Mapping Spatial Overlap in Neuronal Networks Revealed in Keyword-based Meta-analyses

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Background

Neuroscientists try to understand **verbal ability** and **finger dexterity** through **brain-imaging studies** .

- Most coordinate-based meta-analyses are only based on single keywords used frequently in publications
- Lack of a **universal vocabulary** to describe these domains creates gaps in our understanding of **brain-behavior relationships**

NeuroQuery

Maps brain areas for a given query

Uses semantic relations between keywords

Can be applied out of sample

Objectives

1. To **map the brain** to identify regions involved in verbal ability and finger dexterity
2. To evaluate the **overlap** between the two domains

Methods

Analyze Activation Likelihood Estimates (ALEs)
Gather keywords related to verbal ability and finger dexterity from ALE meta-analyses

Eliminate Overlap from Keyword Maps
Group together subdomains of keywords based on predictions from NeuroQuery

Investigate Similarities Between Keyword Maps and Domains
Calculate Jaccard Index and carry out Principal Component Analysis (thresholded at $|z| \geq 3$)

Union of Brain Maps
Created for keywords that share a high Jaccard Score

NeuroQuery is useful for mapping spatial overlap across various brain-behaviour relationships as identified in fMRI studies.

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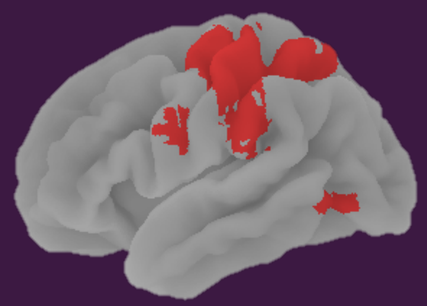
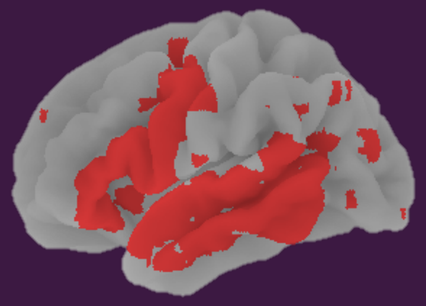
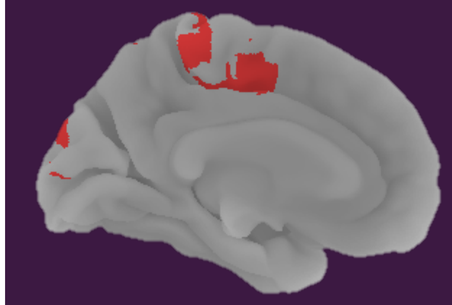
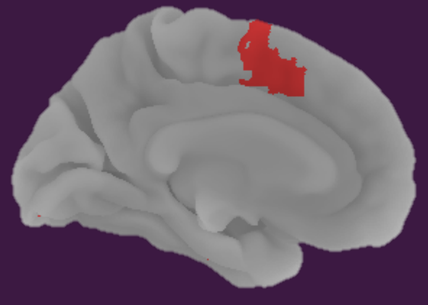
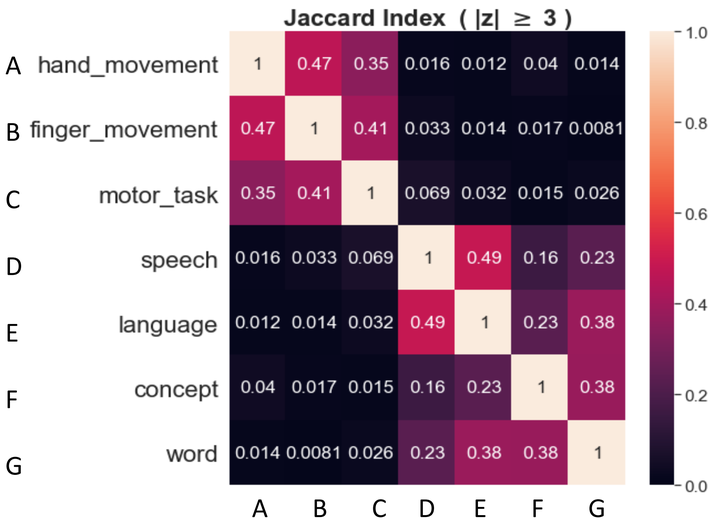

Hand Movement LH Lateral

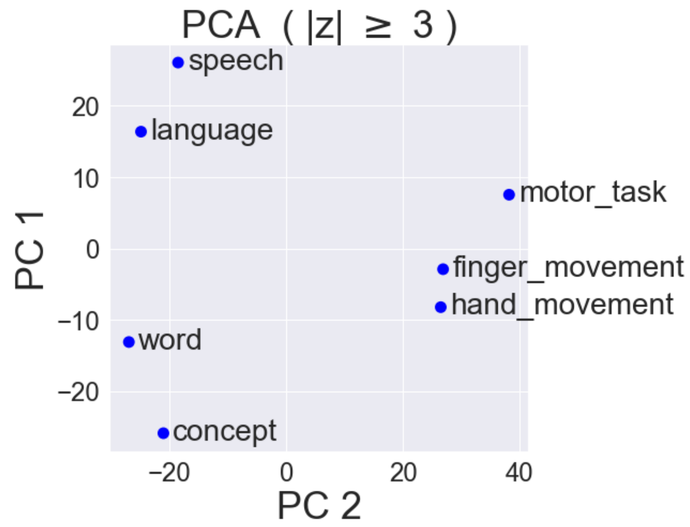

Language LH Lateral


Hand Movement LH Medial


Language LH Medial

Results





Take Home Messages

Neuroscientists will gain a better understanding of the neural systems contributing to verbal ability and finger dexterity

Ultimately aids children with Autism, Cerebral Palsy and Acquired Brain Injuries, who have varying difficulties with these two domains

Acknowledgements

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