Selective processing, distinct memory, easier retrieval

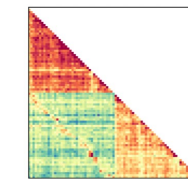
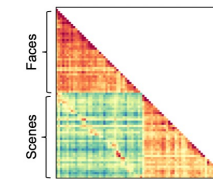
## Resilience to real-world stressors:

- Super Agers are resilient to delirium after surgery



Young

Super Agers



Typical Older Adults

Super Agers

