DECODING **ACTION** AND **OBSERVATION** OF **HAND GESTURES** IN THE HUMAN **BRAIN**

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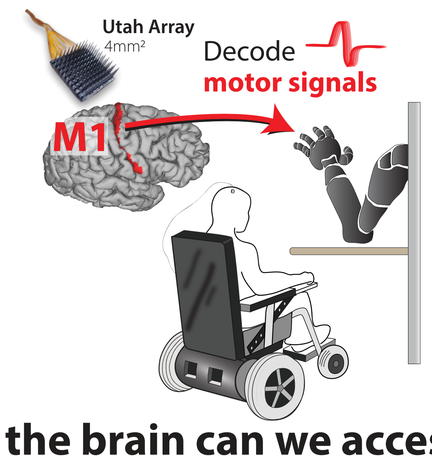
*EQUAL CONTRIBUTION

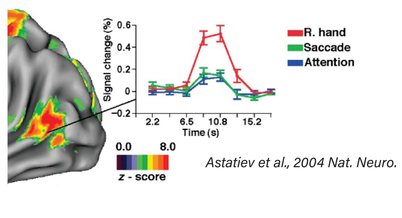
1 Localizing **multisensory hand** BCI sites

Hand use is **multisensory**

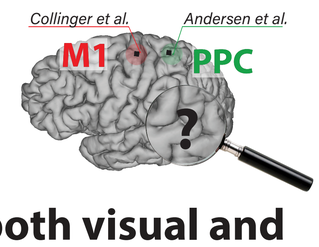
Limited spatial coverage of intracortical **BCI technology**



Lateral occipitotemporal cortex is activated by **hand actions**

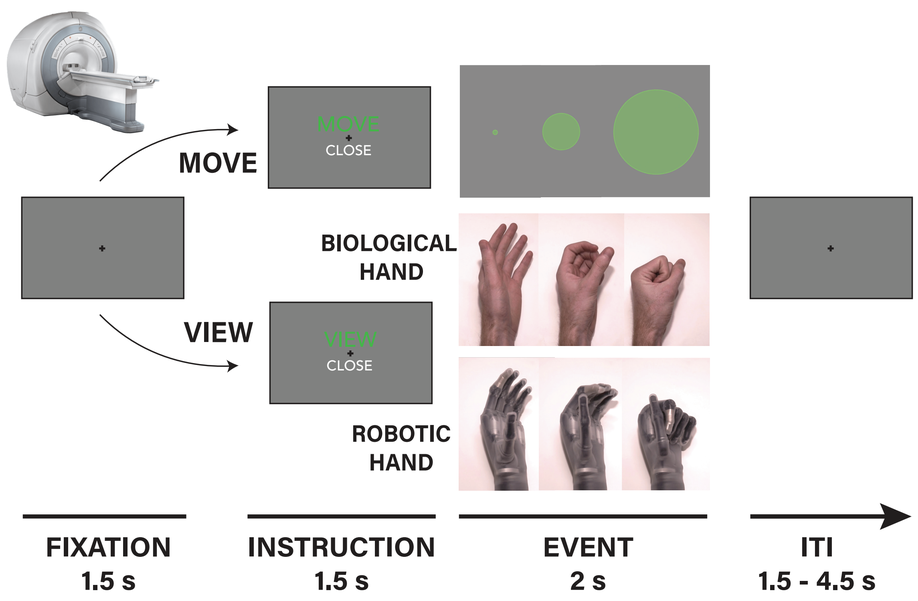


Astatiev et al., 2004 Nat. Neuro.



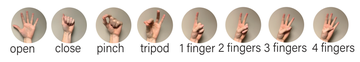
Where in the brain can we access both visual and motor aspects of hand representation?

2 Our approach: **fMRI experimental design**



CONDITIONS

- 8 **MOVE** hand gestures



- 8 **VIEW biological hand** condtions

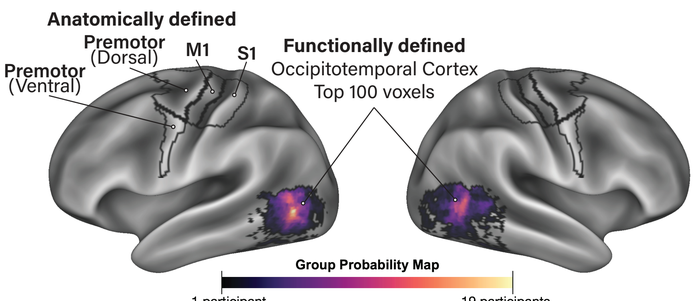
- 4 **VIEW robotic hand** conditions

SCAN PARAMETERS

- 3T fMRI study
- N=60
- 20 conditions, 3 reps per run, 6 runs
- 2^3 mm isotropic, TR = 1.5s

3 **Motor** and **visual hand activity**

Defining regions of Interest

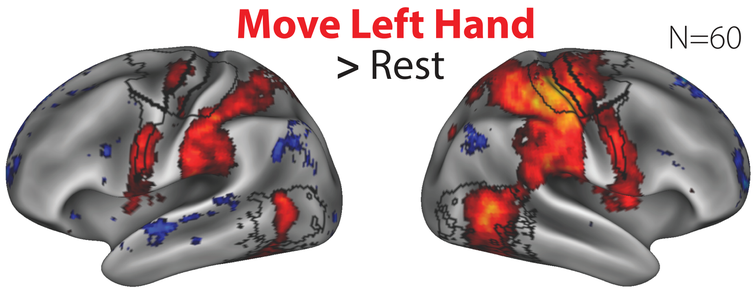


OTC visual localizer

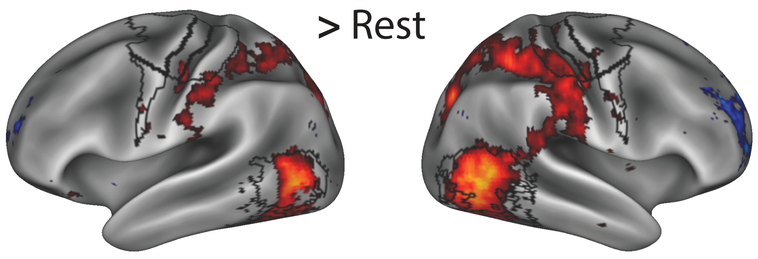
Hands+Tools > Objects + Abstract Visual

Move Left Hand > Rest

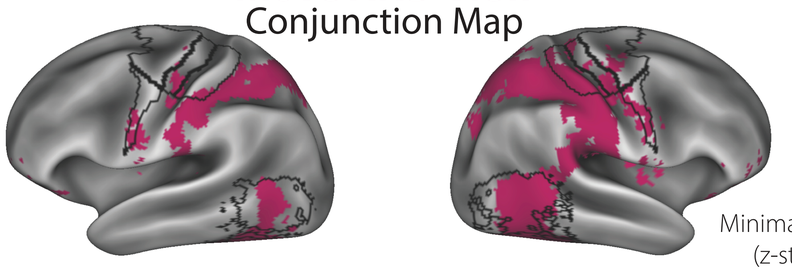
N=60



View Left Hand > Rest



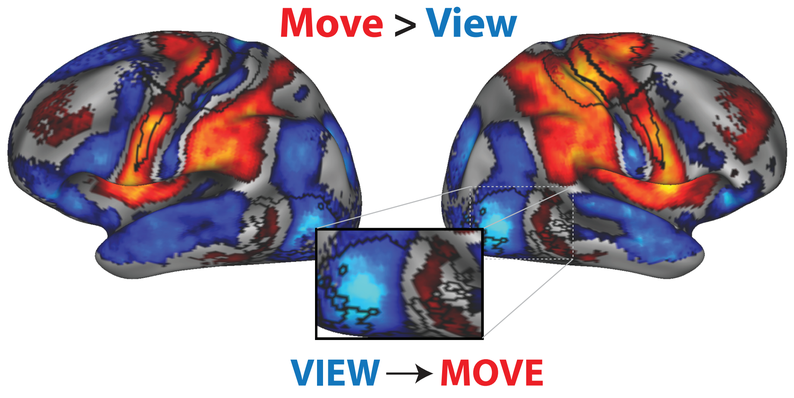
Move AND View Conjunction Map



8.97
3.1
-3.1
-5.36

Minimally thresholded (z-statistic > 3.1)

Move > View



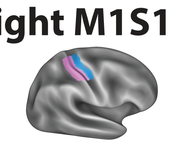
9.45
2
-2
-8.45

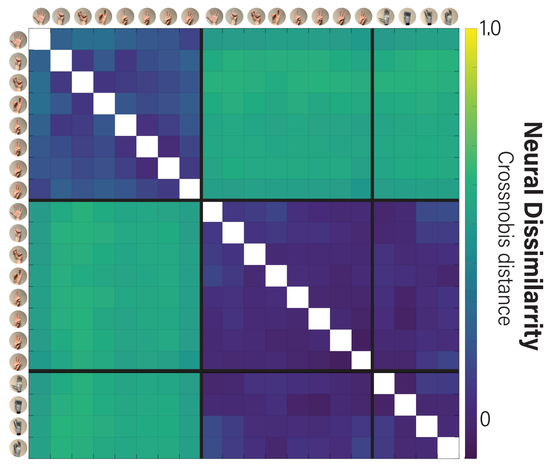
VIEW → MOVE

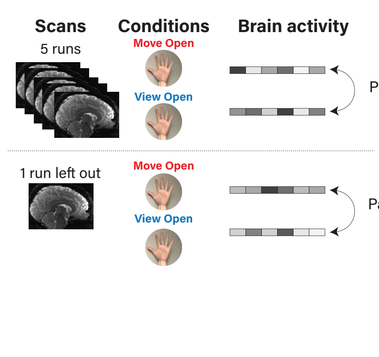
4 **Action-observation representational structure**

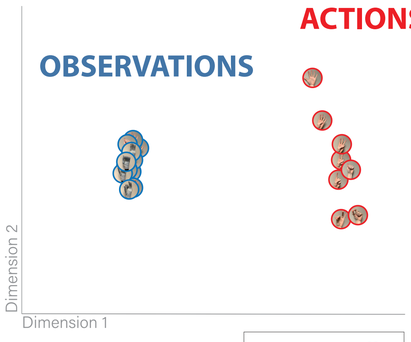
How similar is the representational structure between visual and motor regions?

Right M1S1

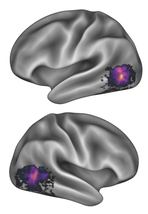


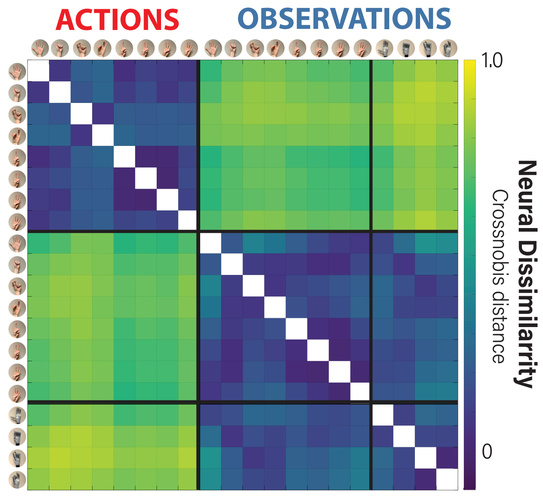


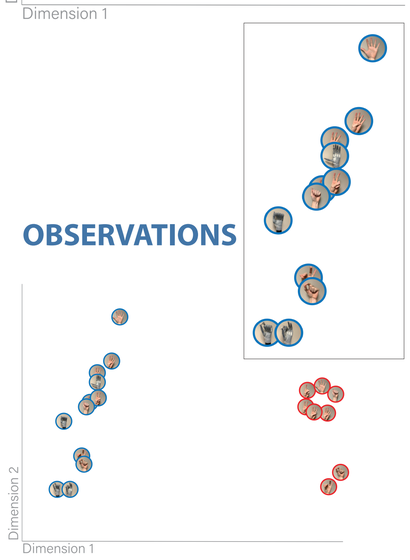


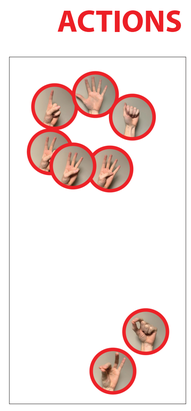


Bilateral OTC

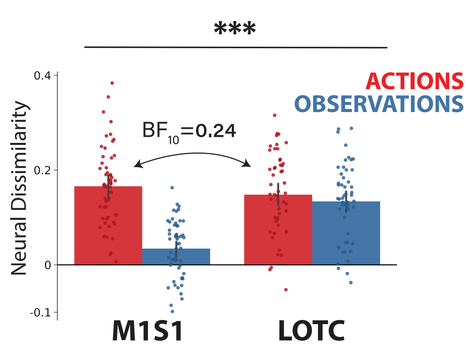




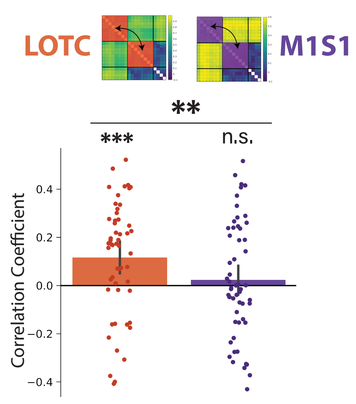




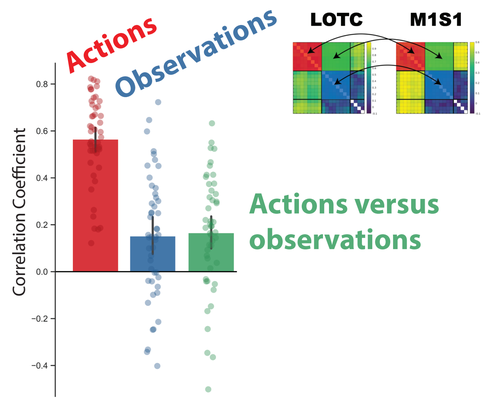
Similar action decoding in LOTC as M1S1



LOTC has increased visuomotor correspondence

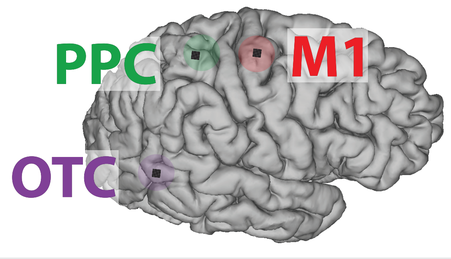


LOTC action representational strucuture similar to M1S1



5 Takeaways: Should **occiptiotemporal cortex** be a **future BCI implant site**?

- Lateral occipitotemporal cortex (LOTC) is activated by both actions and observations of hand gestures
- LOTC contains an **action** (anterior) and **observation** (posterior) **spatial organization**
- Similar action decoding in LOTC as sensorimotor cortex
- LOTC has increased visuomotor correspondence
- LOTC action representational structure similar to sensorimotor cortex



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