

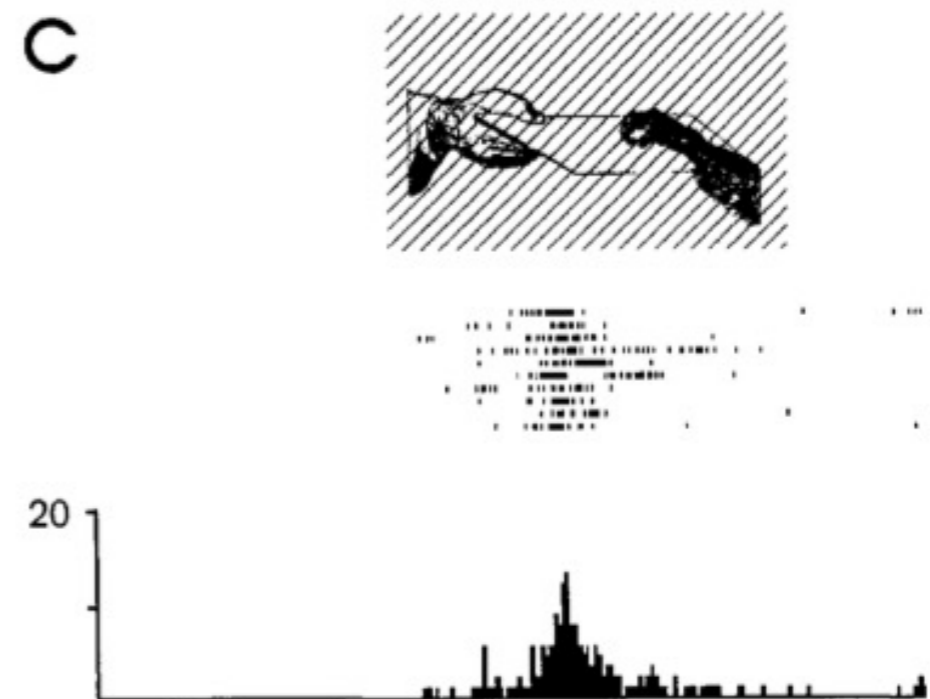
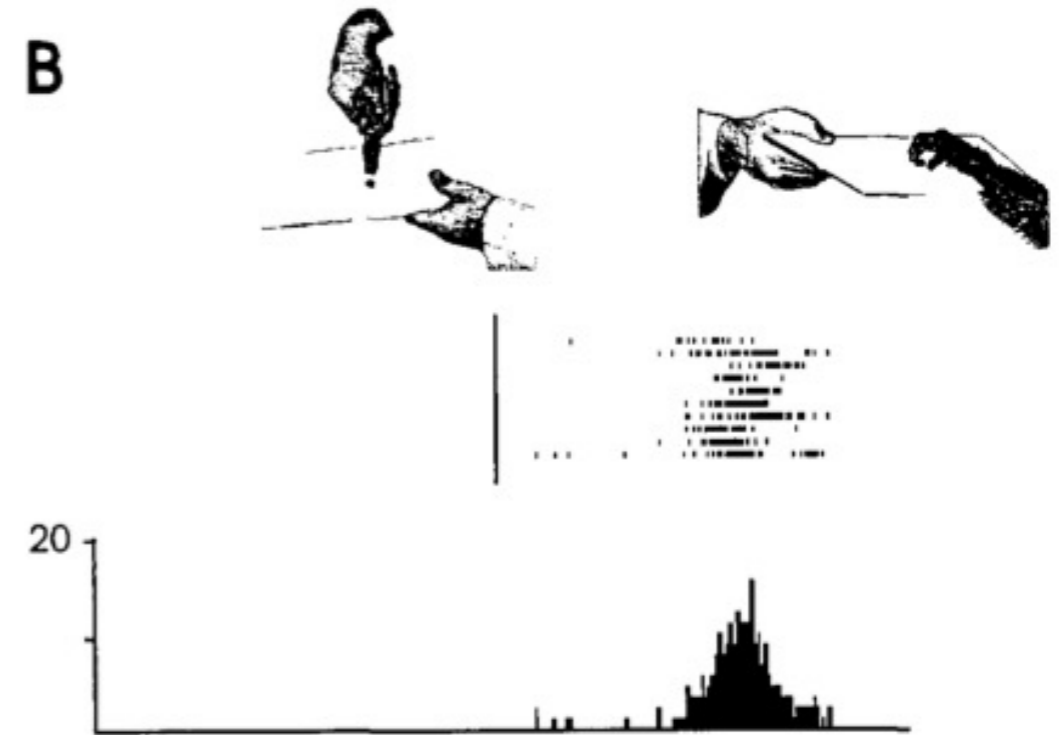
Affective and cognitive empathy are two sides of the same coin

What we talk about when we talk about empathy

The type 1 stuff: mirror neurons

The illusion of dissociable processes

A matching system?



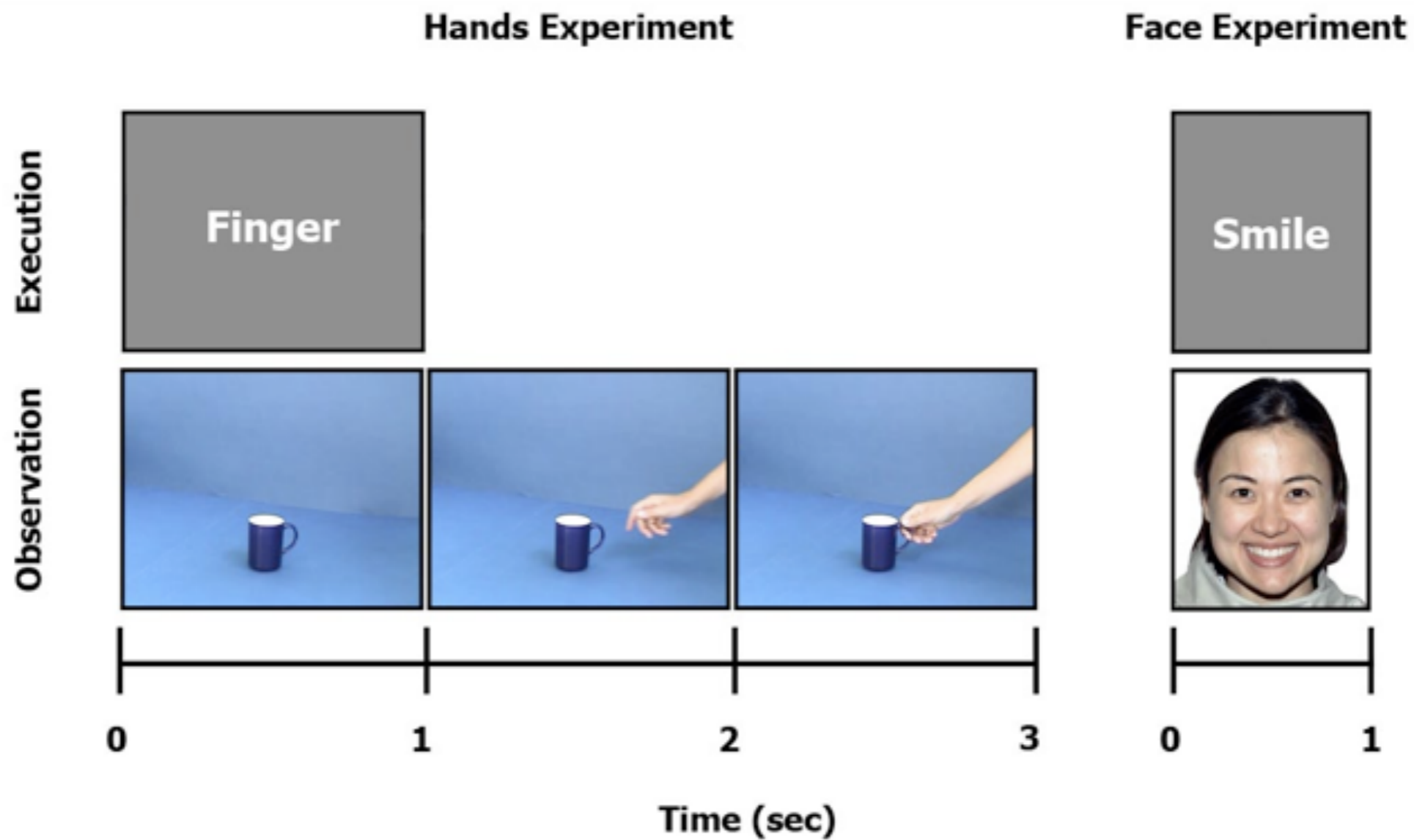
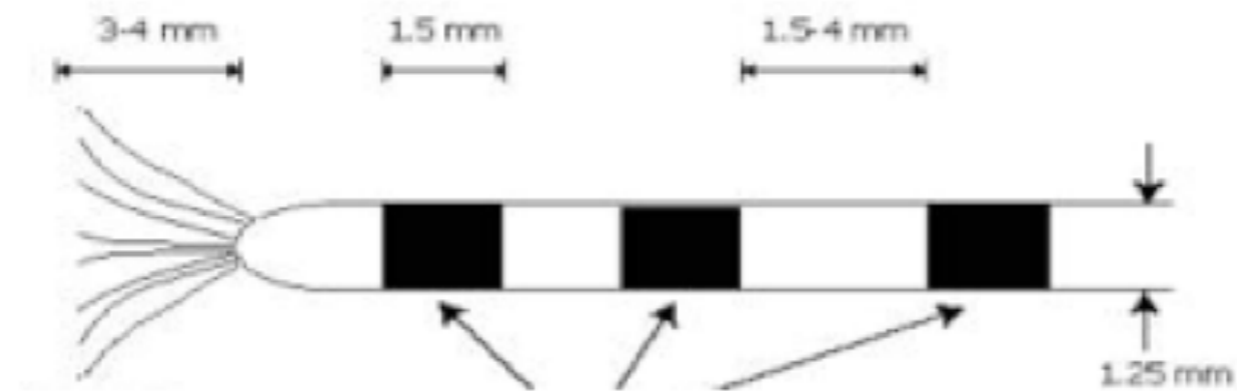
1 s

Mouth mirror neurons

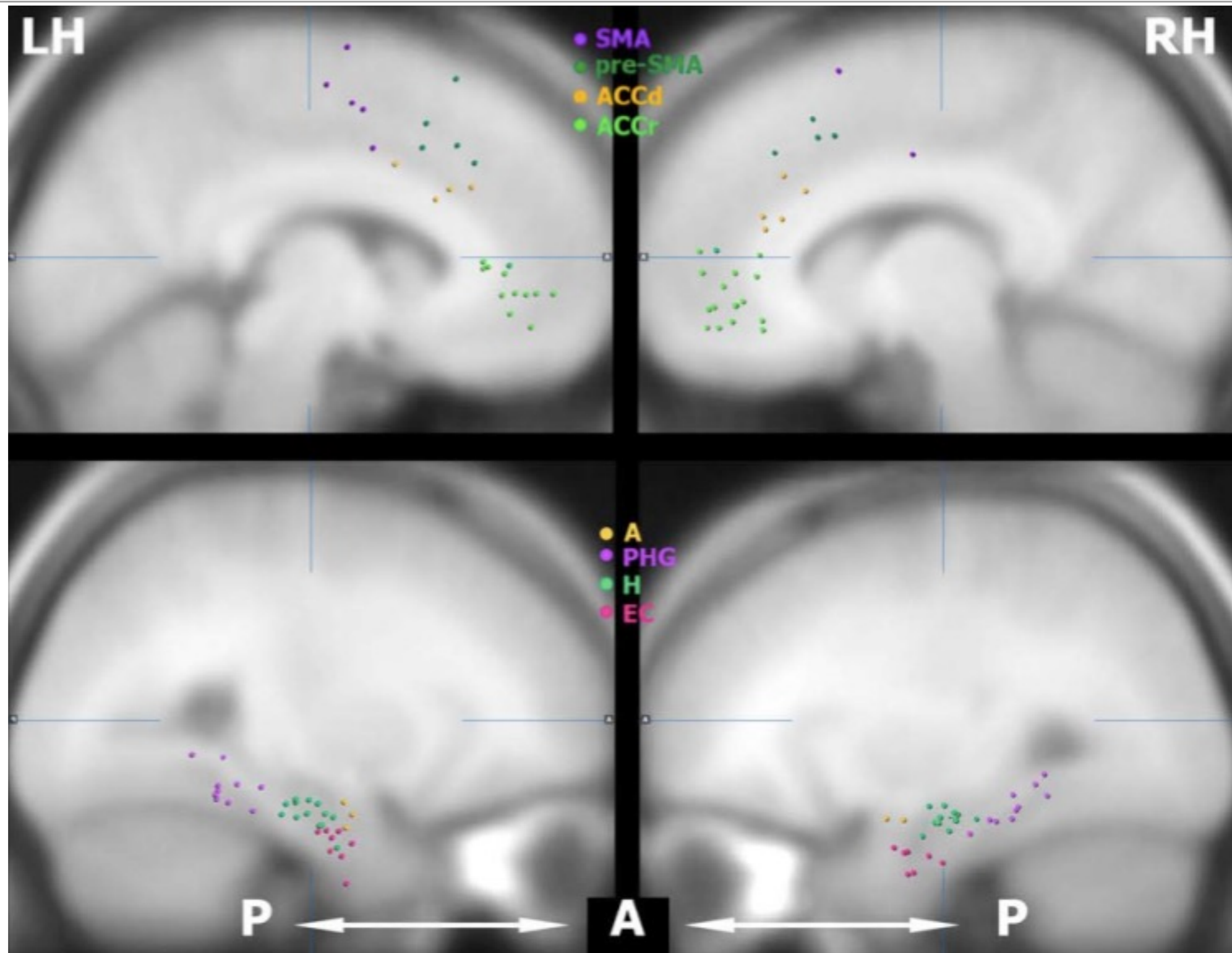


Ferrari et al,
Eur J Neurosci
2003

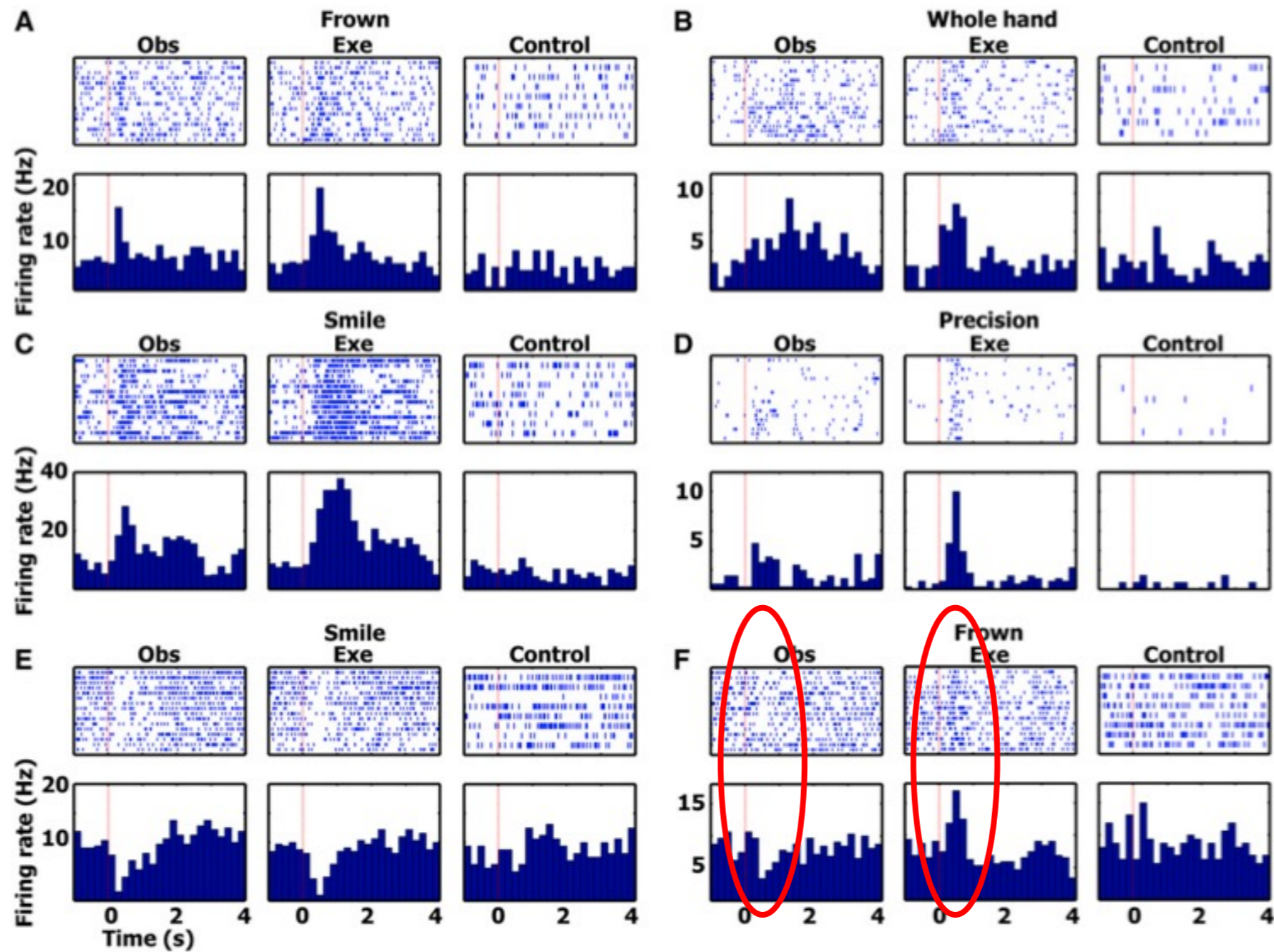
Depth Electrode Recordings in Humans



Recording Sites

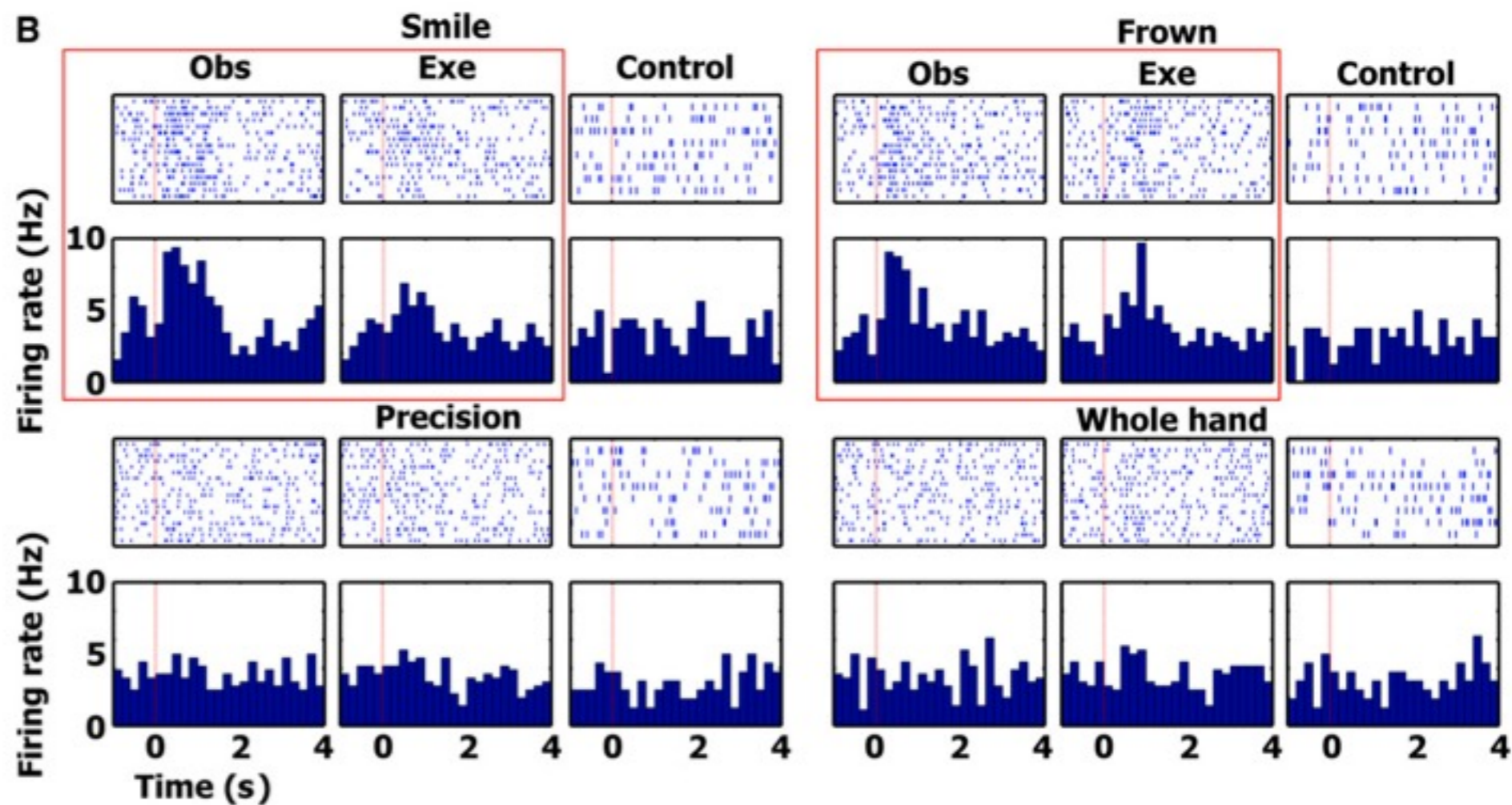


Human Mirror Neurons

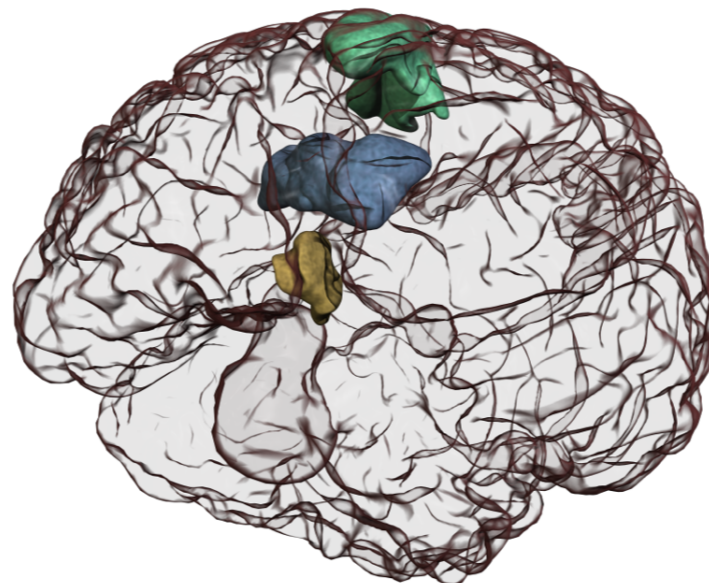
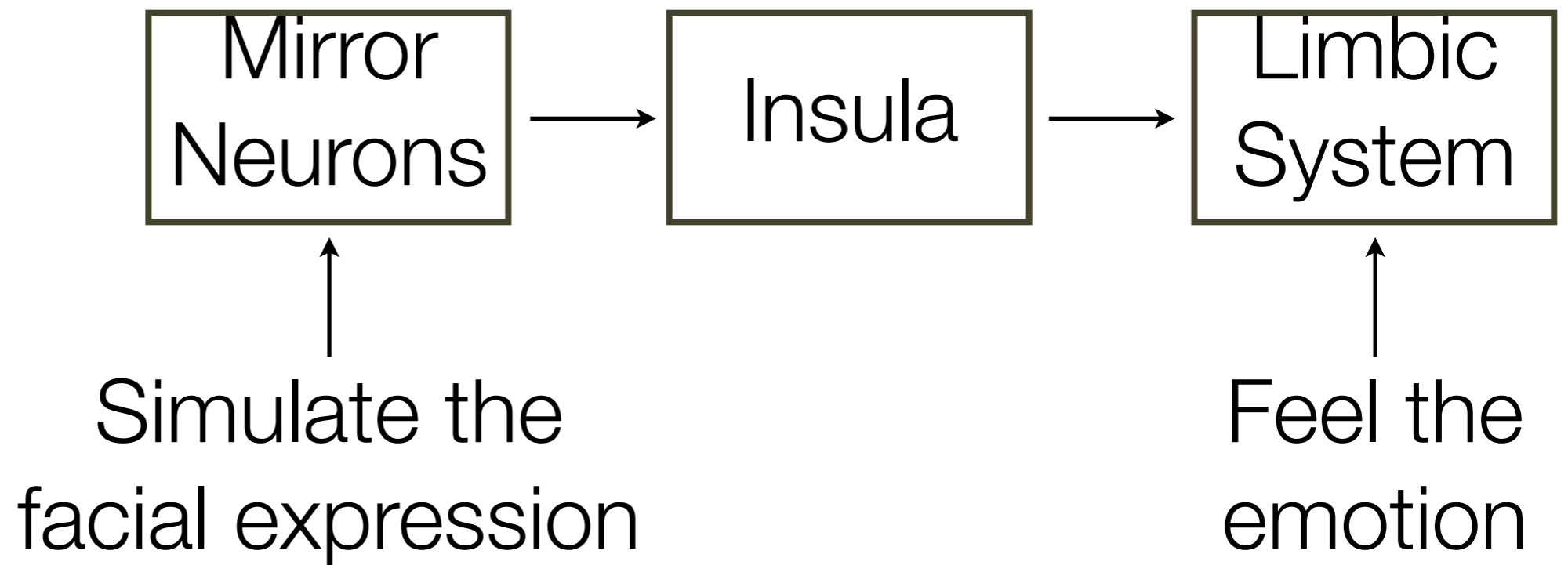


Mukamel et al, Current Biology 2010

Mirror Neurons in Medial Temporal Cortex

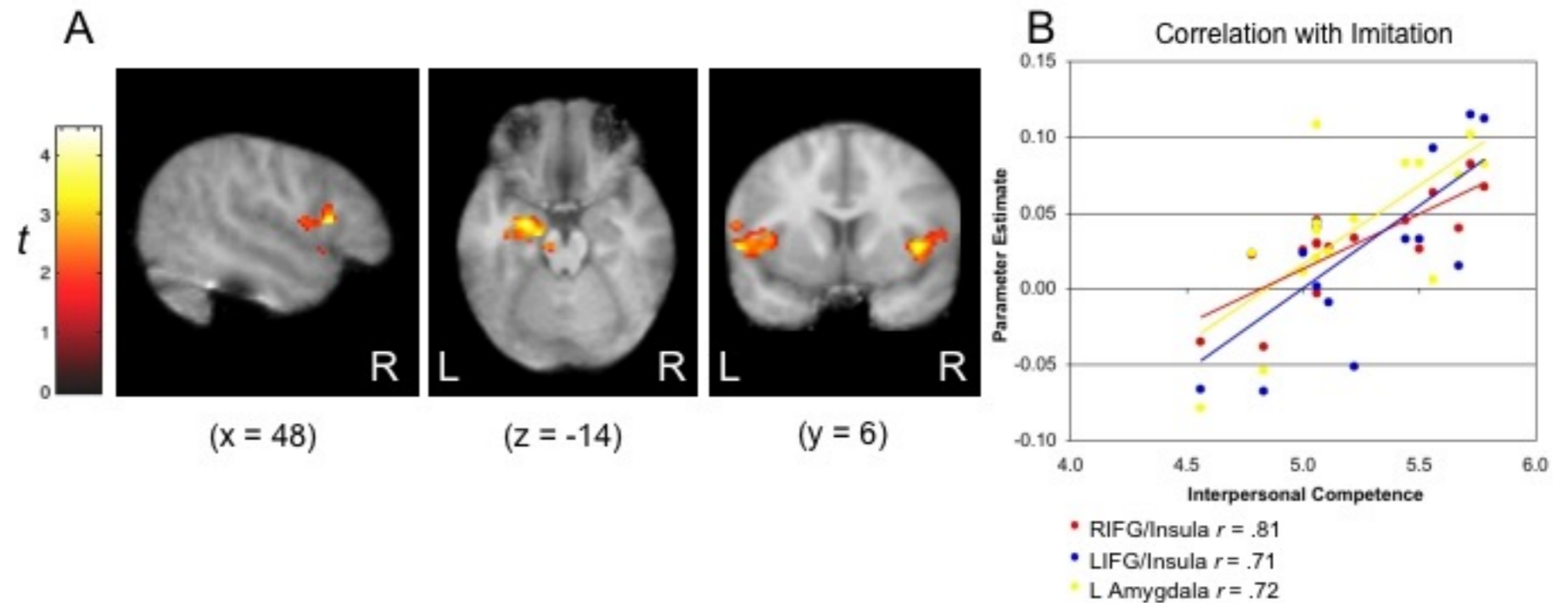


Mirroring Emotions



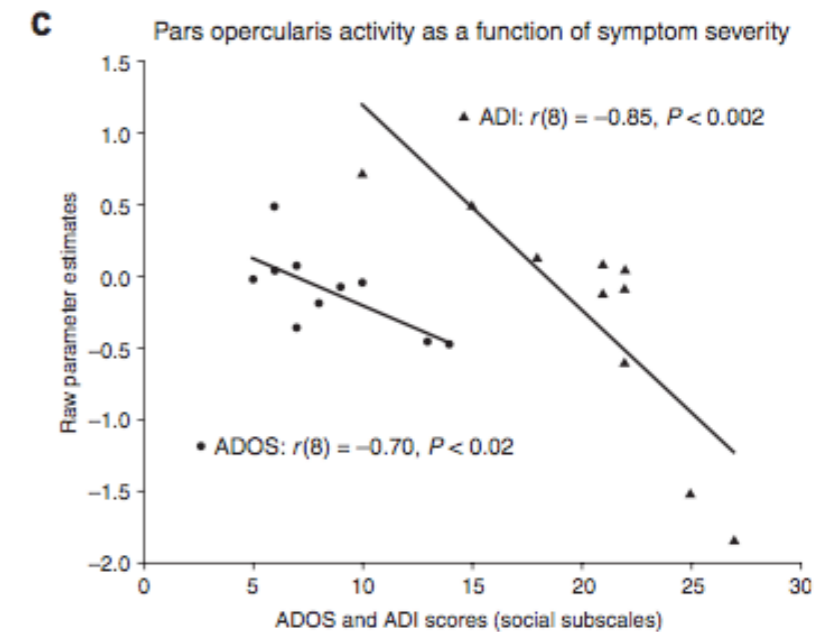
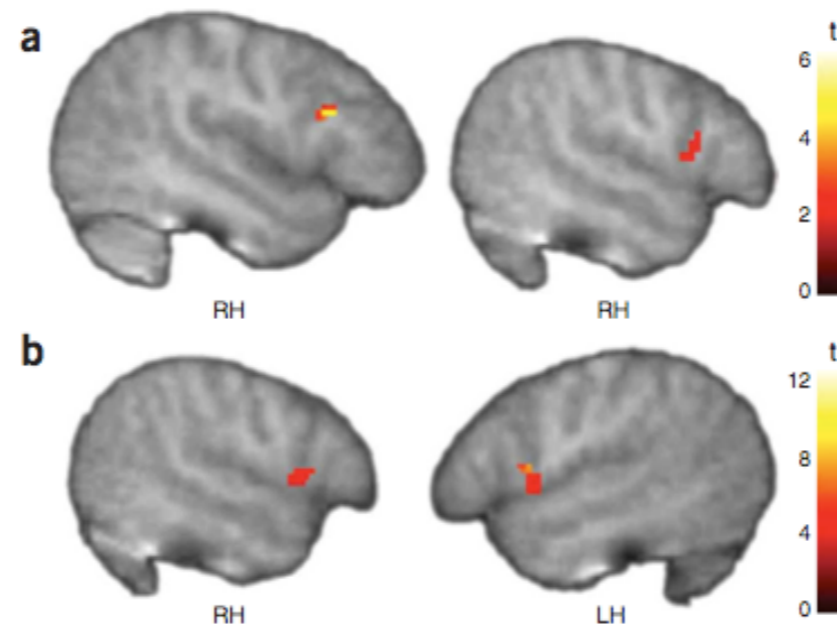
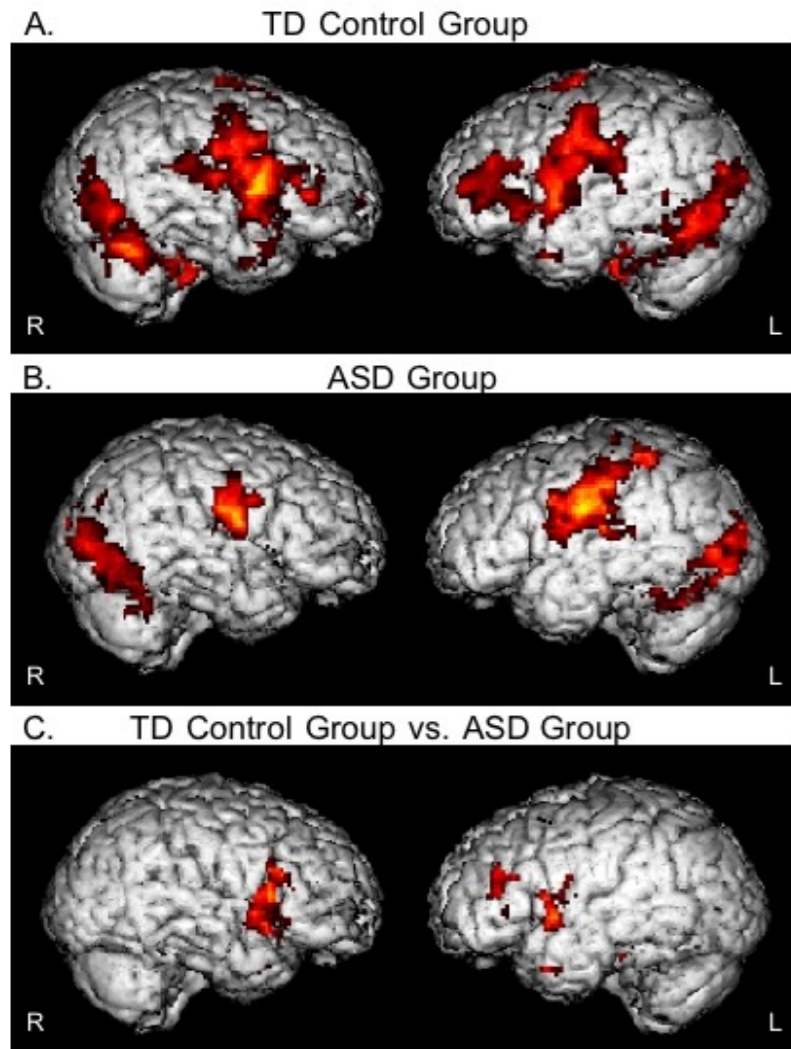
Carr et al
PNAS 2003

Brain-behavior correlations



Pfeifer et al, NeuroImage 2008

Clinical applications: autism, mental health



Dapretto et al, Nature Neuroscience, 2006

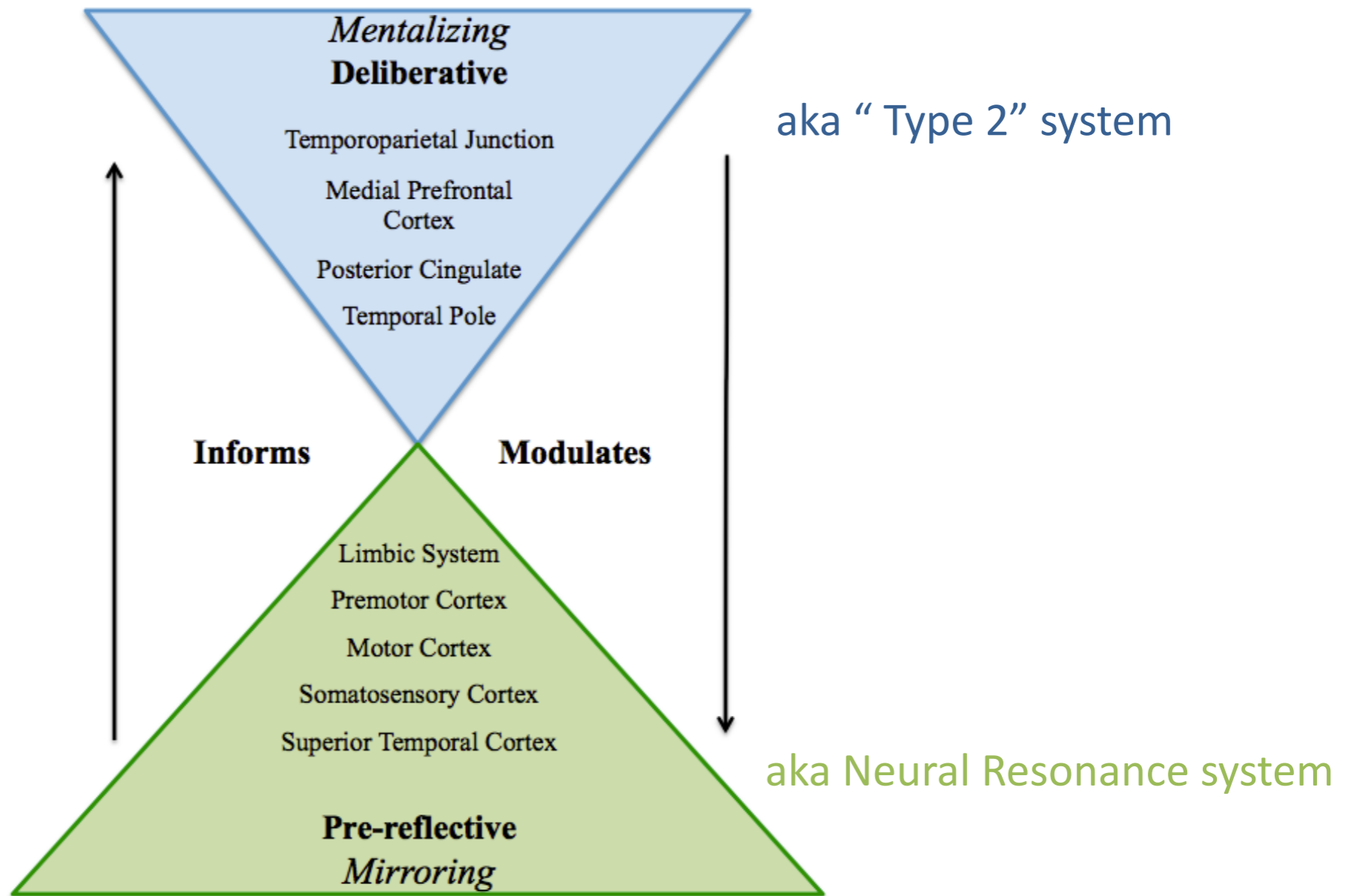
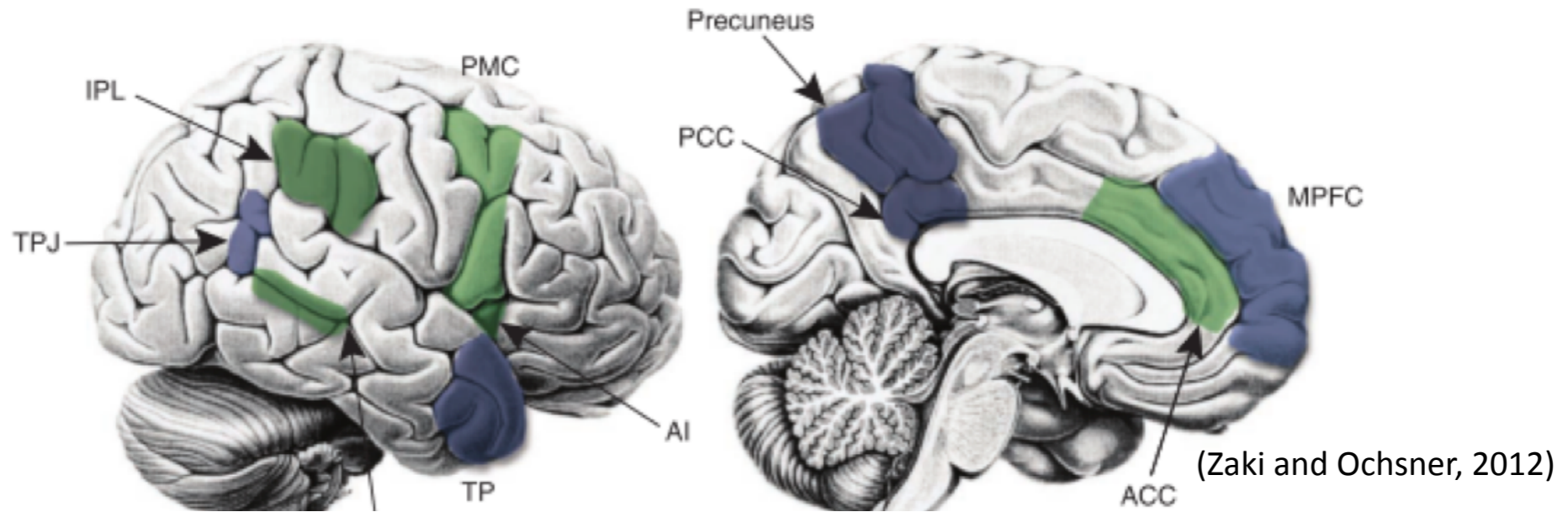
The touch of empathy



Dual Process Models

- Type 1: fast, efficient, stimulus-driven
- Type 2: slow, cognitively laborious, flexible

The tale of two systems

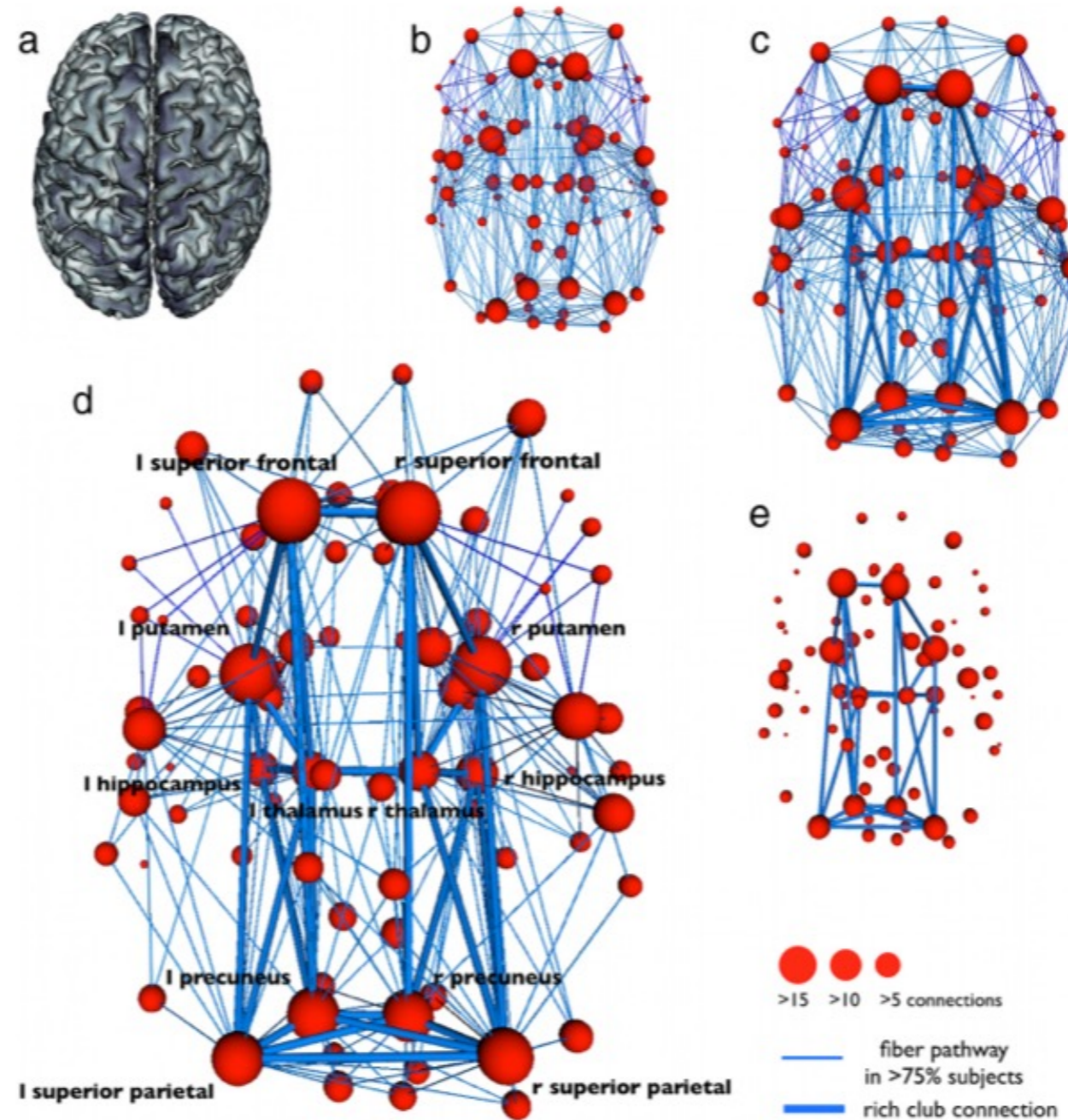


Automatic Imitation in Frontal Patients



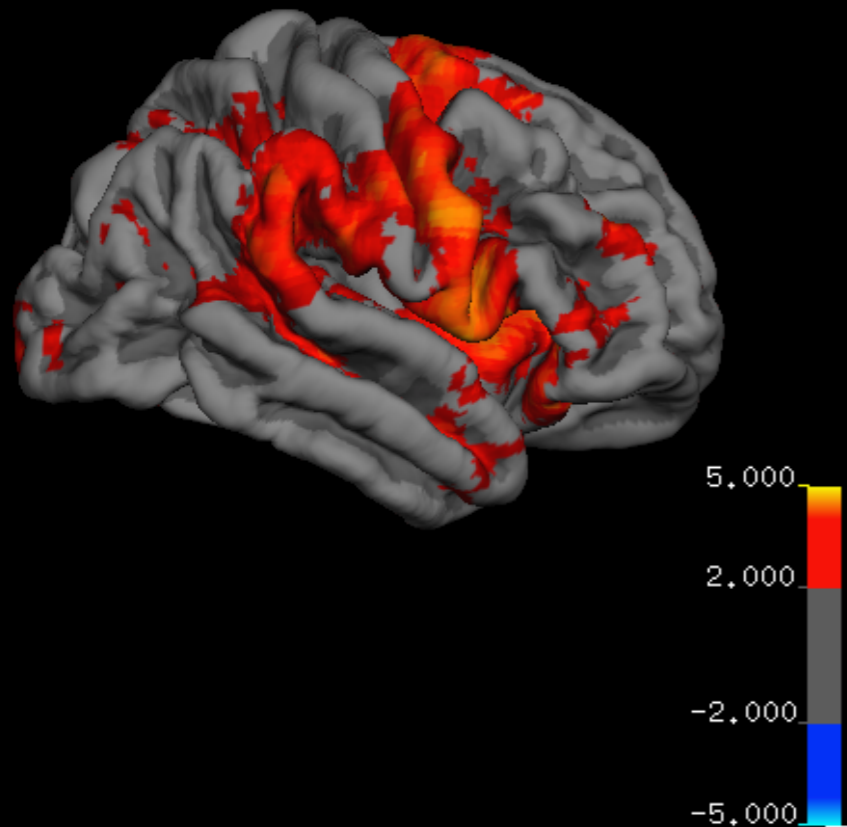
Lhermitte, Ann Neurol 1986

Brain regions are highly interconnected

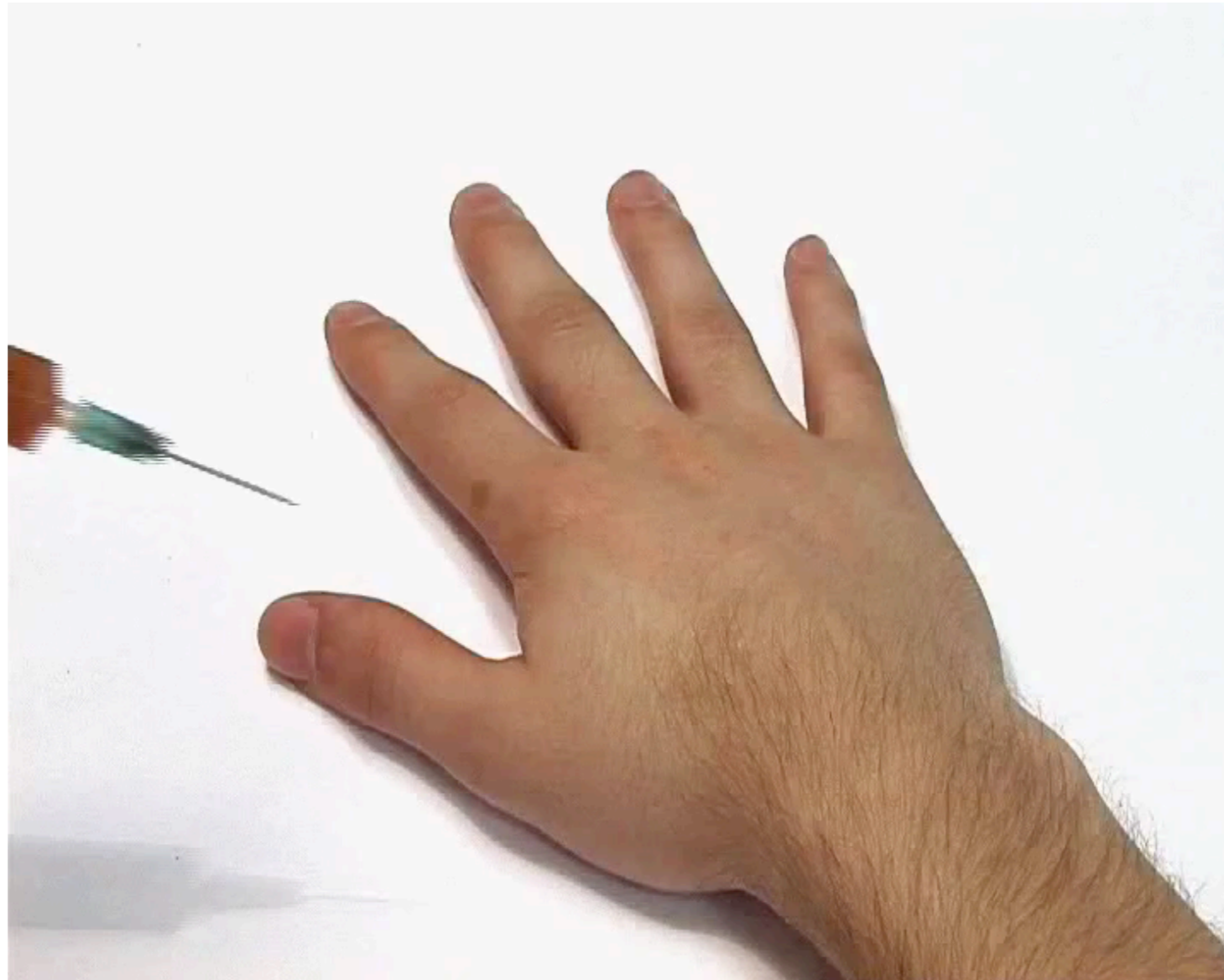


Experimental Question:

Can we predict subjects' prosociality from their brain activity during mirroring/neural resonance tasks?



Mirroring Tasks



Dictator Game



Profiles



This is Andrew Benson

He makes about \$25,000/yr



This is Wendy Lee Huan

She makes about \$26,000/yr



This is Colin Bowler

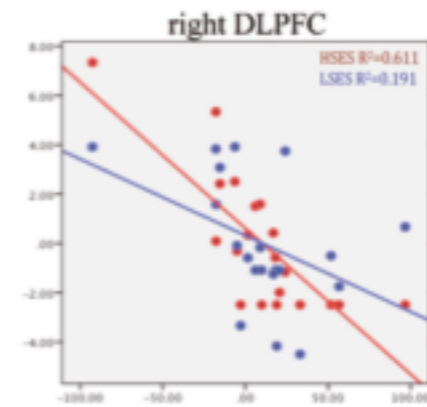
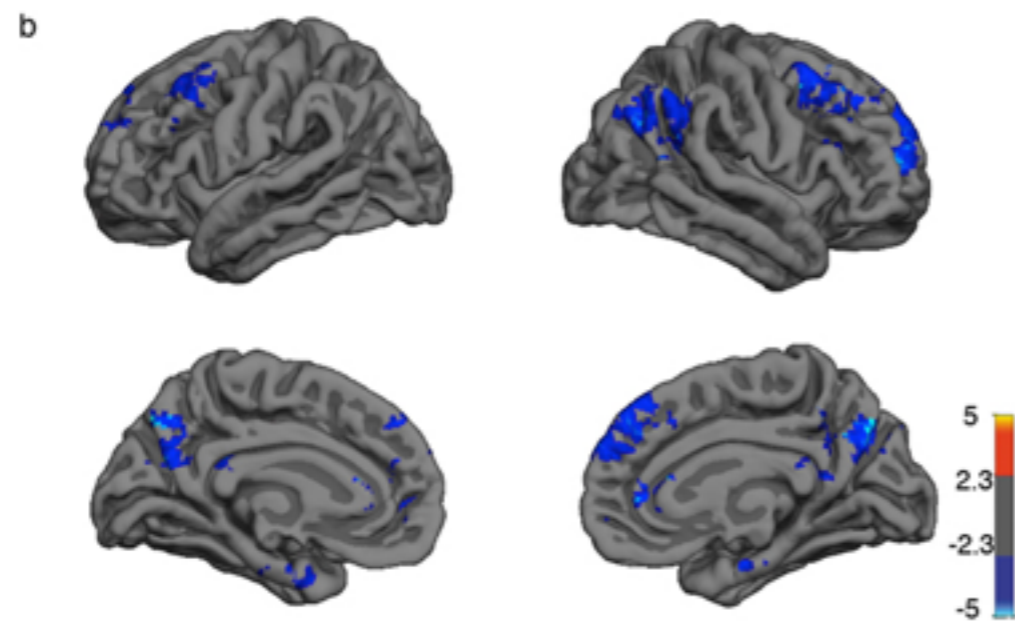
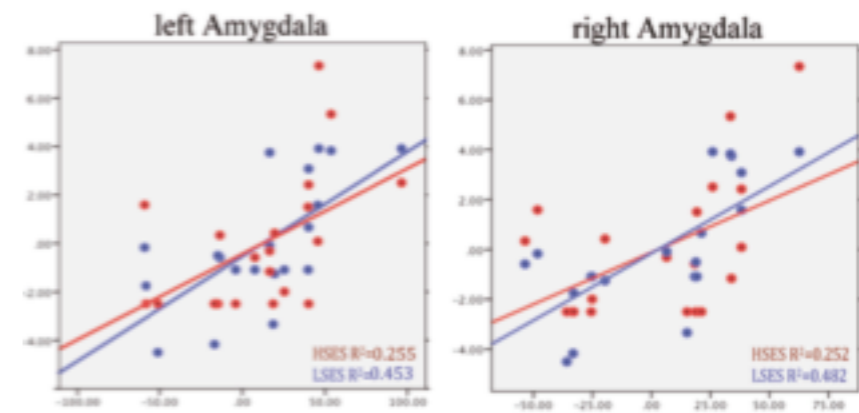
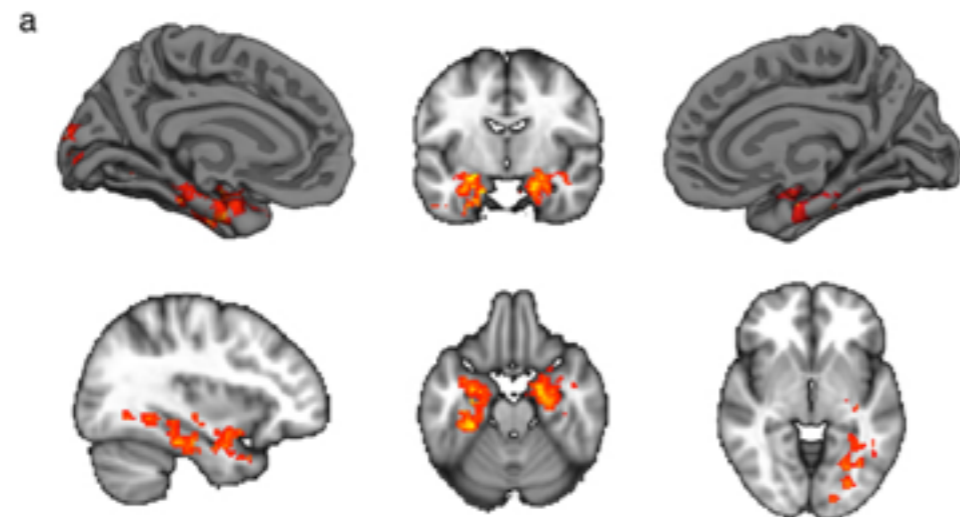
He makes about \$120,000/yr



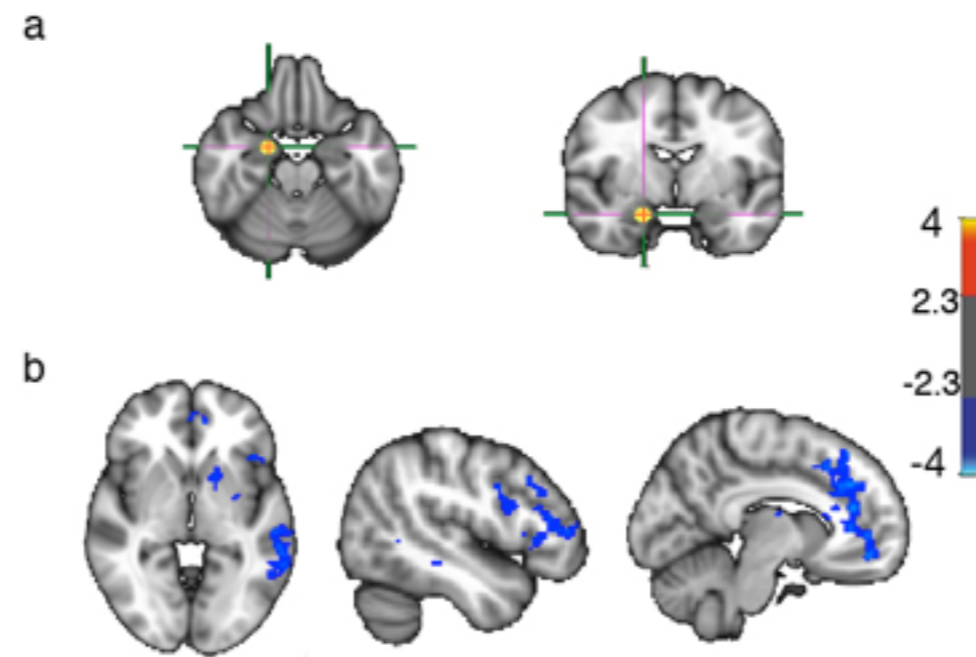
This is Adriana Vasquez

She makes about \$110,000/yr

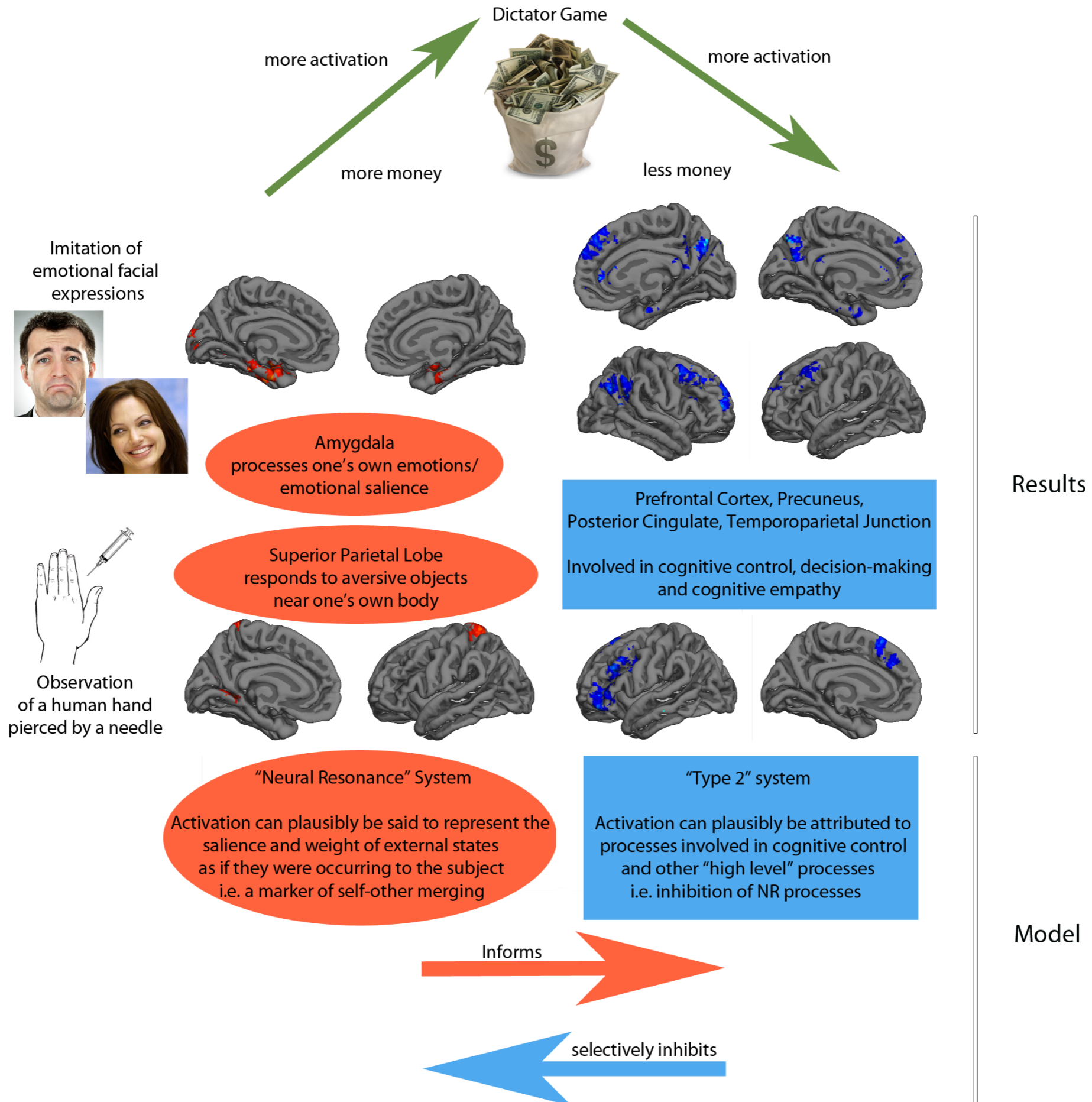
Brain - Behavior Correlations



Correlations between offers and connectivity changes



Brain - Behavior Correlations



Embodied Decisions about People

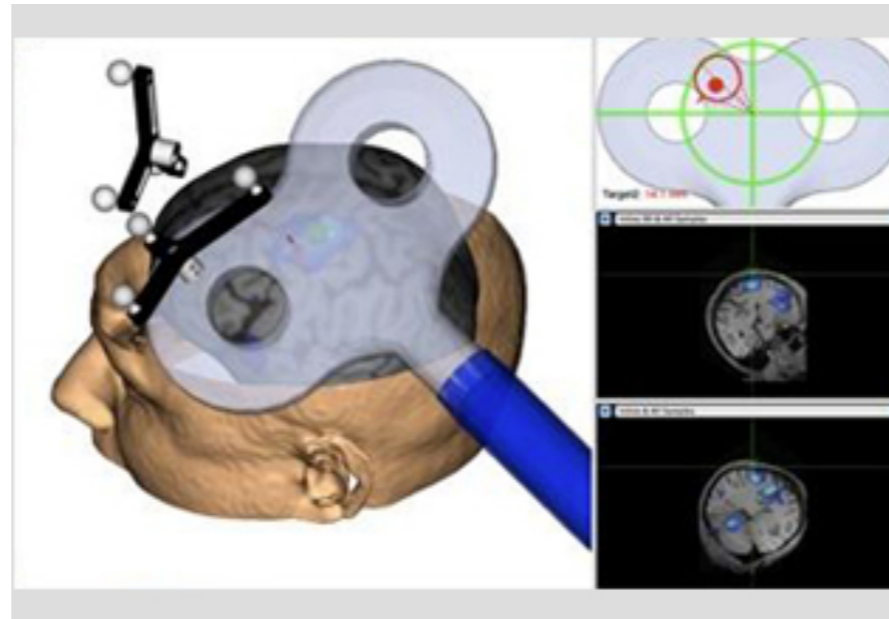


This is Adriana Vasquez

She makes about \$ 110,000/yr

How much \$ would you like to offer?

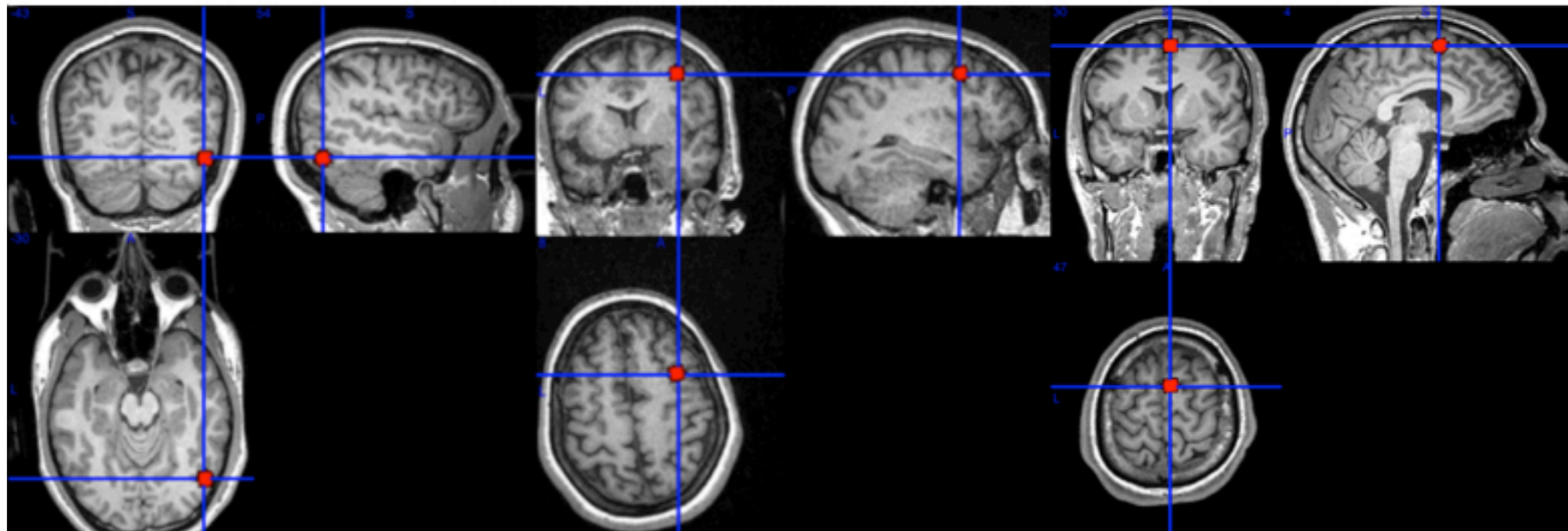
Neuromodulation



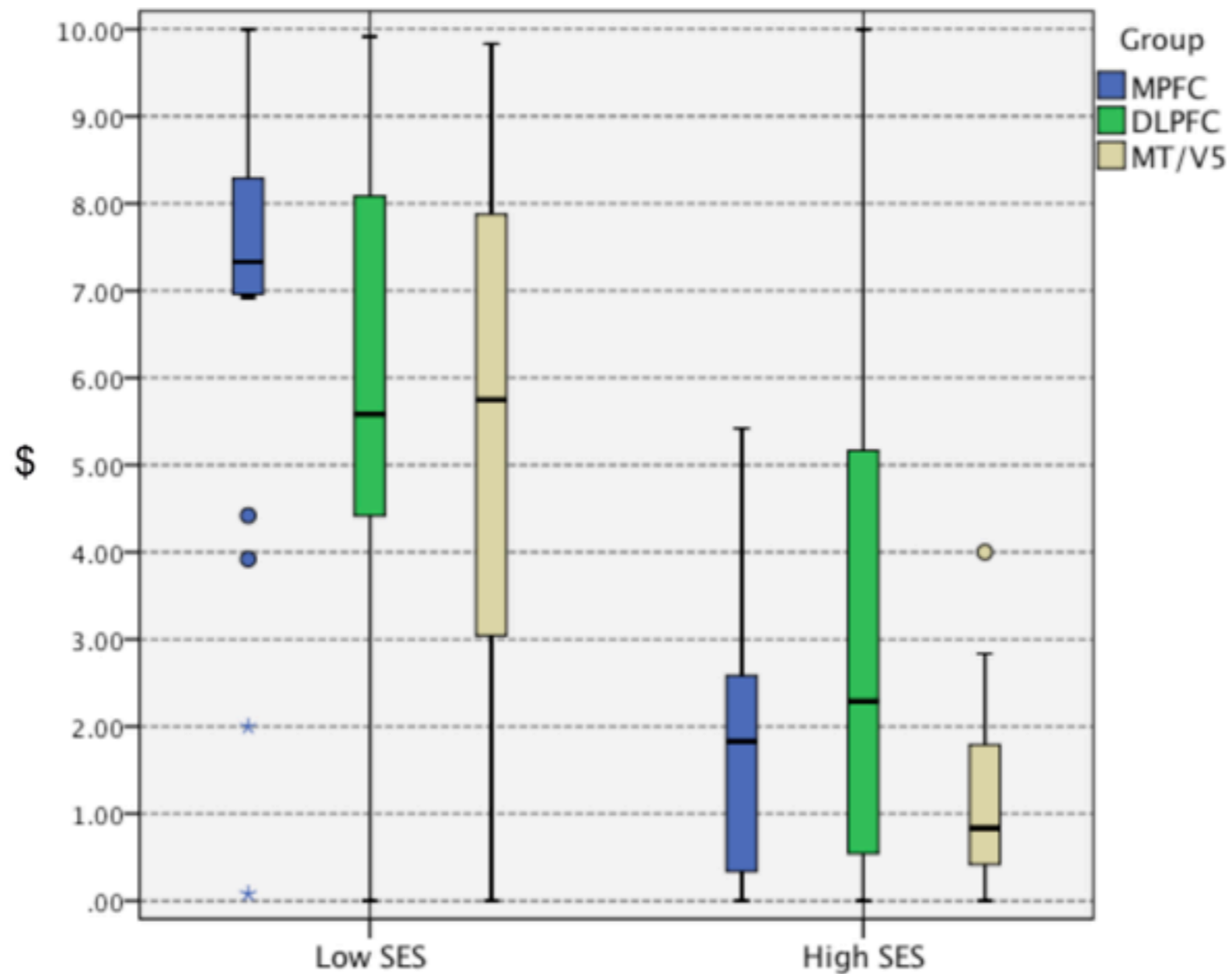
Control
right MT/V5

Test
right DLPFC

Test
right MPFC



Making people more generous with neuromodulation



"Accessible, entertaining, and far-reaching" —*The Wall Street Journal*

MARCO IACOBONI

PICADOR



MIRRORING

People

The Science of Empathy and How
We Connect with Others

Is the emotion/cognition split an
illusion?

Our intuitions are not always reliable:
the case of space maps

Embodied Prosociality

Funded by NIMH (1R21MH097178)