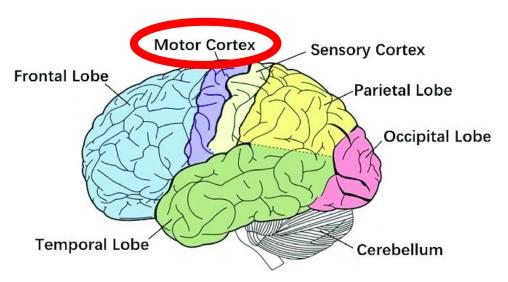


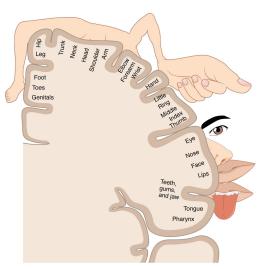


Function-Based Representations in the Brain's Sensorimotor System

Calla Doh SAMP LAB 2022

Background Information





Two types of organizational methods: somatotopic (body part) representation and function-based representation

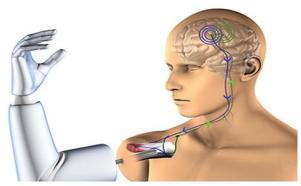
Research Question:

Which brain motor regions are organized by **function** and not by body part?

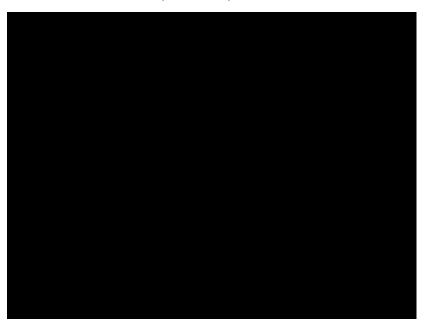
Why is this research important?

Cognitive models!



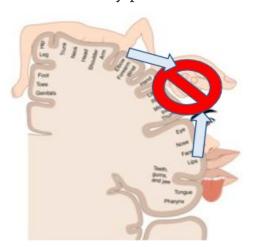


Focus of the Study: Individuals Born Without Hands (IDs)

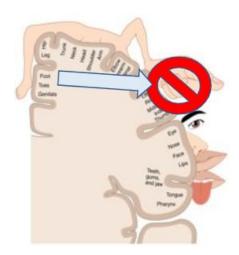


Motor Region Reorganizes in People Born Without Hands (IDs)

Somatotopic organization: organized by body part



Function-based representation: organized by how the body part is used



Functional Magnetic Resonance Imaging (fMRI) Neuroimaging Experiment

Participants: 14 controls + 3 individuals born without hands (IDs)

Experimental procedure:

- Whole-brain fMRI scanning
 - Flex R/L hand/foot, move R/L shoulder, move whole stomach, move whole mouth



My Role at the Internship

Weeks 1-5

- Comprehend existing literature on sensorimotor systems
- Learn how to use Brain Voyager and Matlab (coding)
- Edit and process the controls' and IDs' data
- Present a paper from a journal to the lab

Weeks 6 - present

- Perform analysis on the data
- Compare regions of activation between controls & IDs
- Compose a scientific paper on my findings

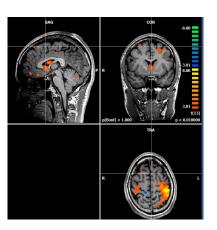




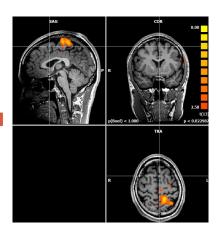


Data Analysis

- Identify regions of hand-selectivity in the controls
- 2. Identify regions of foot-selectivity in the IDs
- 3. Overlap = function-based representation

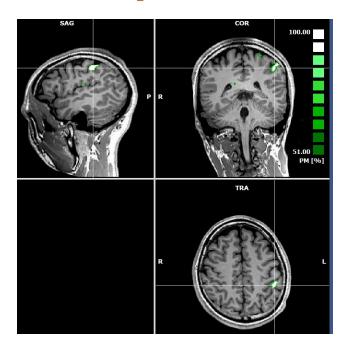


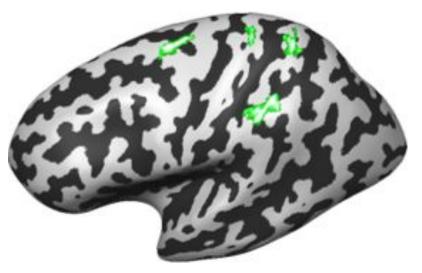
Hand selectivity in controls
Hand > other body parts



Foot selectivity in IDs Foot > other body parts (excluding hand)

Data Analysis





Overlap map

Regions of Function-Based Representations



The dorsal premotor cortex, PPC (Superior & inferior parietal lobule), and secondary somatosensory cortex

Lessons I Learned

- 1. When reading papers and analyzing data, remain SKEPTICAL! Ask questions.
- 2. Explore literature from all perspectives when researching a scientific question.
- 3. Mistakes will happen; it's how you respond to a mistake that determines the outcome.
- 4. Learn to code it is a highly versatile and essential skill.

THANK YOU!!!!

From the SAMP Lab:

- Dr. Ella Striem-Amit
- Flo Martinez Addiego
- Viveka Sinha
- Sam Namian

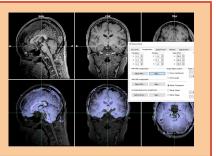
Dr. Krug
My parents:)



Preparing the Data for Analysis

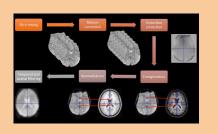
COREGISTRATIONS

Transforming a participant's brain to a template brain



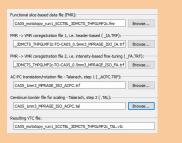
PREPROCESSING

cleaning up a photo by separating noise from the BOLD signal



CREATING VTCs

Used in analysis
"Checkpoint" for
coregs +
preprocessing



MATLAB SCRIPTS

Final steps before statistical analysis

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Statistical Analysis

- Testing the relative significance of a task to brain activation within a particular region
 - GLM (general linear model)

