

# Functional Connectivity and the Ageing Brain

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European Association of Geriatric Psychiatry (EAGP)

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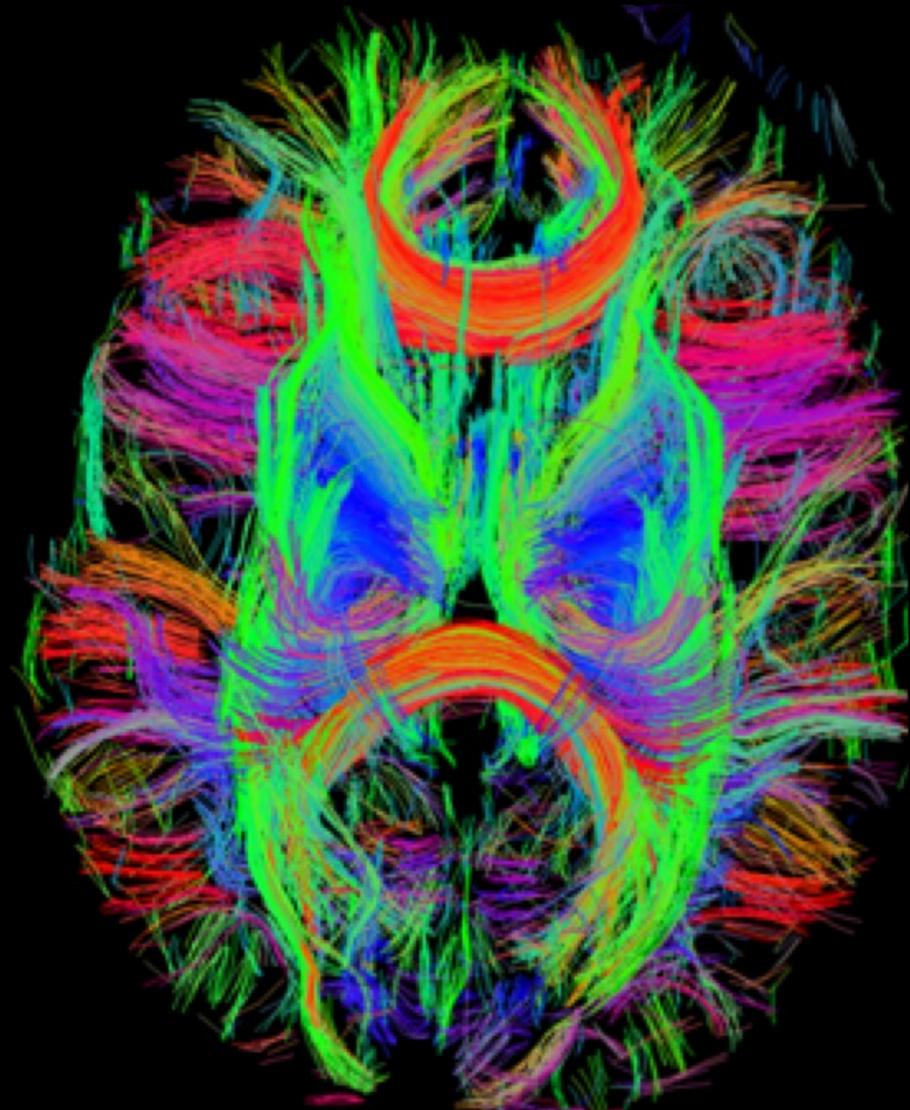
Old age psychiatric ward, South Stockholm Psychiatry

Department of Neurobiology, Care Sciences and Society, Karolinska Institutet

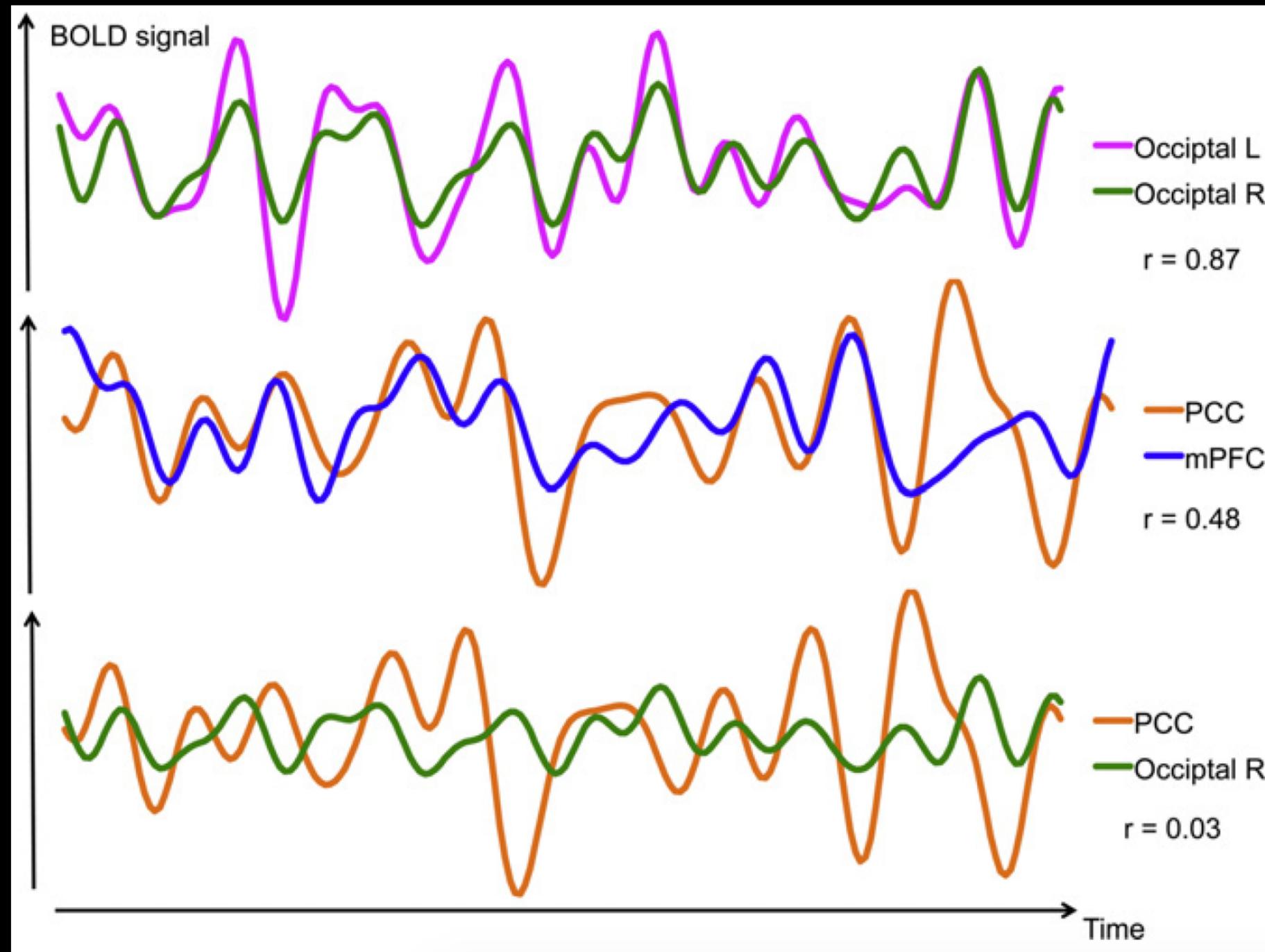
# Program

- Functional connectivity: what is it?
- Resting-state: why?
- Changes in functional connectivity during ageing
- Amyloid-beta and functional connectivity

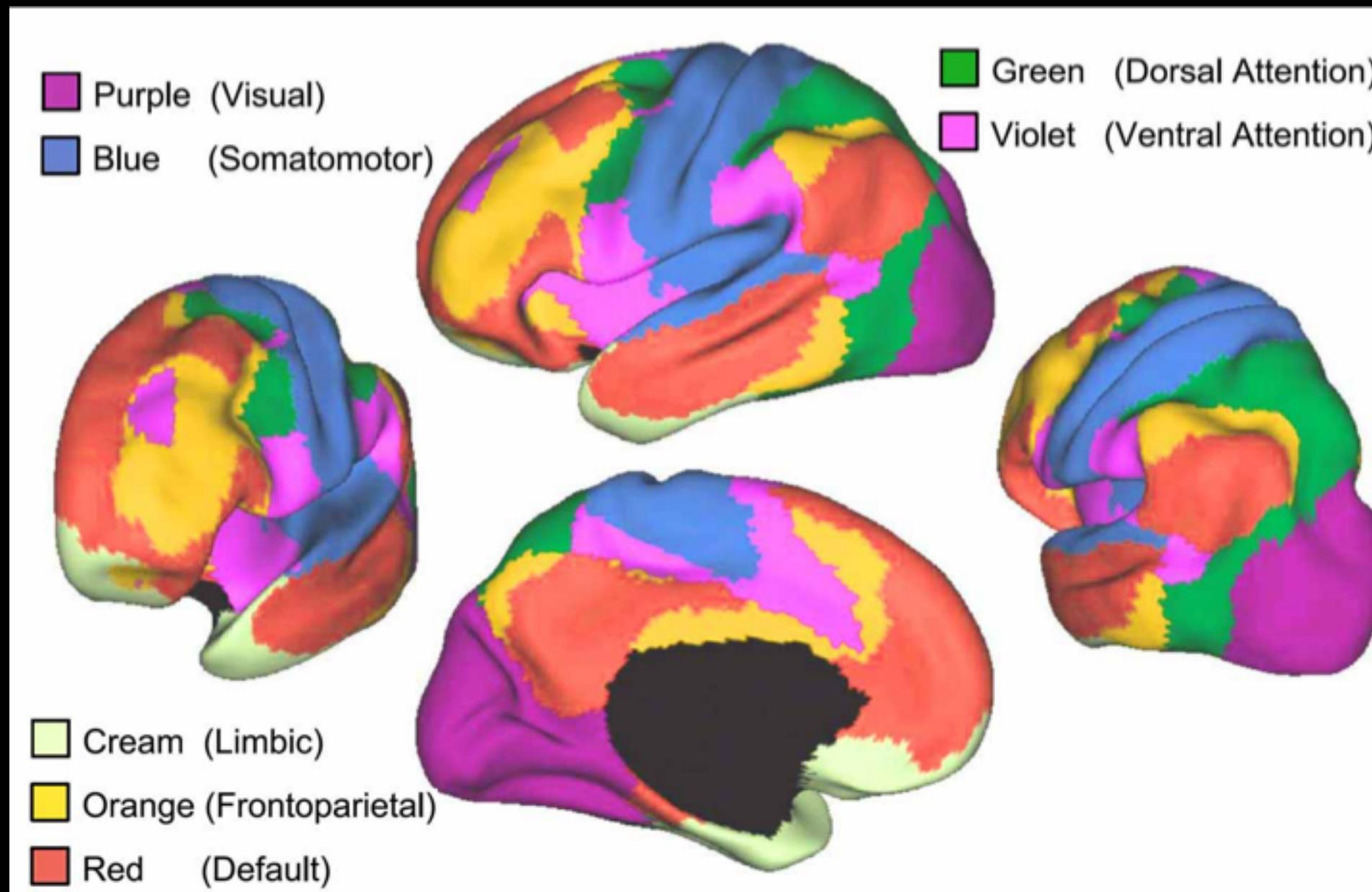
# Structural Connectivity



# Functional Connectivity



# 'Networks'



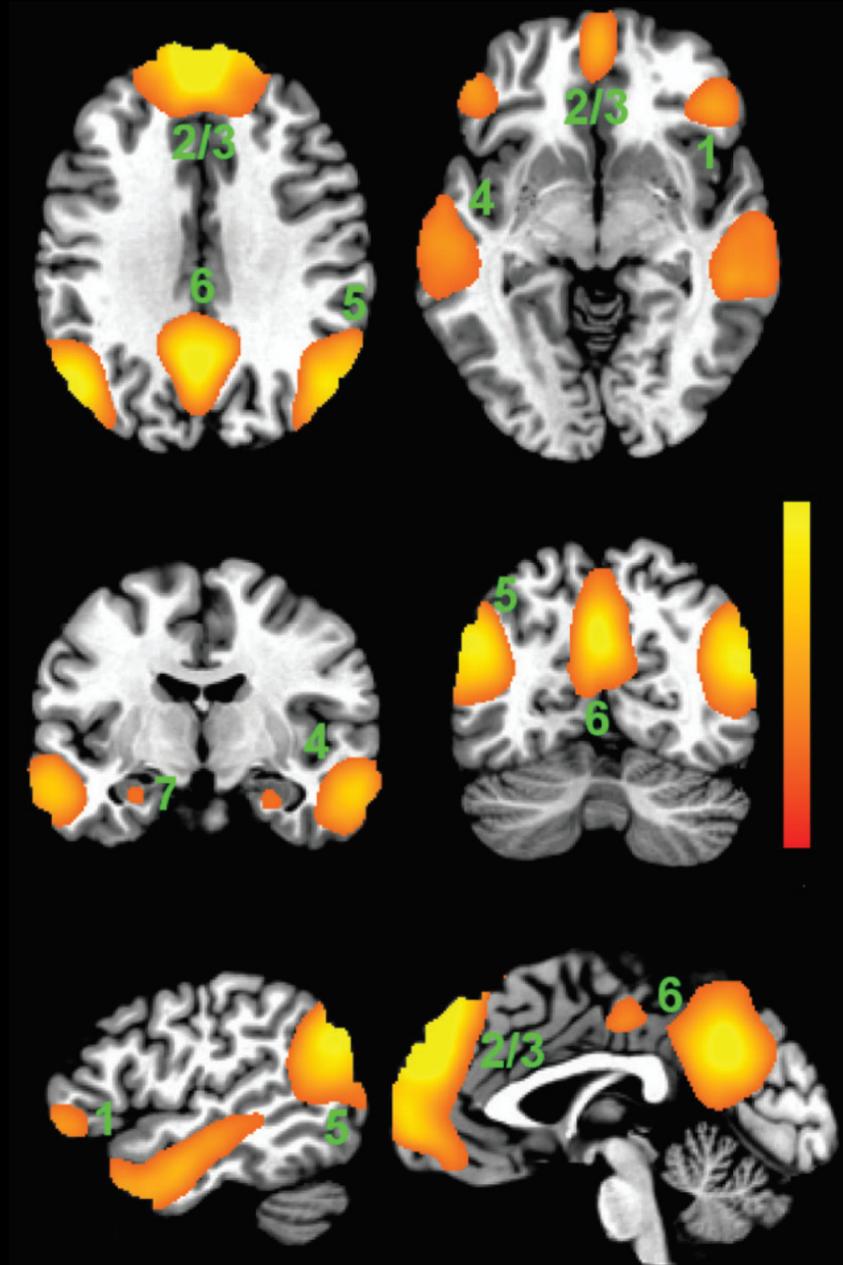
# Resting-state



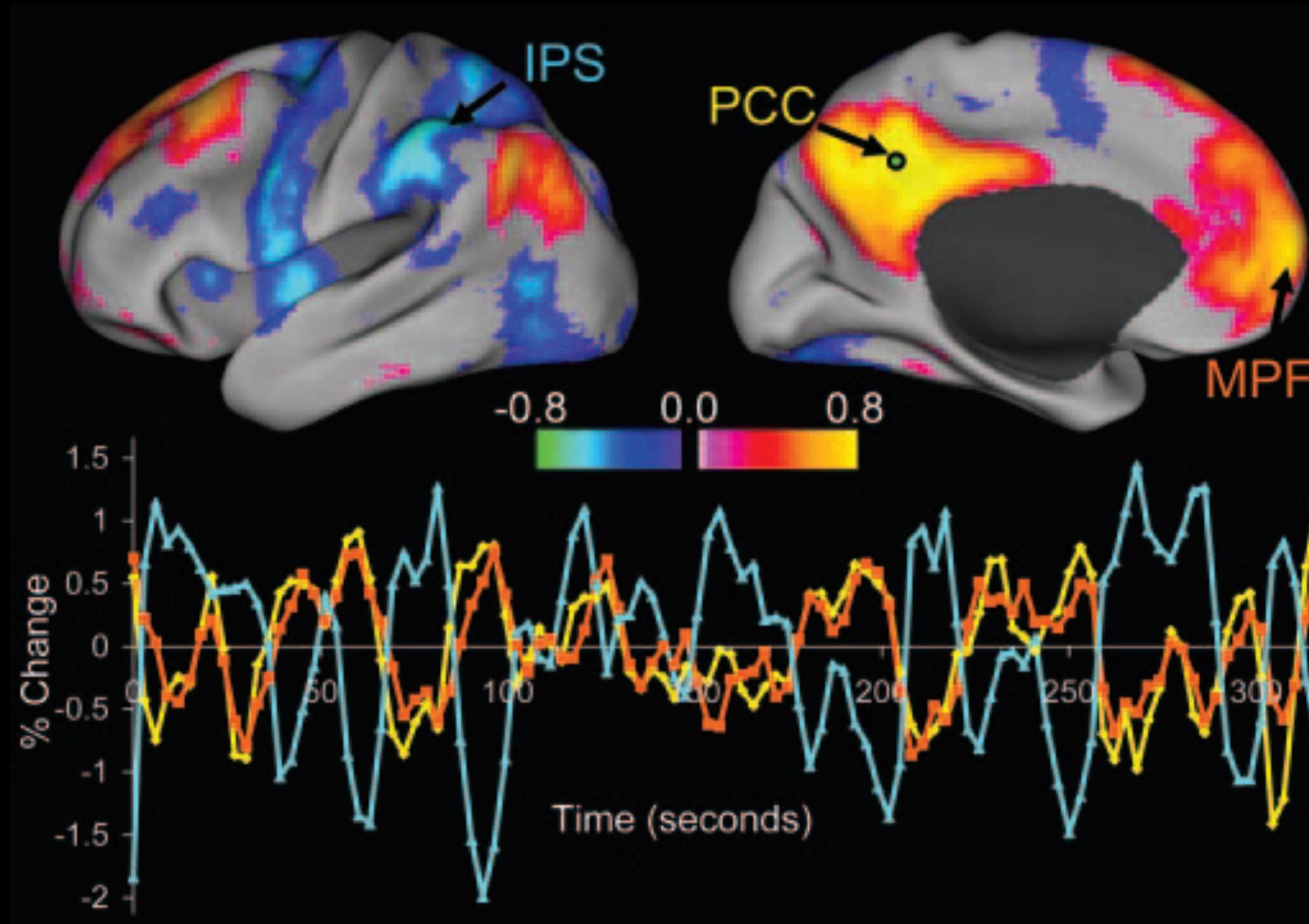
Photo by Zachary Nelson on Unsplash

# Default Mode Network

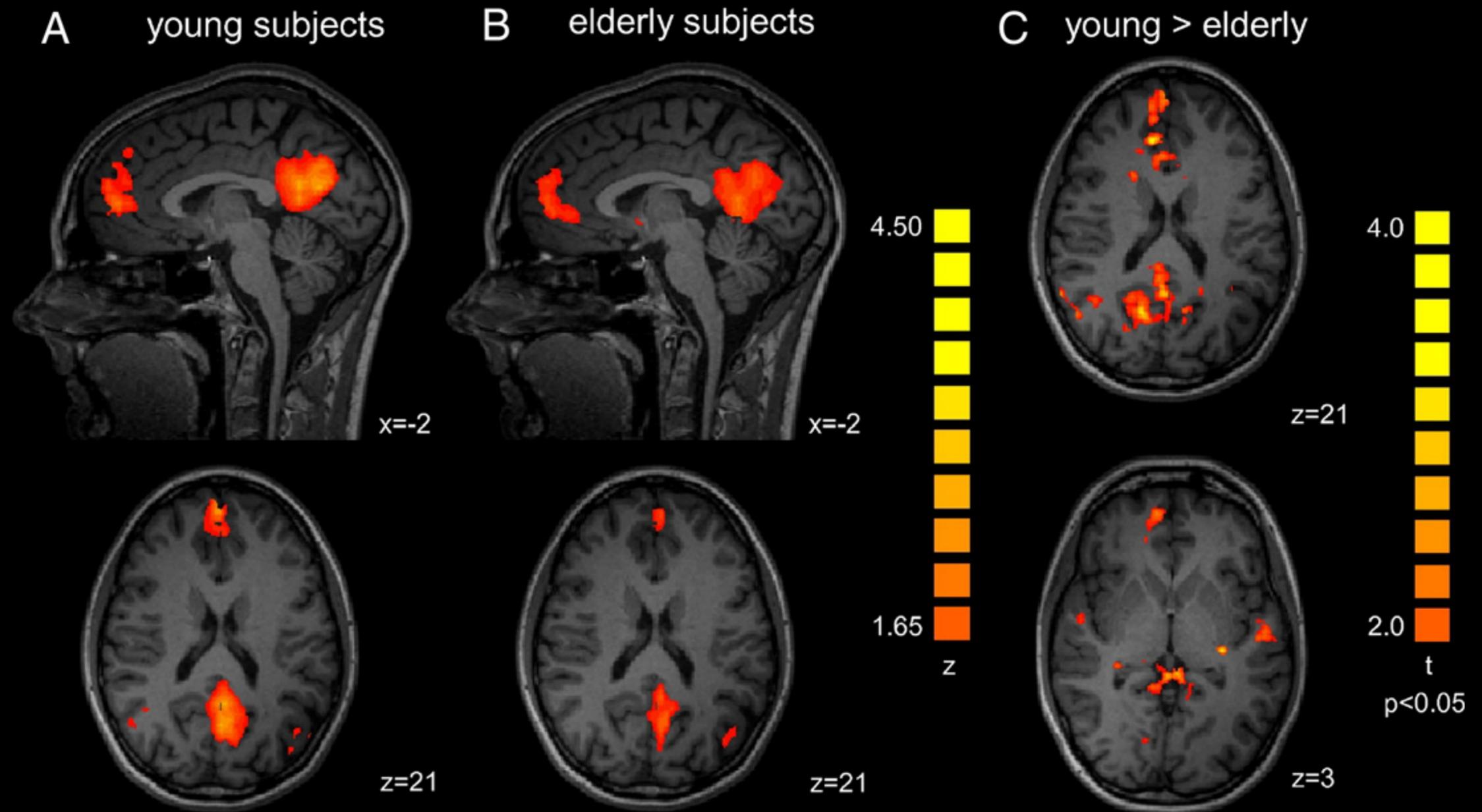
'We posit that when an individual is awake and alert and yet not actively engaged in an attention-demanding task, a **default** state of brain activity exists that involves, among other areas, the MPFC and the posterior cingulate and precuneus. Information broadly arising in the external and internal milieu is gathered and evaluated. When focused attention is required, particularly if this activity is novel, activity within these areas may be attenuated.' (Raichle et al., 2001)



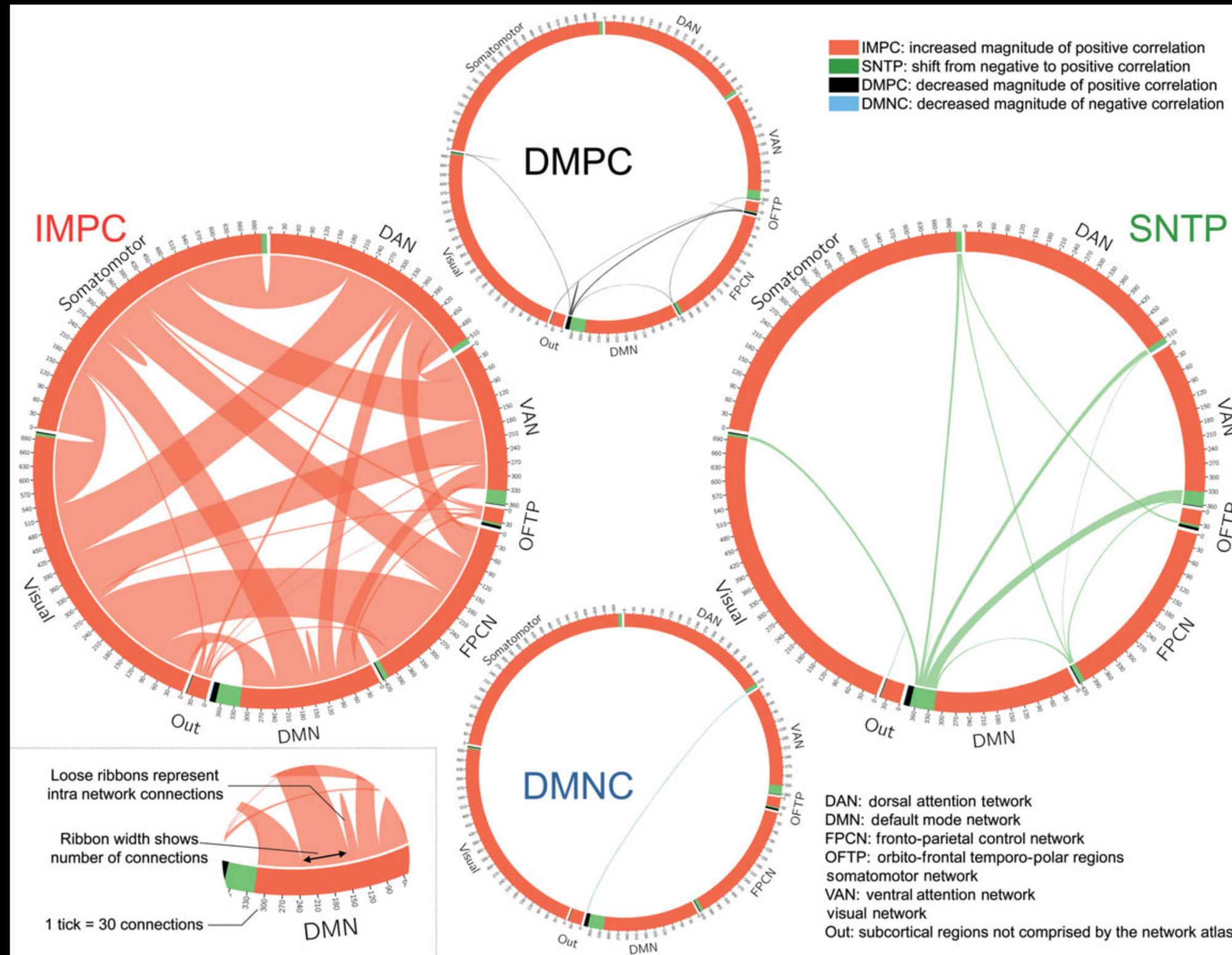
# Correlations and Anticorrelations



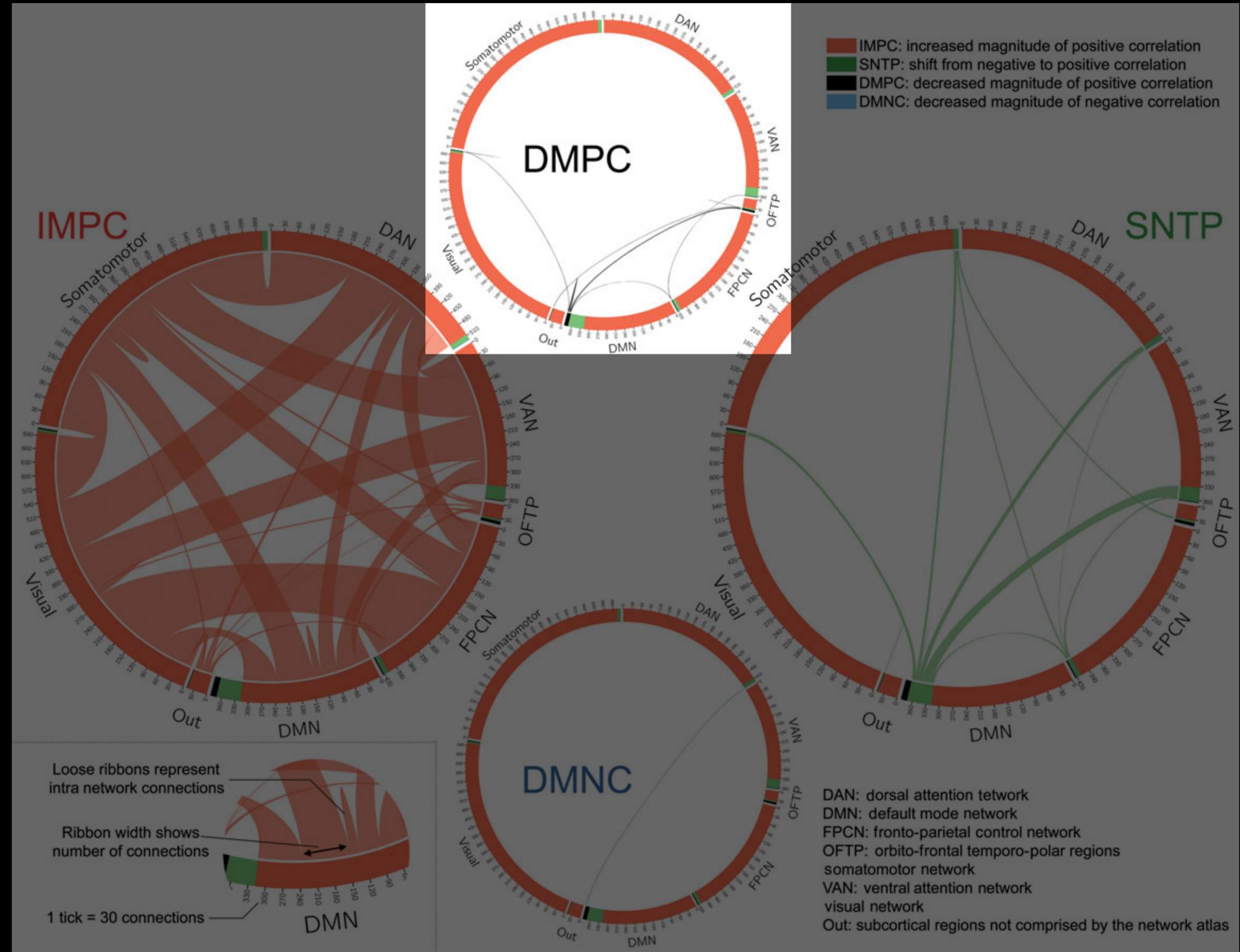
# DMN and Ageing



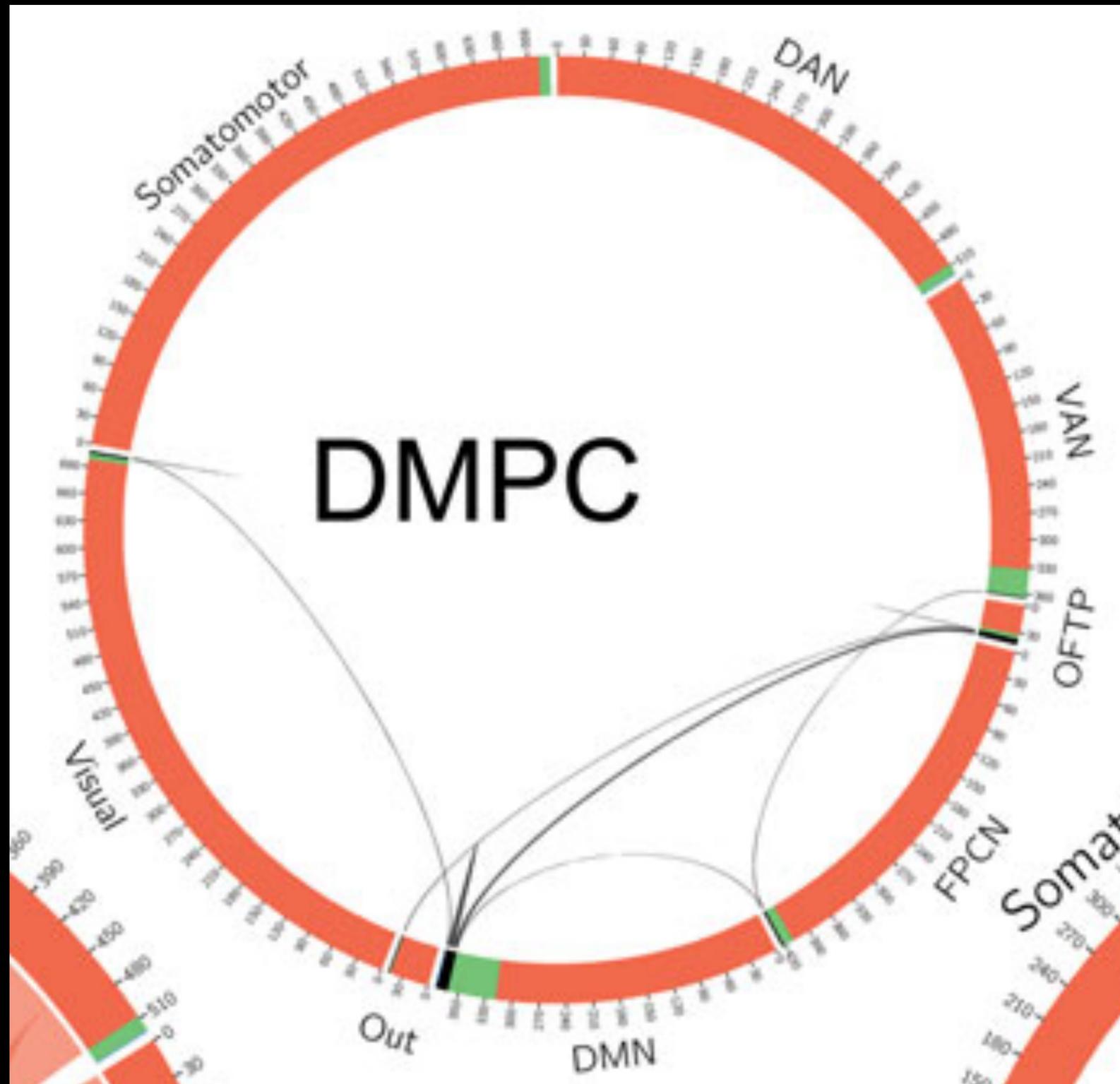
# Whole-brain Functional Connectivity



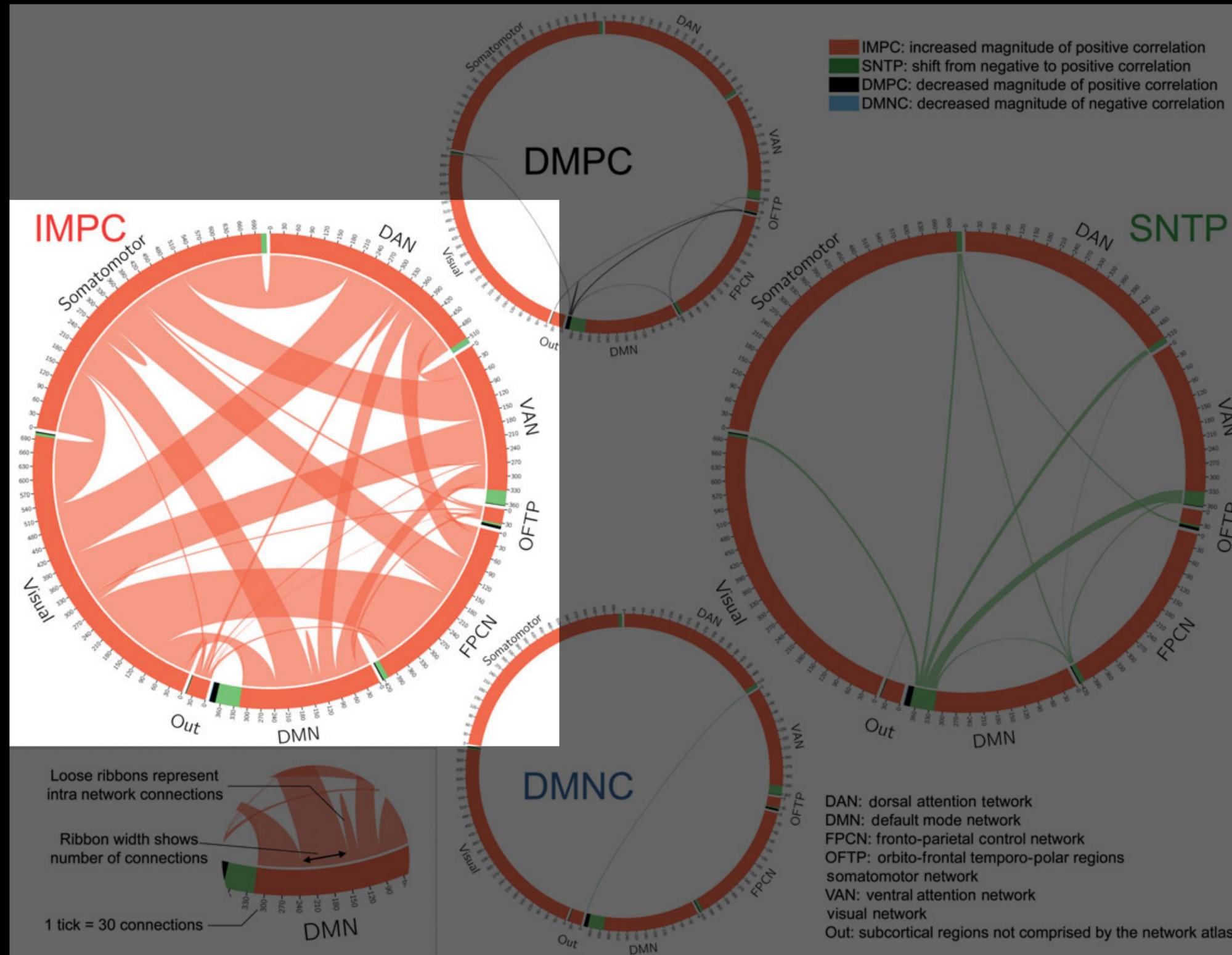
# Whole-brain Functional Connectivity



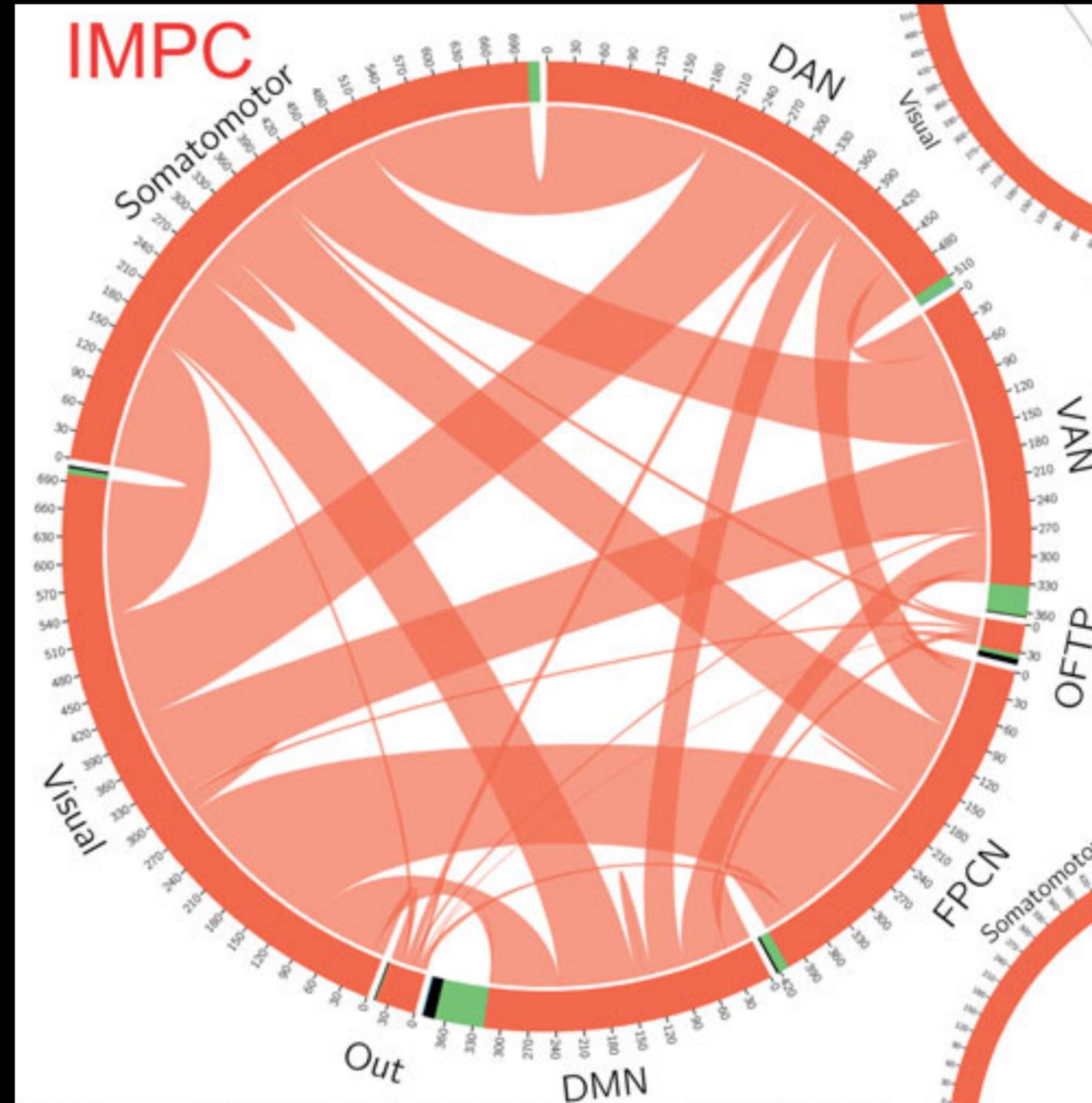
# Whole-brain Functional Connectivity



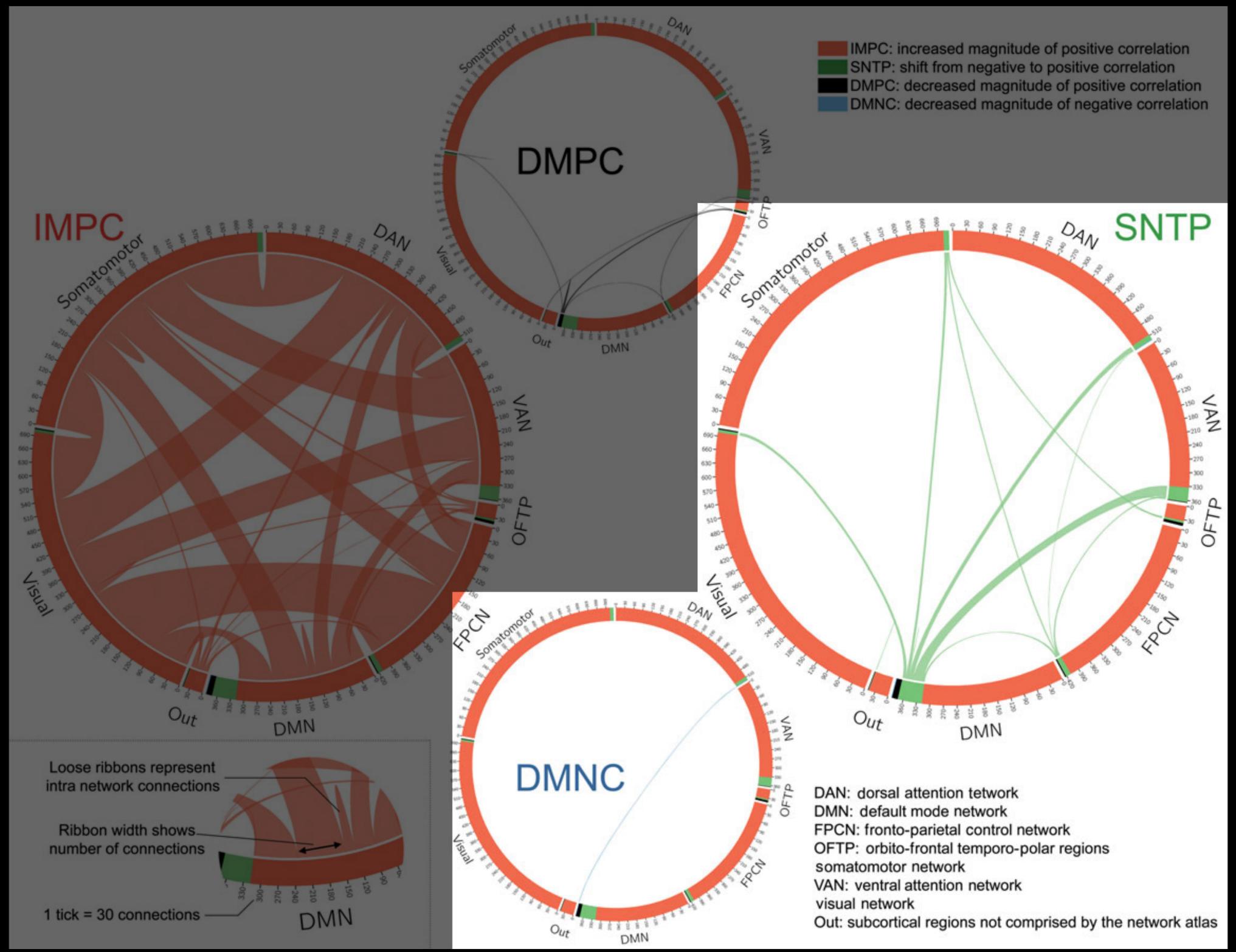
# Whole-brain Functional Connectivity



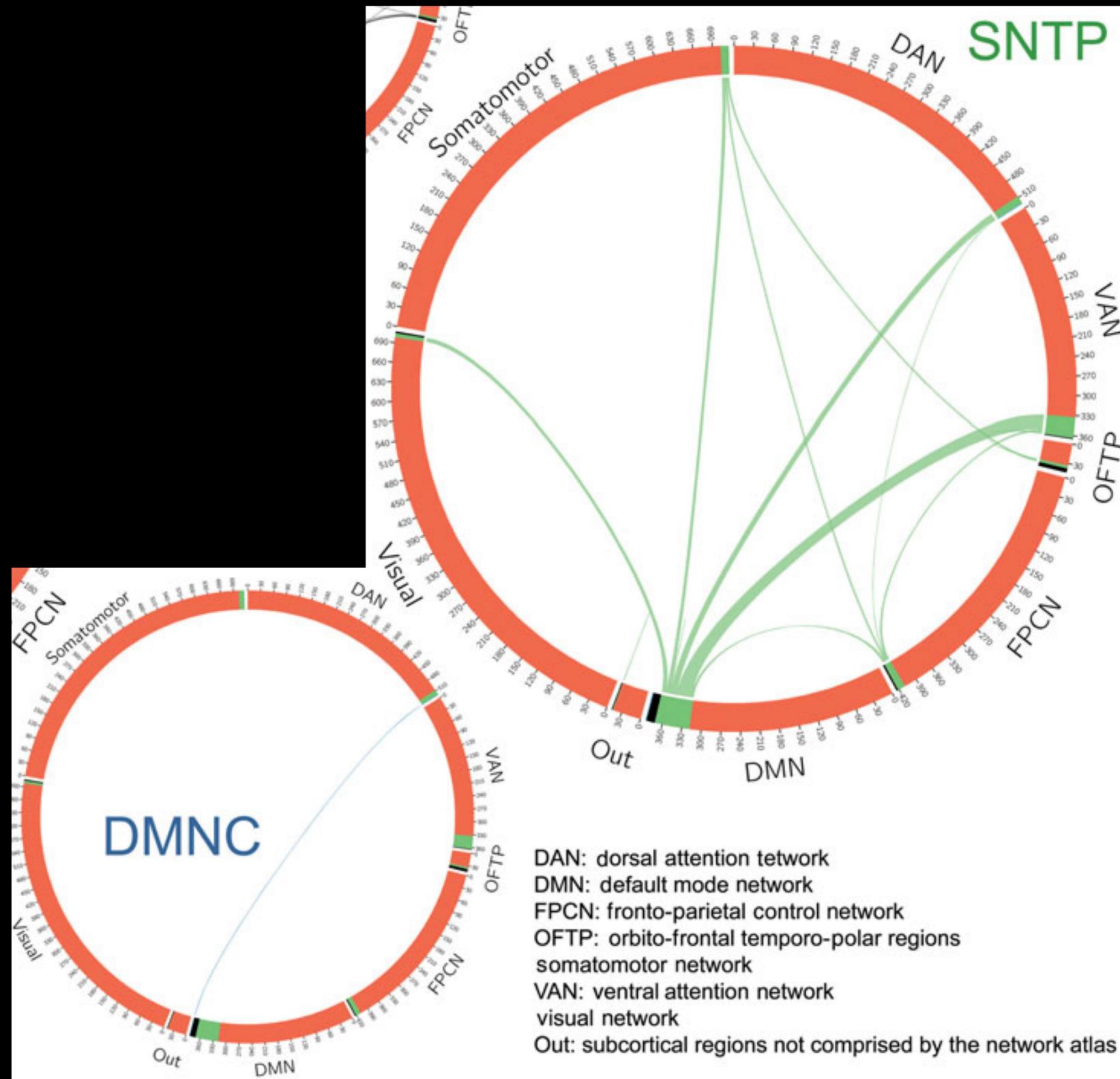
# Whole-brain Functional Connectivity



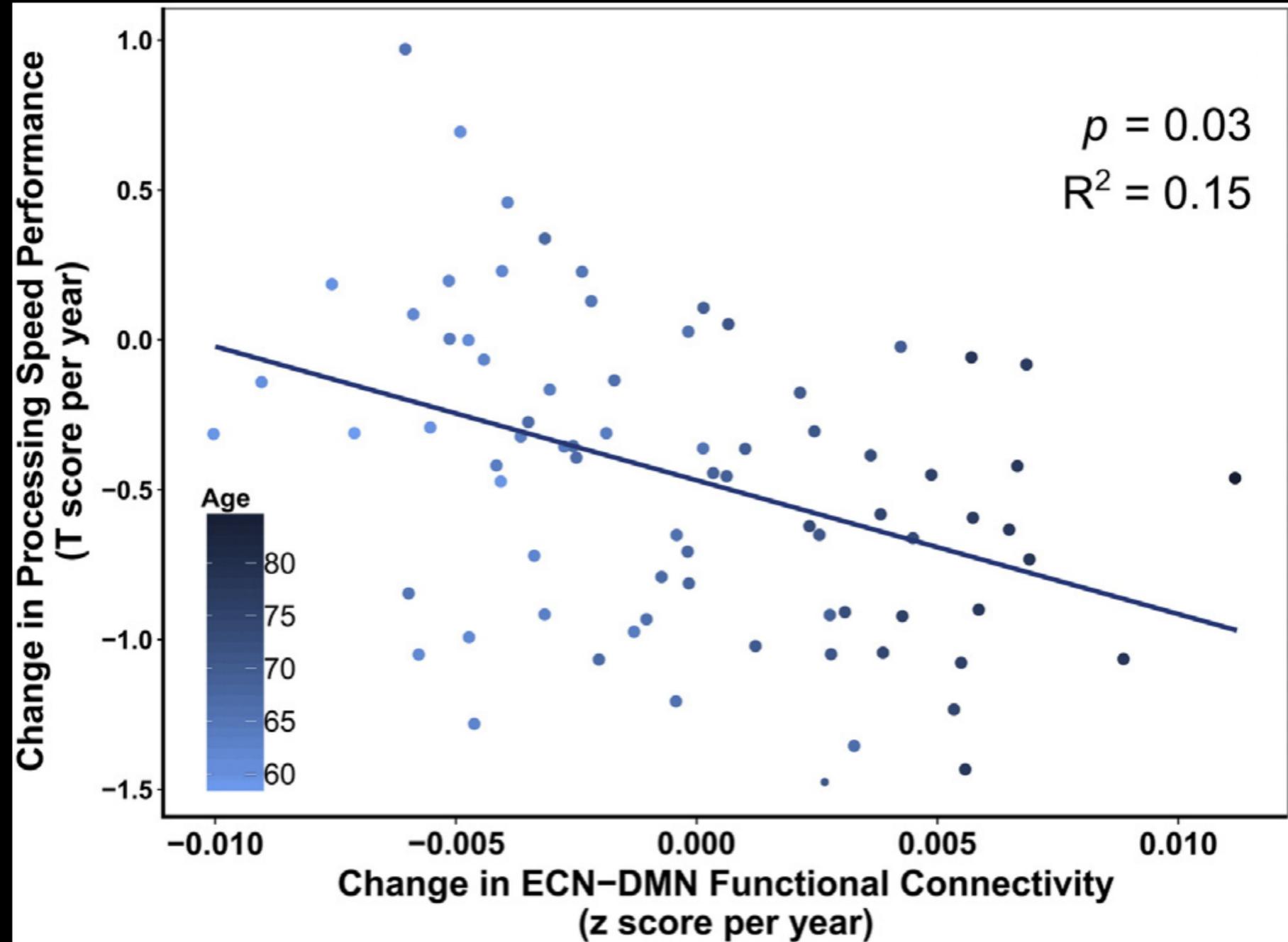
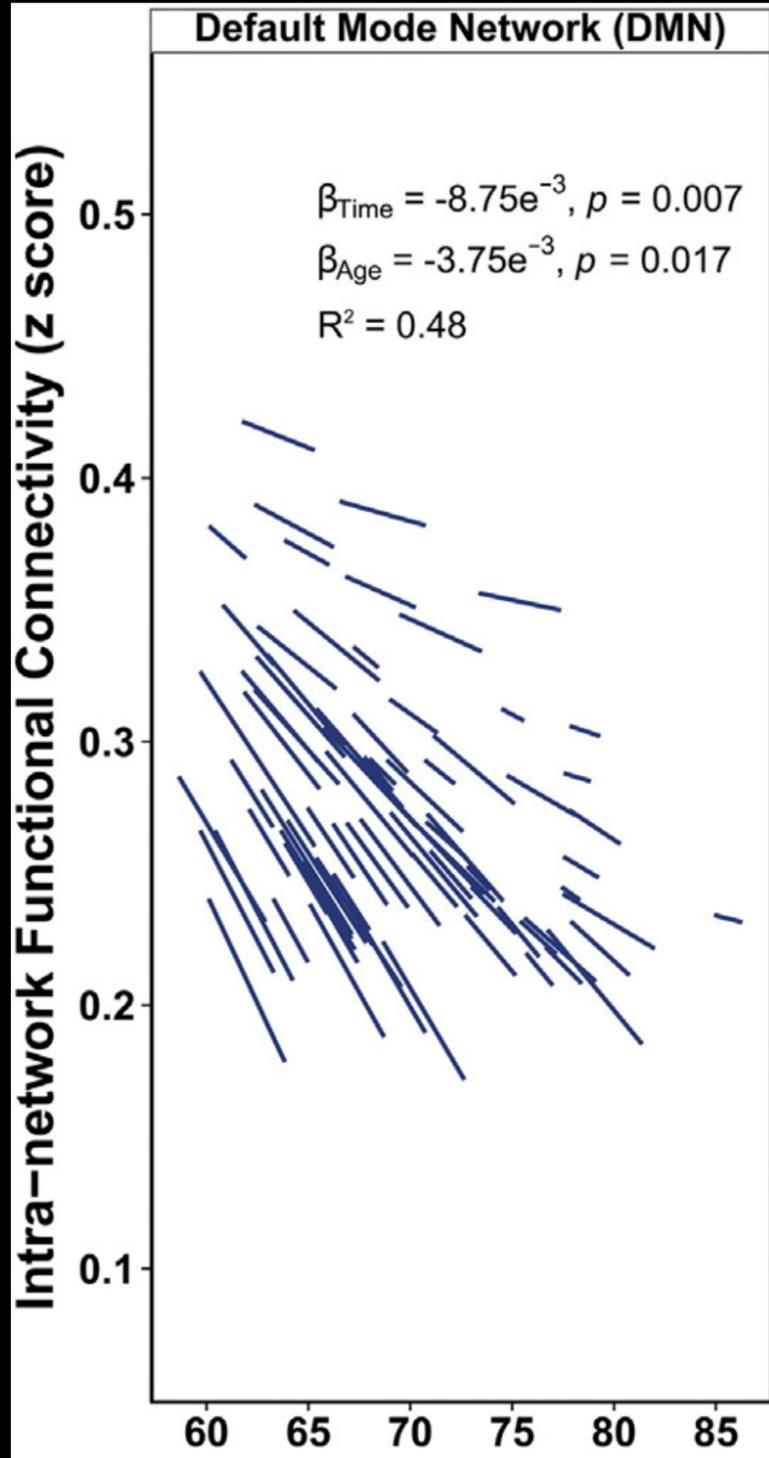
# Whole-brain Functional Connectivity



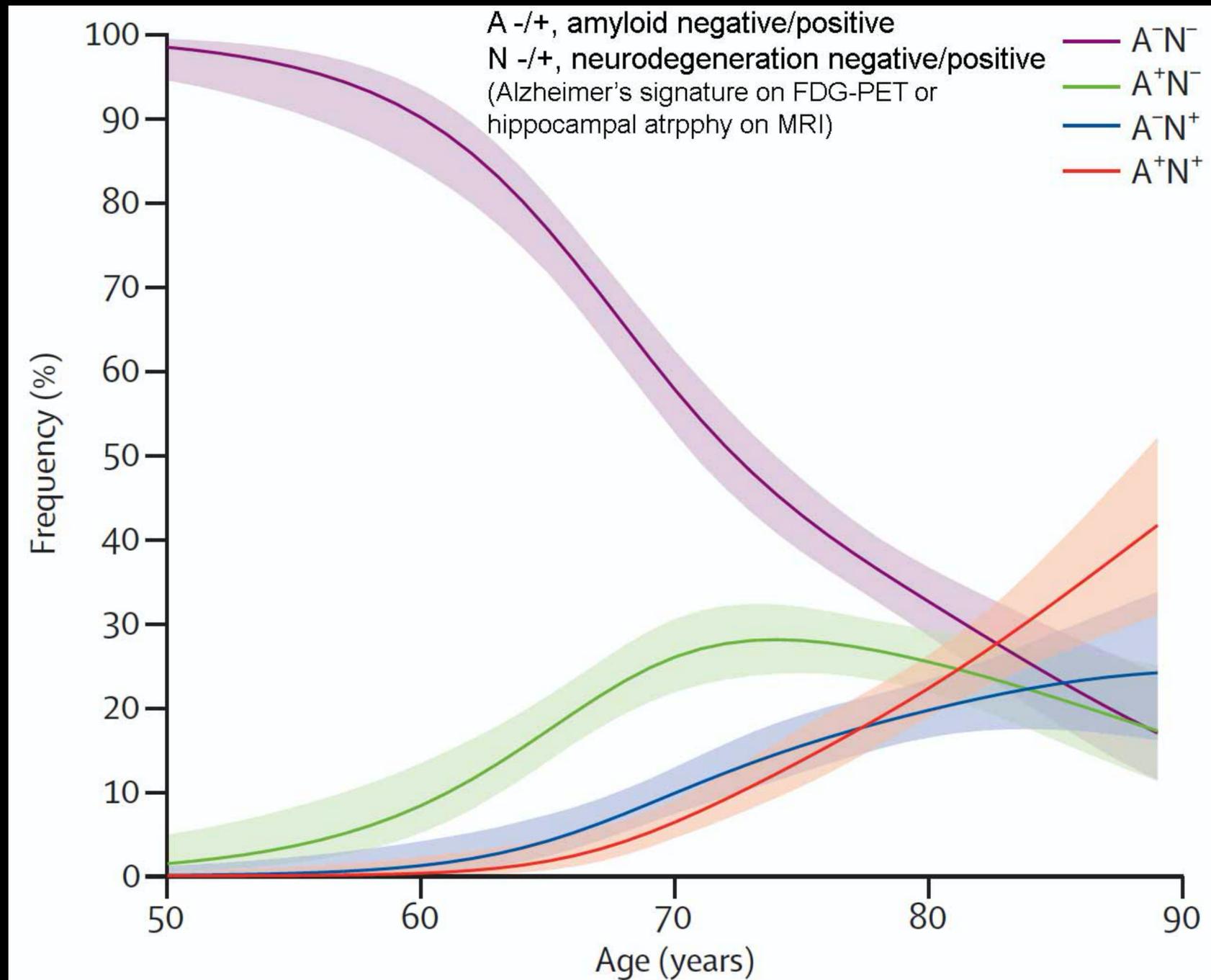
# Whole-brain Functional Connectivity



# Longitudinal study

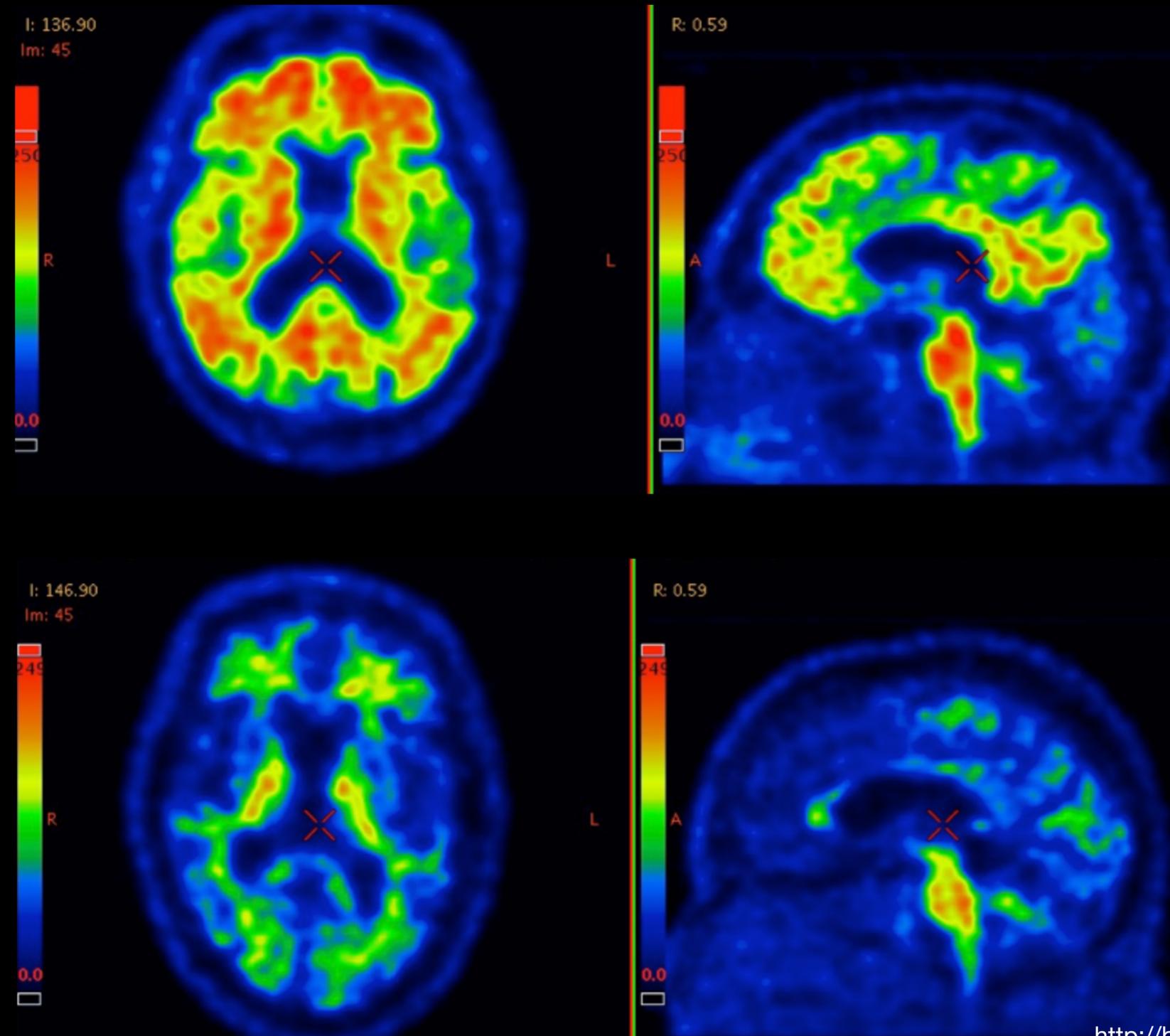


# Amyloid-beta and Ageing



"By age 89 years, about 83% of individuals with normal cognitive function had levels of amyloidosis, neurodegeneration, or both that were similar to those seen in mild Alzheimer's disease [...] and people are able to maintain normal cognitive function despite these abnormalities. Typical cognitive ageing, defined as remaining free of dementia, is therefore most often characterized by the presence rather than the absence of these imaging abnormalities."

# Amyloid-beta imaging

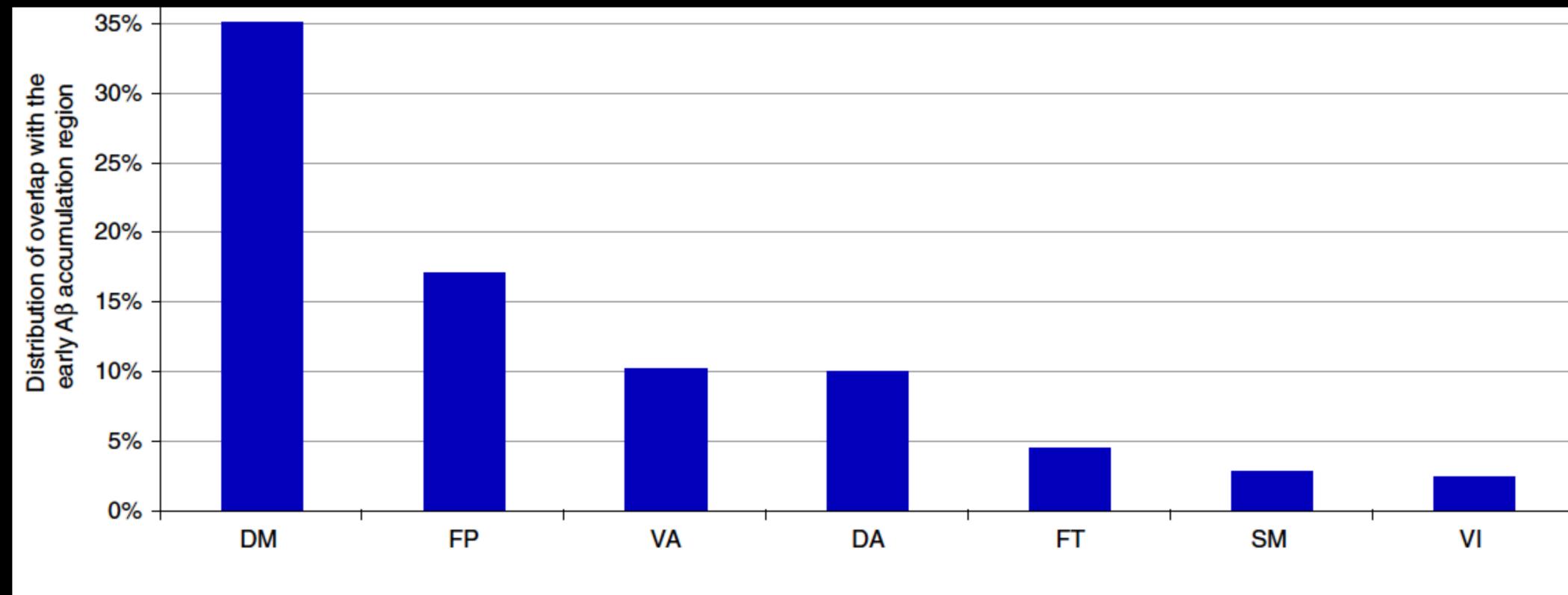
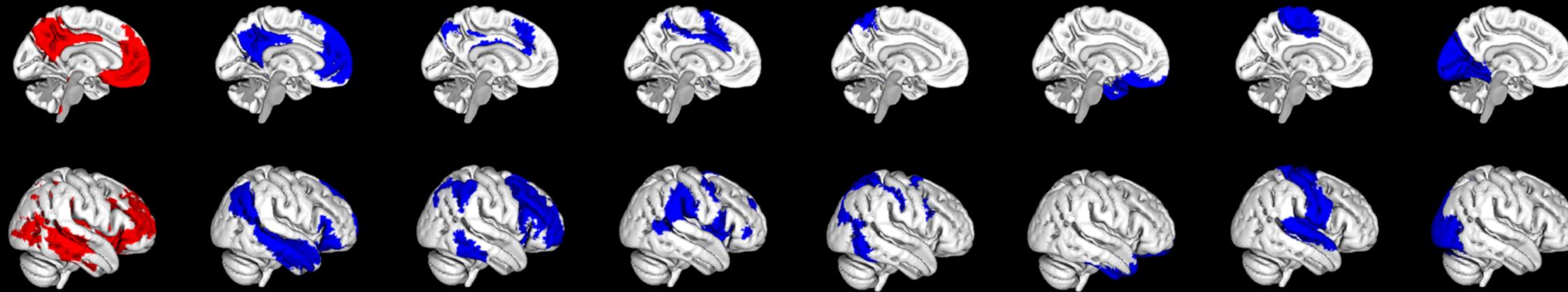


<sup>18</sup>F-Flutemetamol

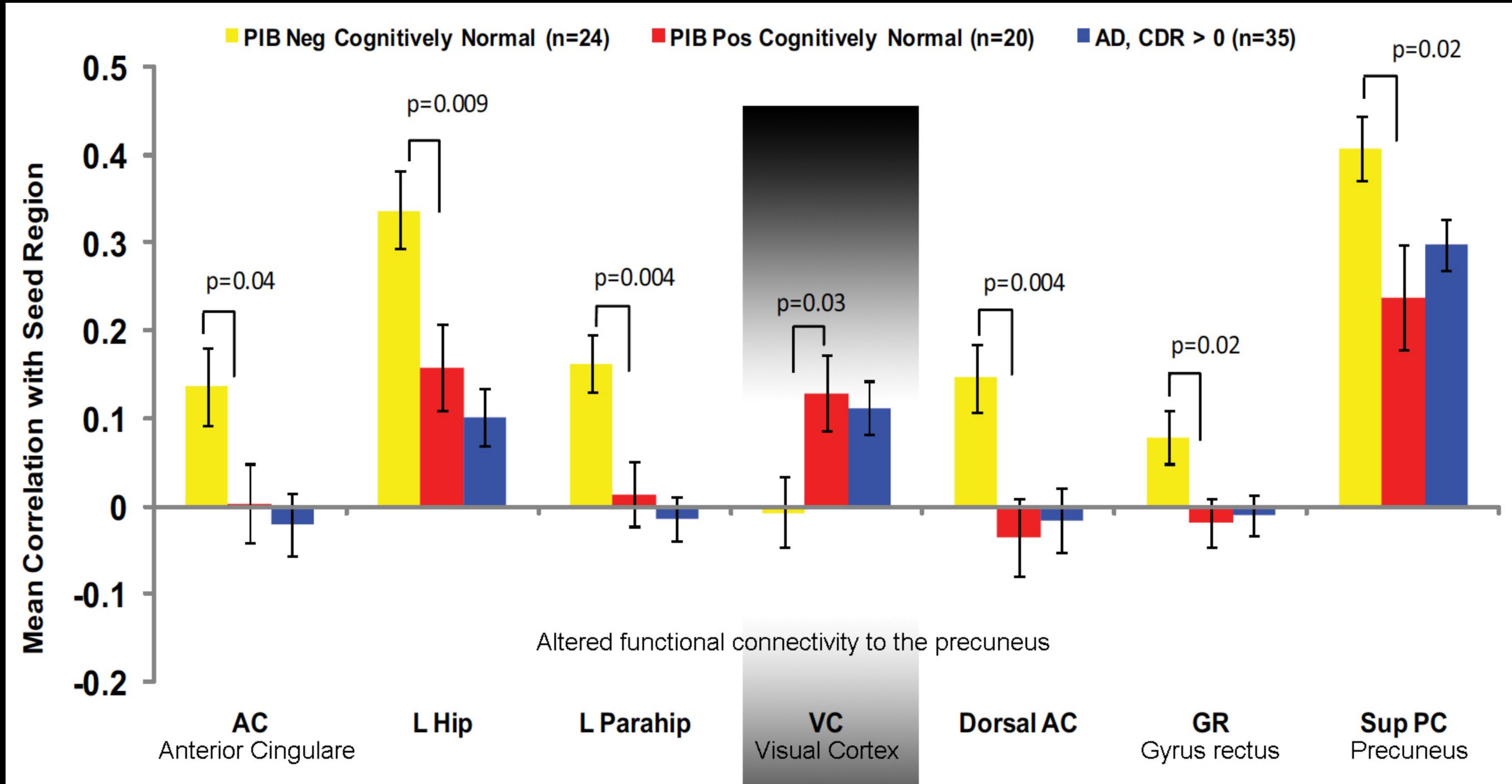
The Swedish Biofinder Study

<http://biofinder.se/data-biomarkers/amyloid-pet-imaging/>

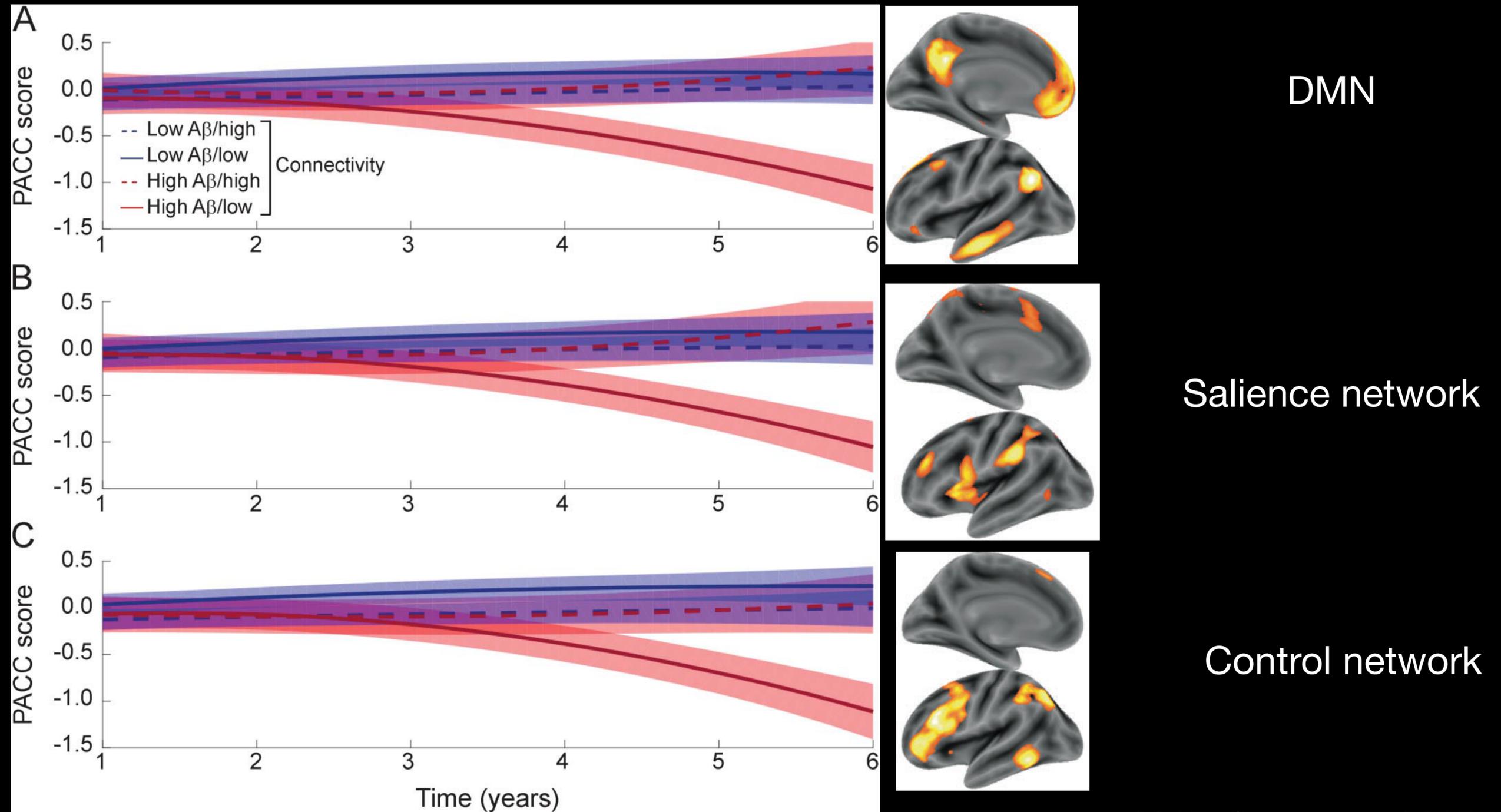
# Amyloid-beta and Default mode network



# Amyloid-beta and Default mode network



# Amyloid-beta, Connectivity and Prognosis



Buckley et al 2017. Shaw et al 2015.

# Wrapping up

- Aging is associated with :
  - decreases in functional connectivity within the DMN
  - decreased segregation between networks
  - loss of anticorrelations
- Amyloid-beta deposition
  - Earliest accumulation: DMN
  - Impact on functional connectivity
  - Mechanism: Amyloid-beta excitotoxicity? Connectivity as an cause? Compensation?

Thanks!

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