NEUROSCIENCE

NAVIGATION

An in-depth look into how we navigate the world

Information sourced from Dr. Marlene Behrmann's publications
https://www.cmu.edu/dietrich/behrmannlab/Publications/index.html

Navigation is essential to humans carrying out their daily activities. Visual navigation uses both the vestibular system and muscular movements to determine environmental orientation.

Path integration is key to navigation

- Helps in determining one's position based on internally generated self-motion signals
- Derives current displacement from one's last known position

BRAIN REGIONS

OCCIPITO-TEMPORAL & PARAHIPPOCAMPAL REGION

- Recognizes previous, familiar landmarks

RETROSPINAL CORTEX

- Encodes & derives directional information from landmarks

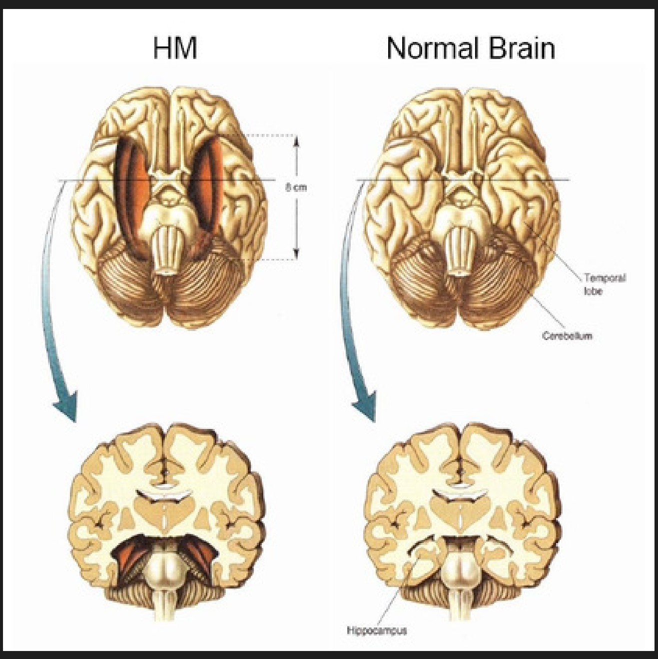
MEDIAL TEMPORAL LOBE

- Represent newly learned routes & environment

POSTERIOR PARIETAL CORTEX

- Represents location of objects with respect to themselves

DR. BEHRMANN'S RESEARCH



Path-integration deficits

Medial temporal lobe injury plays a key role in path integration deficits along linear paths

This is studied with partial medial temporal lobectomies

Developmental topographic disorientation (DTD)

The functional properties of the posterior parietal cortex, retrospinal cortex, & other brain areas is compared in patients with DTD

This is studied localization and fMRI adaptation experiments

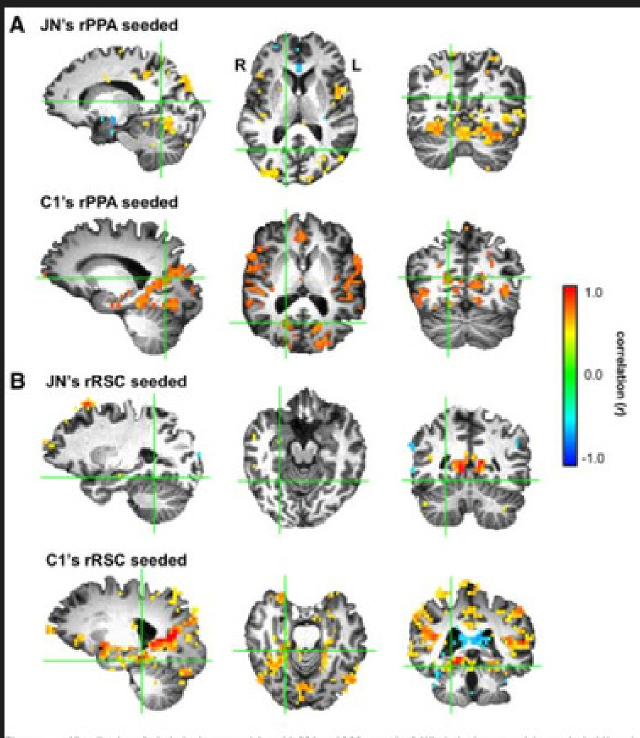


Figure 7. Visualization of whole-brain connectivity with PPA and RSC as seeds. ***A***, Whole-brain connectivity results in J.N. and C1 when the right PPA is seeded. The green crosshairs denote the center of each subject's respective right RSC. Unlike C1, there were no voxels near RSC showing correlation to PPA responses in J.N. ***B***, Similarly, the correlation results in J.N. and C1 are shown when the right RSC is seeded. The green crosshairs denote the centers of J.N. and C1's respective right PPA. Again, unlike C1, there were no voxels near J.N.'s PPA showing correlation to RSC responses.