Coherent Spontaneous Activity Identifies a Hippocampal-Parietal Memory Network
Vincent et al. 2006

Aims

• Determine whether there was coherent activity between hippocampus and parietal cortex during rest
• Are functionally correlated regions in hippocampus and parietal cortex involved in memory?
Seeds

• Hippocampus
  - correlation map with the retrosplenial cortex --- ant hippocampus (from dataset 1)

  - MT+ seed: from previous motion detection study

Preprocessing for connectivity

• Temporal bandpass filter
  – .009 to .08 Hz

• Spatial smooth 6mm

• Regress out
  – Global signal
  – Head motion (from realign)
  – Signal averaged from lateral ventricles and a seed in the white matter
Correlation with a motor cortex seed after each preprocessing step

Correlation maps of MT+ and HPC
From all 4 datasets (conjunction)

ROIs defined from Dataset 1. Correlation with MT+ and Hippocampus (dataset 2+3)
Memory retrieval
1) R vs. K (Wheeler & Buckner 2005)
2) deep vs. shallow (Shannon and Buckner 2004)

Regions correlated with MT+ seed

A

Regions correlated with hippocampus

B

R > K for all 5 regions. Rem > CR for 4/5 regions; Deep > CR in 4/5. shallow > CR in LIPL
Memory retrieval in hippocampus and MT+ seeds

Overlap of regions correlated with hippocampus and regions involved in recollection (from meta-analysis, Wagner, 2005)
Evidence for a Frontoparietal Control System Revealed by Intrinsic Functional Connectivity

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Two competing networks

• Dorsal attention system
  – Spatial attention, eye movements, etc.
  – FEF, premotor, SPL, intraparietal sulcus, MT+
• Hippocampal-cortical memory system
  – Internal mental states – recollection
  – Part of the default network
  – vMPFC, PCC, posterior IPL
  – Overlaps with memory retrieval regions
  – **Anti-correlated** with dorsal attention system
  – **Internal versus external** processes (?)
A third system – frontalparietal control

- Executive control system for decision making integrates internal and external information
- aPFC (lateral) – top of the hierarchy of prefrontal control system (Badre 2007)
- Use aPFC as a seed to identify the control system
parietal regions correlated with 3 seeds
Seeds from 3 parietal regions (defined from dataset 2)

Convergent analysis across 3 data sets
Frontal cortex correlation with the 3 parietal seeds

Three networks
Memory and frontal-parietal network

• Related to memory retrieval
  – Familiarity-based retrieval?
  – Sensitive to target probability
    • More active when old:new ratio is low (Herron, 2004)

• In contrast, hippocampal correlated system is associated with recollection (vincent 2006)