



# The Self in a Social World



# Insights into Autism

Dr Michael Lombardo  
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sensation  
 representations  
**reflection**  
 shared **brain**  
 mind  
 awareness  
 introspection  
 mirroring  
 neuroscience  
 emotion  
 egocentrism  
 interoception  
 mentalizing  
**social-cognition**  
 theory-of-mind  
**fMRI**  
 self  
 autism  
 allocentrism  
 consciousness

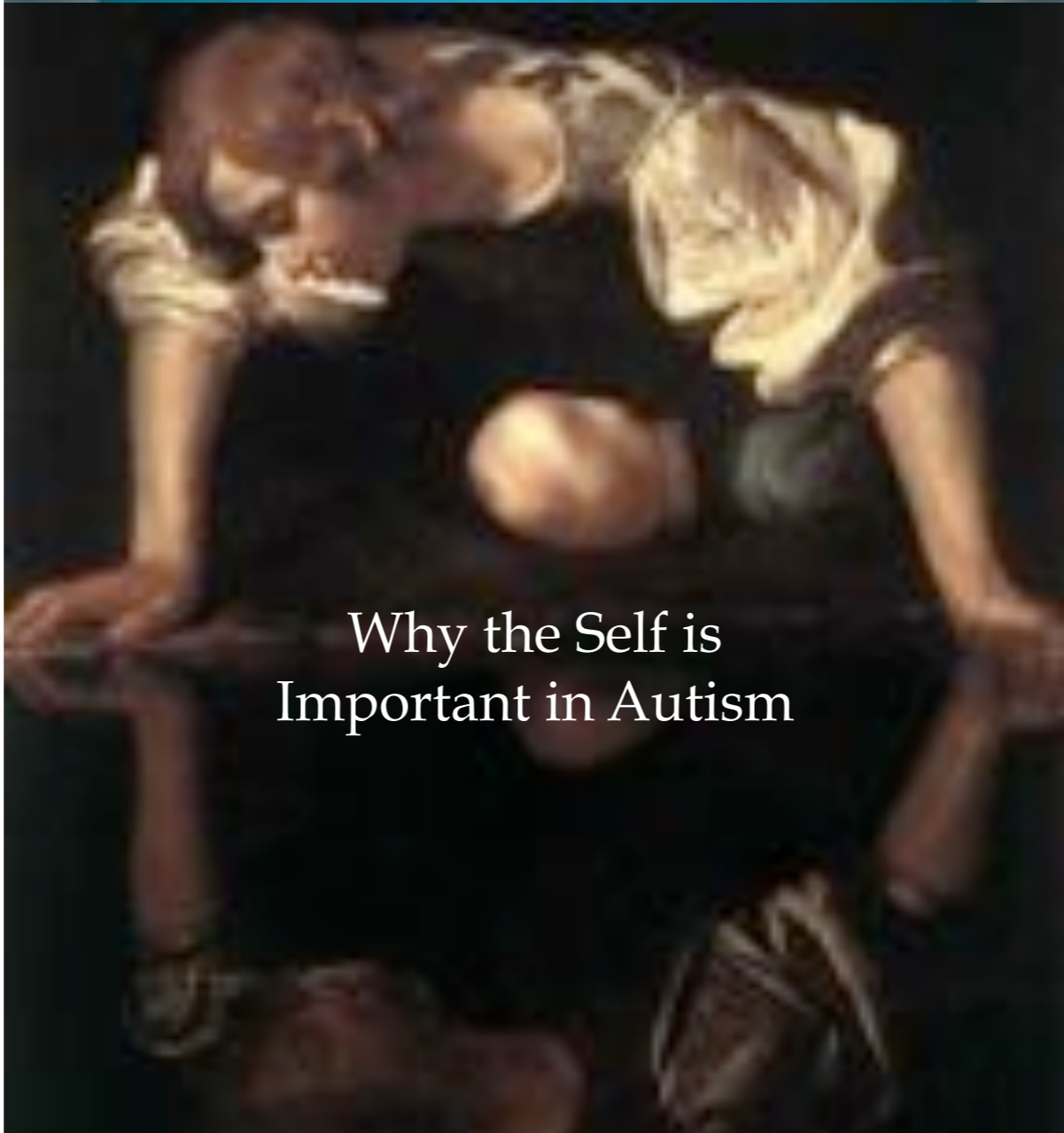
**awareness**  
**reflection**  
**allocentrism** **self** **neuroscience**  
**mentalizing** **representations**  
**mind** **interoception** **mirroring**  
**theory-of-mind** **brain** **social-cognition**  
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**consciousness**  
**sensation**  
**emotion**  
**shared**  
**autism**  
**fMRI**

Autism Neuroscience Conference  
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# The Paramount Role of the Self in the Social World



# Why the Self is Important in Autism

sensation  
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**consciousness**  
**fMRI**

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# The 'Real' Problem of Others Minds

## The Philosophical Problem

I know *I* have a mind.

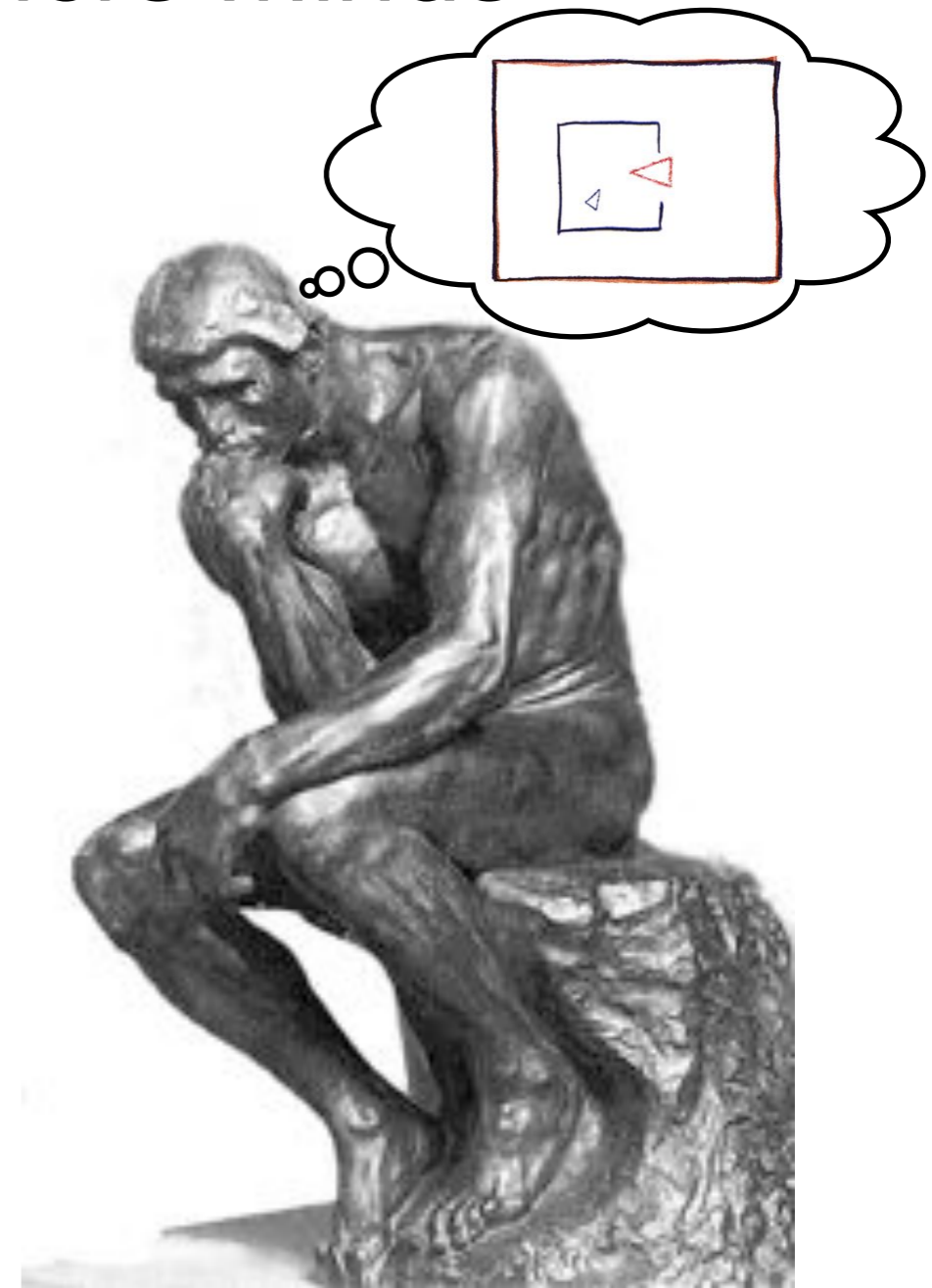
But how do I know *you* have a mind?

Maybe you're just a really convincing robot?



This is a problem mainly for philosophers, as the average person starts developing a concept that others have minds relatively early in life.

We even spontaneously attribute mental states to things that don't have mental states. Think of the Heider-Simmel animations.



However, the reason this problem exists is because of the disparity between access to our own and other's minds.

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# Asymmetry to Informational Sources



The information available for understanding self is much larger than for other. Qualitatively, there is also information for self that we do not possess when perceiving others. We do not possess *direct* access to other's mental states and embodied information. We judge others primarily based on *indirect* methods of observing external information (e.g., behavior, action, context), second-hand reports (e.g., gossip), or sheer intuition.

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# How We Solve the Problem of Other Minds

**Self**

**Other**



1. Behaviorism - assume other's have minds, but judge them purely on behaviors
2. Theorizing - like a scientist, have a theory, gather data, evaluate hypothesis, replicate, revise theory, etc, etc, etc.

### **3. Simulation or Projection**

\*\*\*Caveat: These strategies aren't mutually exclusive and not an exhaustive list of everything in the mindreader's toolkit

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# Why Simulate or Project Self in the Social World?

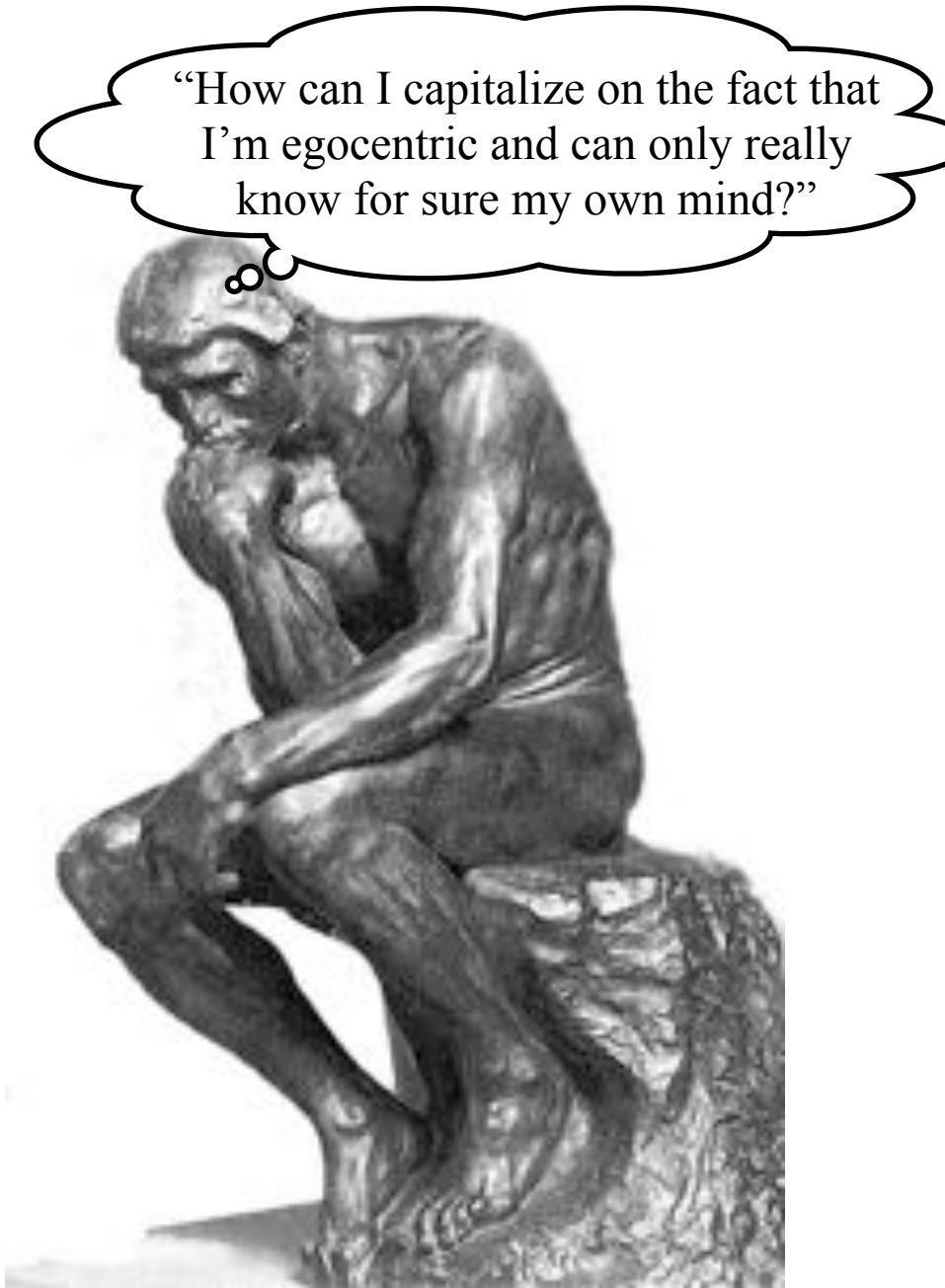
- **Asymmetry in the *kind* of information available for self and other**

- We have direct access to our own embodied experiences and mental states. We do not have such privileged access to this 'internal' information about others. Instead, we only have access to the observable behaviors of others. This asymmetry in the *kind* of information available for understanding self and other, paves a 'path-of-least-resistance' for using the self as a proxy for understanding others.

- **Homo-egocentric**

- We are extremely egocentric. This is because the 'self' exerts a totalitarian effect on information processing. The self organizes and shapes our experiences and perceptions, is central to our view of the social world, and exerts control over our attributions and construals of the world. **This makes the self the default starting point for making sense of the social world.**

**What is this good for?** Under 'Simulation & Projection', both considerations here can be leveraged to help facilitate understand the minds of others



“How can I capitalize on the fact that I’m egocentric and can only really know for sure my own mind?”

# Historical Perspective

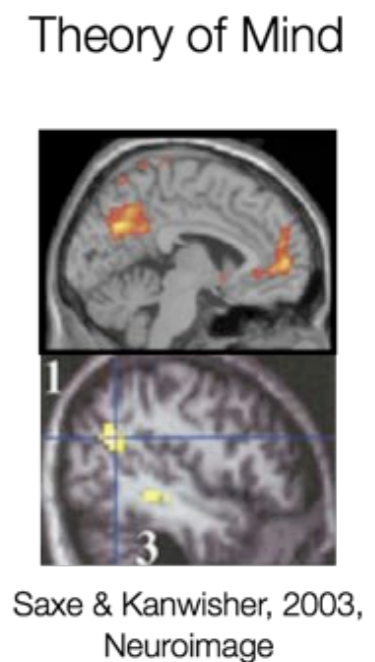
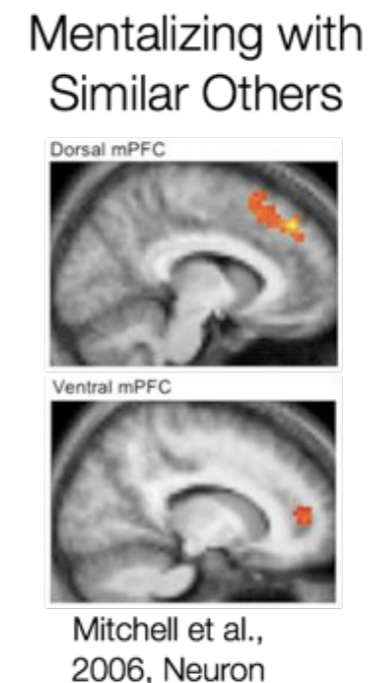
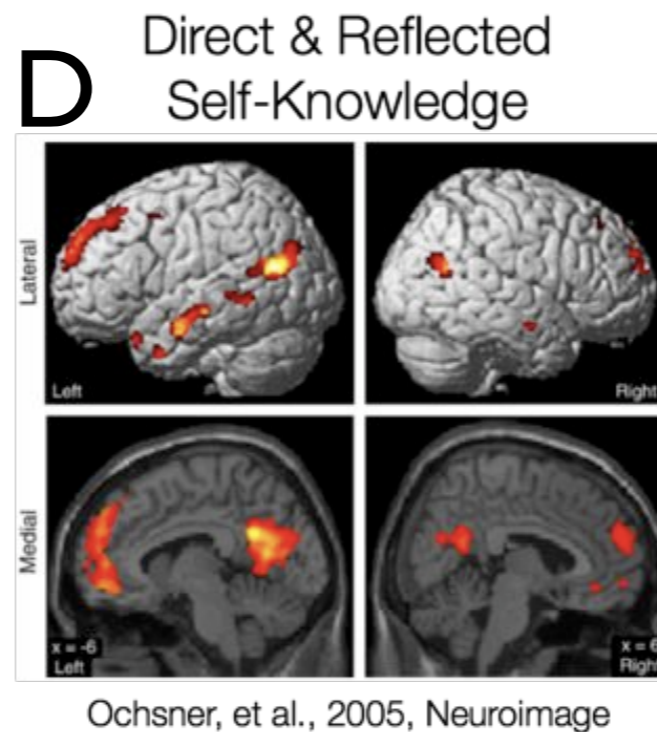
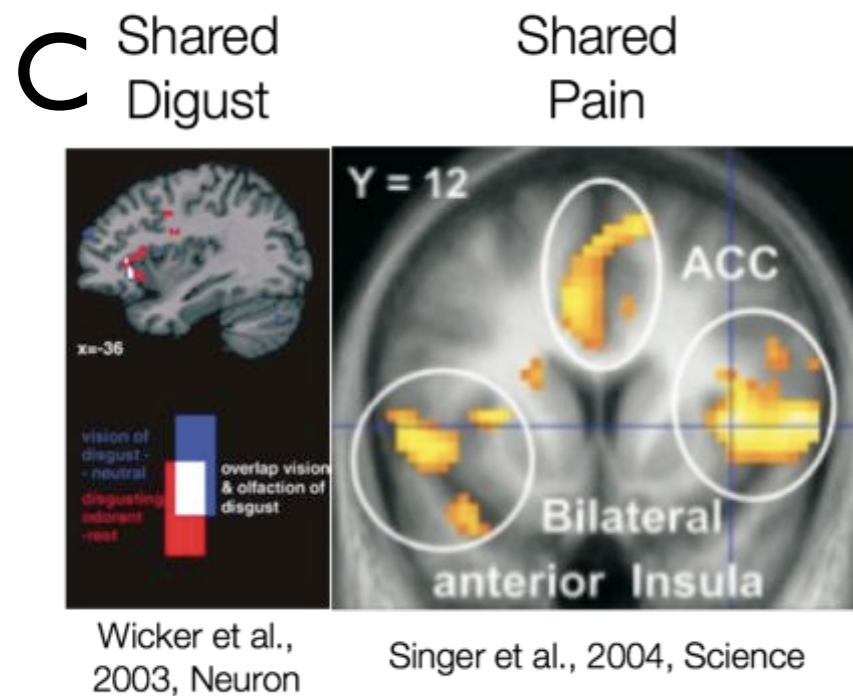
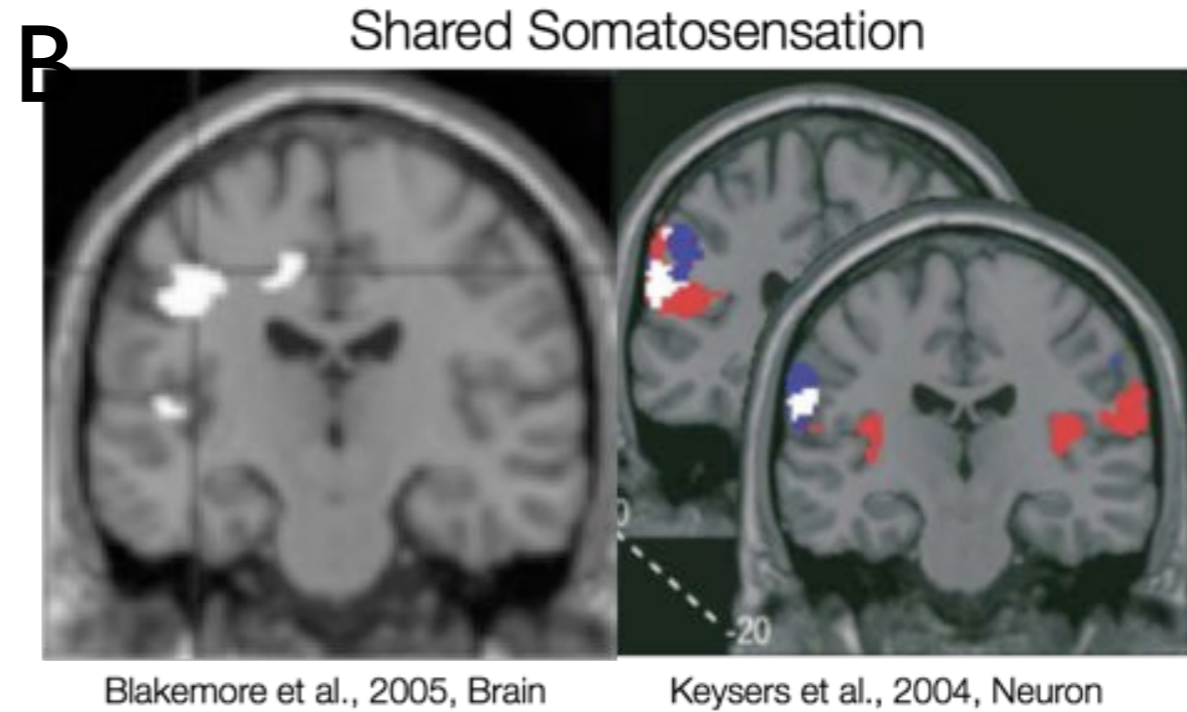
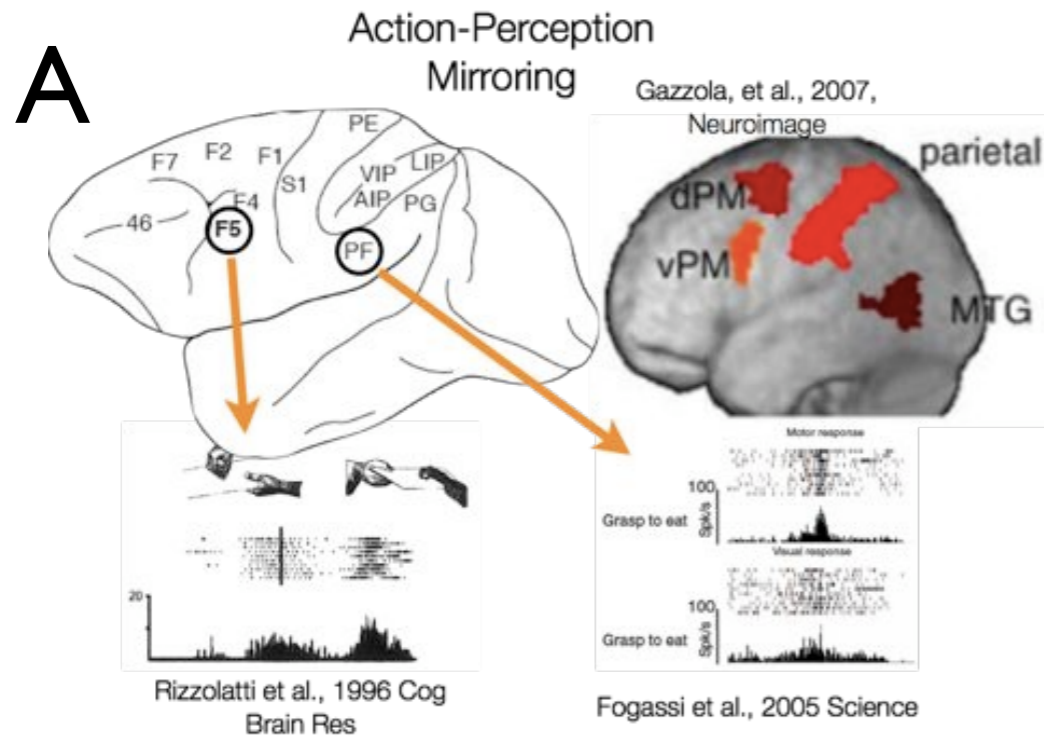


The Ancient Greeks were the first to point out the integral relationship between understanding ourselves and understanding others. The Greeks thought that **by understanding oneself, one could become capable of understanding others as well.**

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# Simulation at the Neural Level

## Shared neural representation for Self AND Other

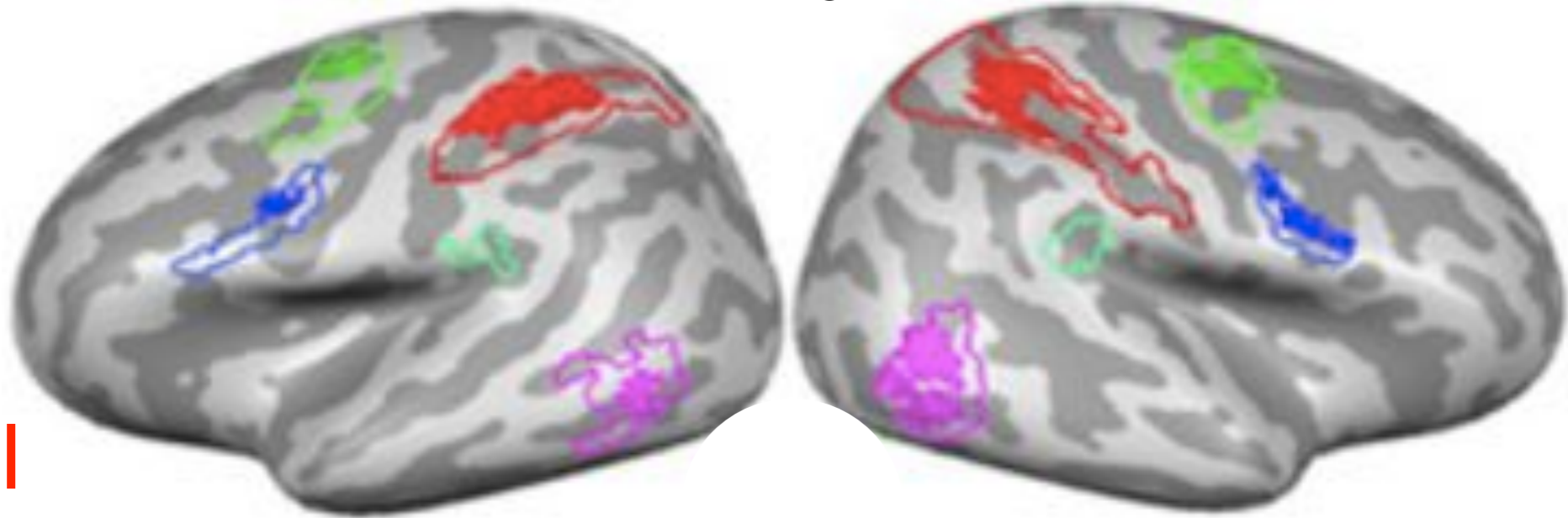


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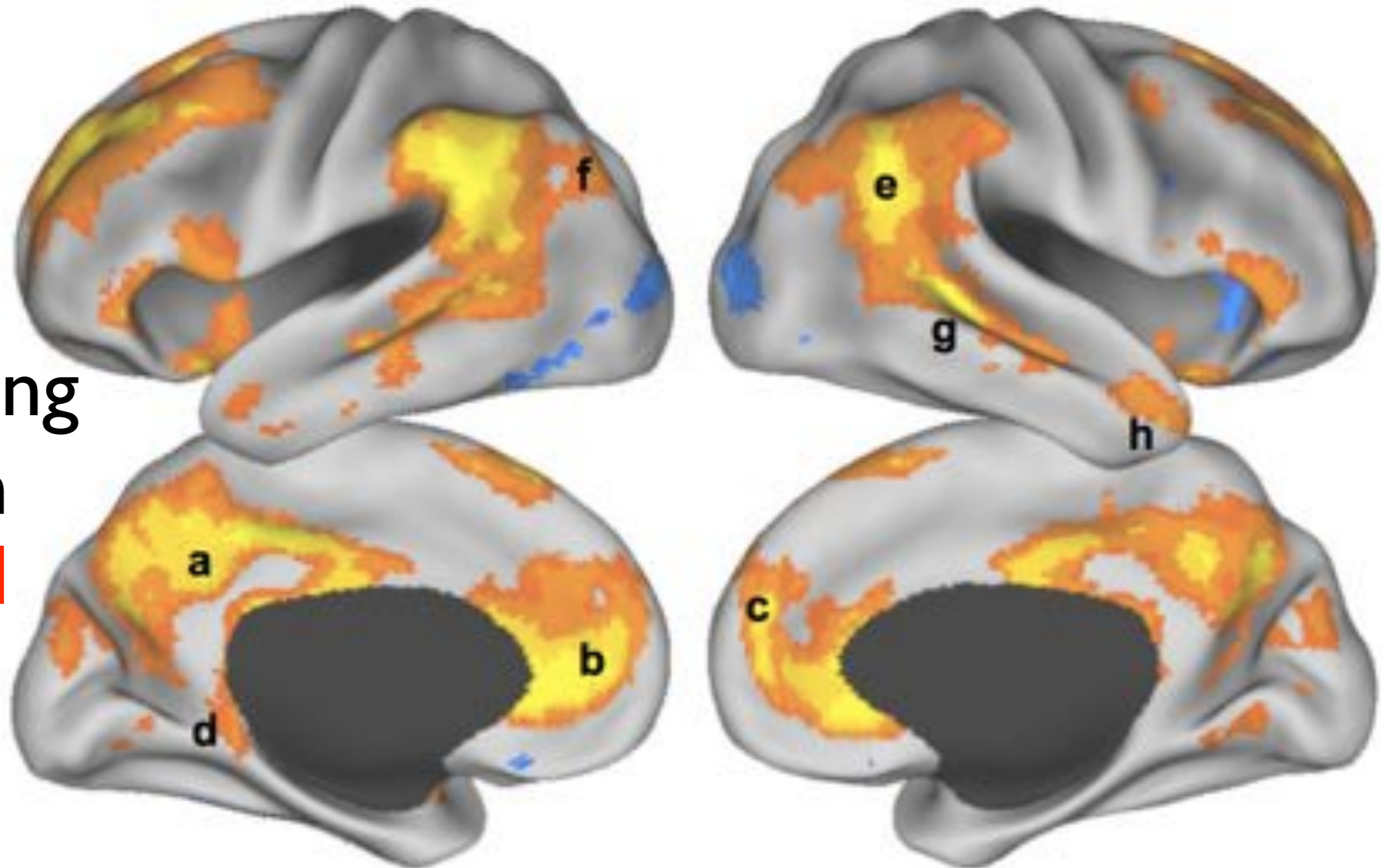


# A Tale of Two Systems

Mirror  
System  
Low-level

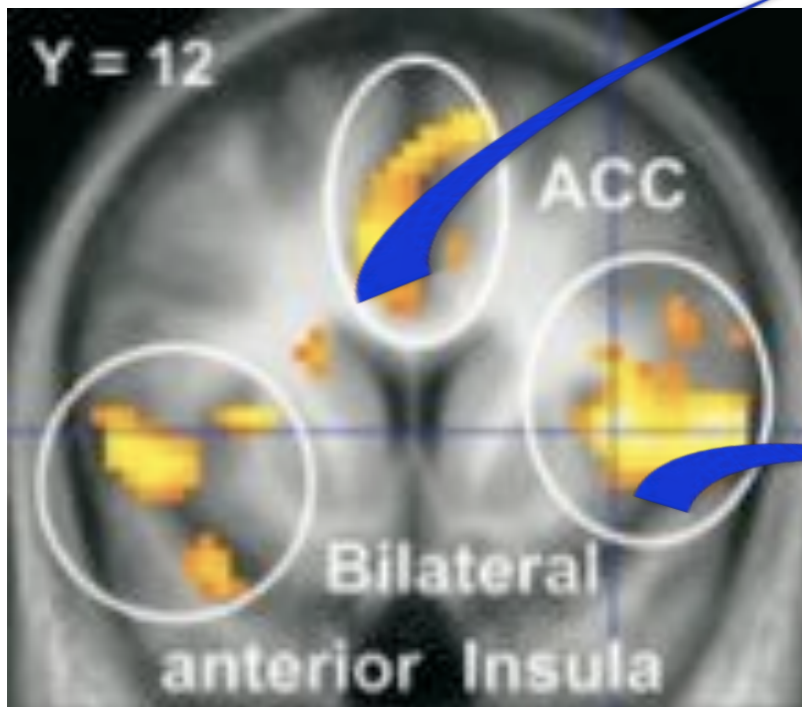


Mentalizing  
System  
High-level

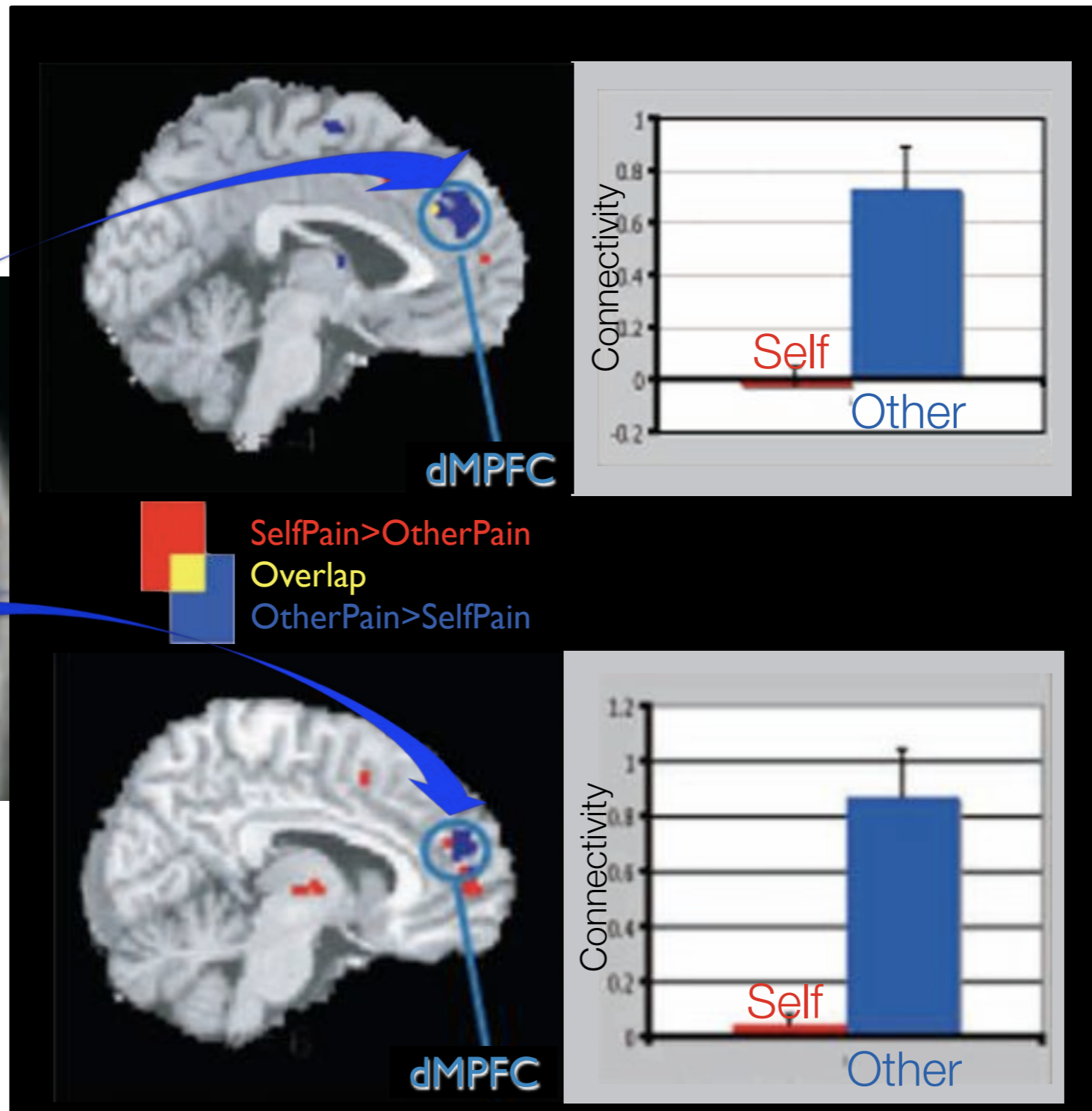


# Functional Connectivity

Shared Pain



Singer et al., 2004, Science



Zaki, Ochsner, et al., 2007, Soc Neurosci

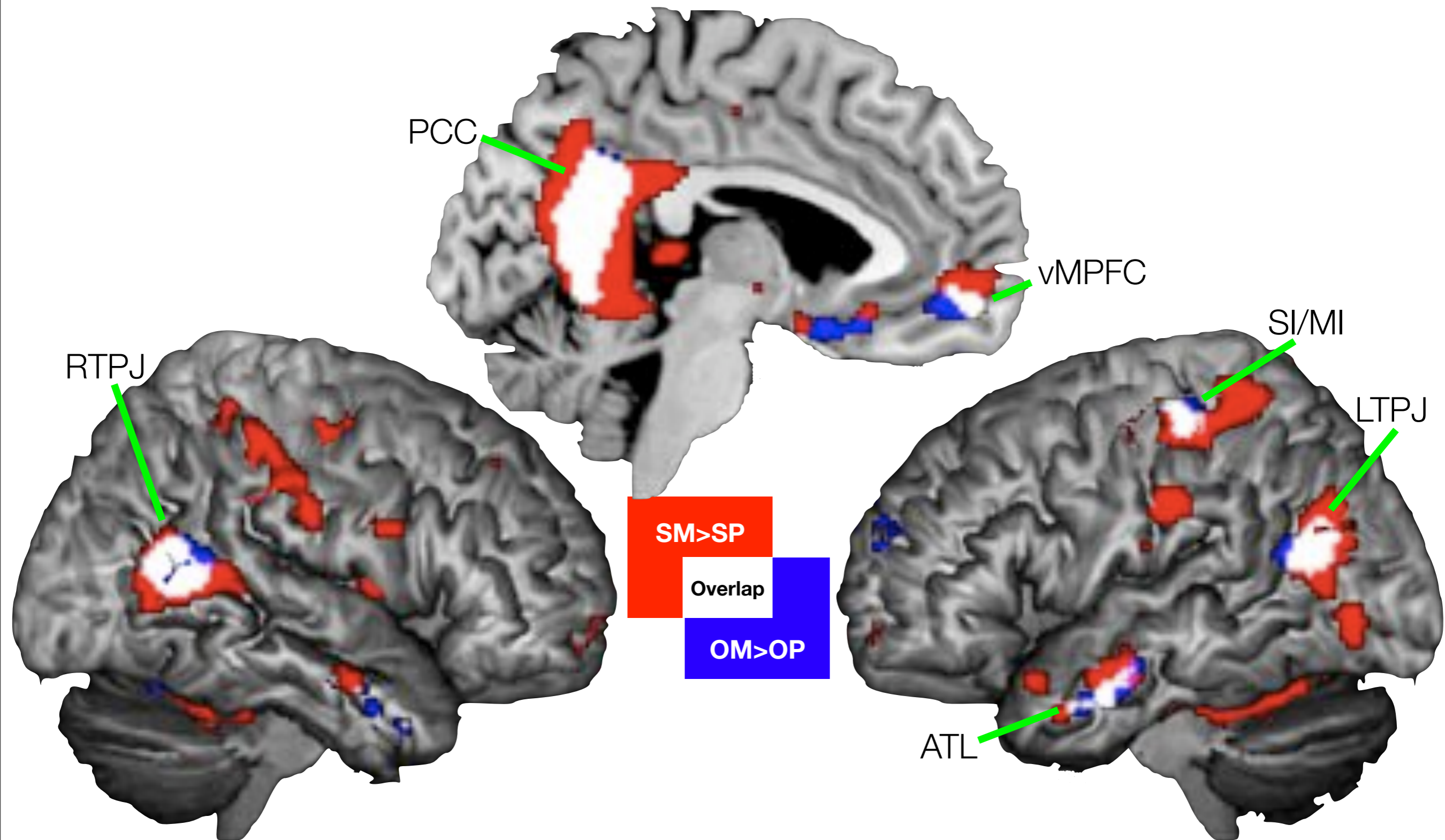
<http://sites.google.com/site/mvlombardo>

# Design

fMRI (3T)	Mentalizing	Physical
<p><b>Self</b></p>	<p>How likely are <b>You</b> to... think keeping a journal is important</p> <p>1      2      3      4 not at all                      very likely</p>	<p>How likely are <b>You</b> to... have bony elbows</p> <p>1      2      3      4 not at all                      very likely</p>
<p><b>Other</b></p>	<p>How likely is the <b>Queen</b> to... think keeping a journal is important</p> <p>1      2      3      4 not at all                      very likely</p>	<p>How likely is the <b>Queen</b> to... have bony elbows</p> <p>1      2      3      4 not at all                      very likely</p>

n=33 Block Design TR=2000ms 33 axial slices  
Data Analysis: SPM5 8mm FWHM smoothing

# Shared Mentalizing



Lombardo et al., 2010, *J Cogn Neurosci*

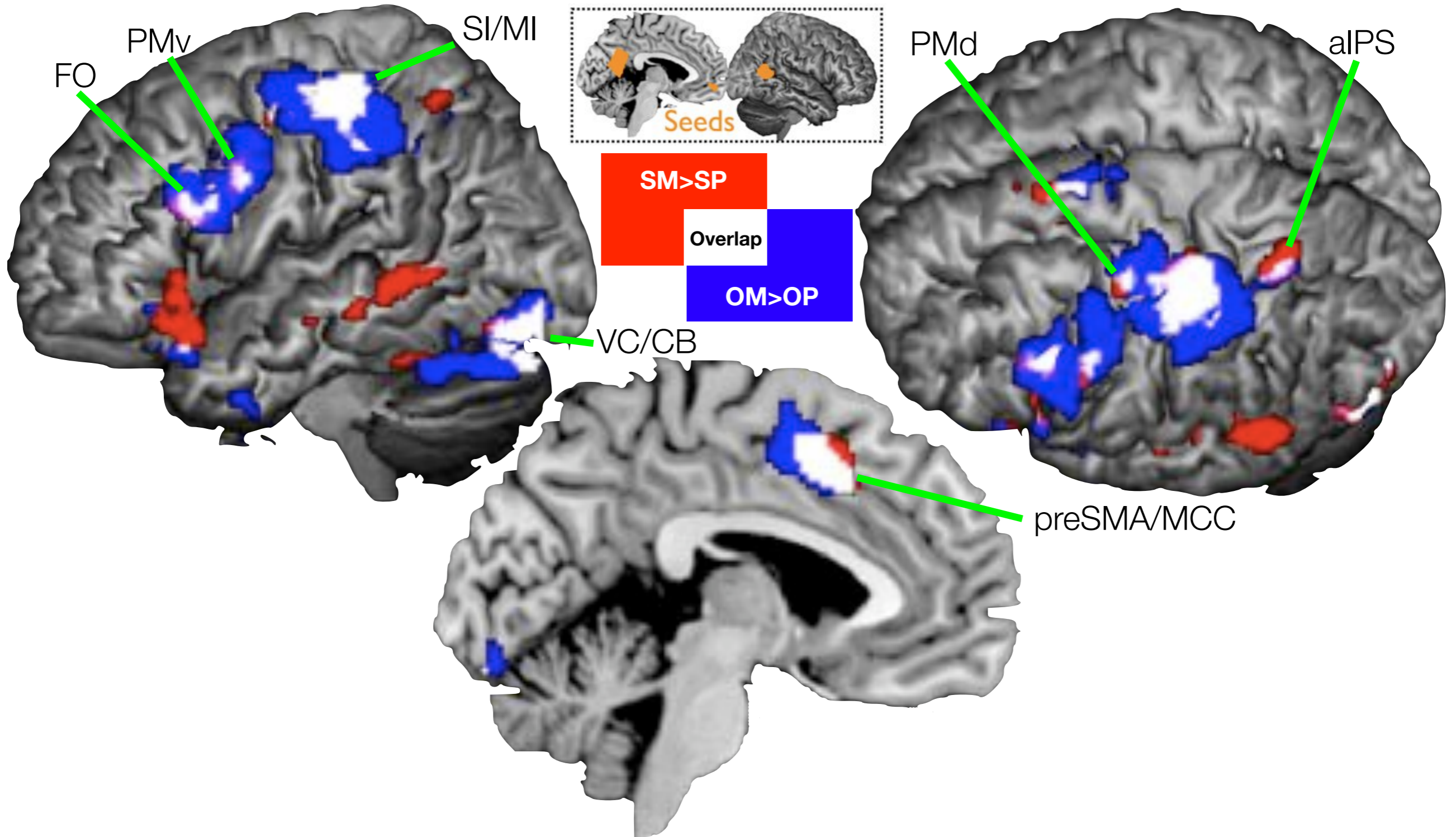
<http://sites.google.com/site/mvlombardo>

# Independent Mentalizing Systems?

[SM>SP]>[OM>OP]

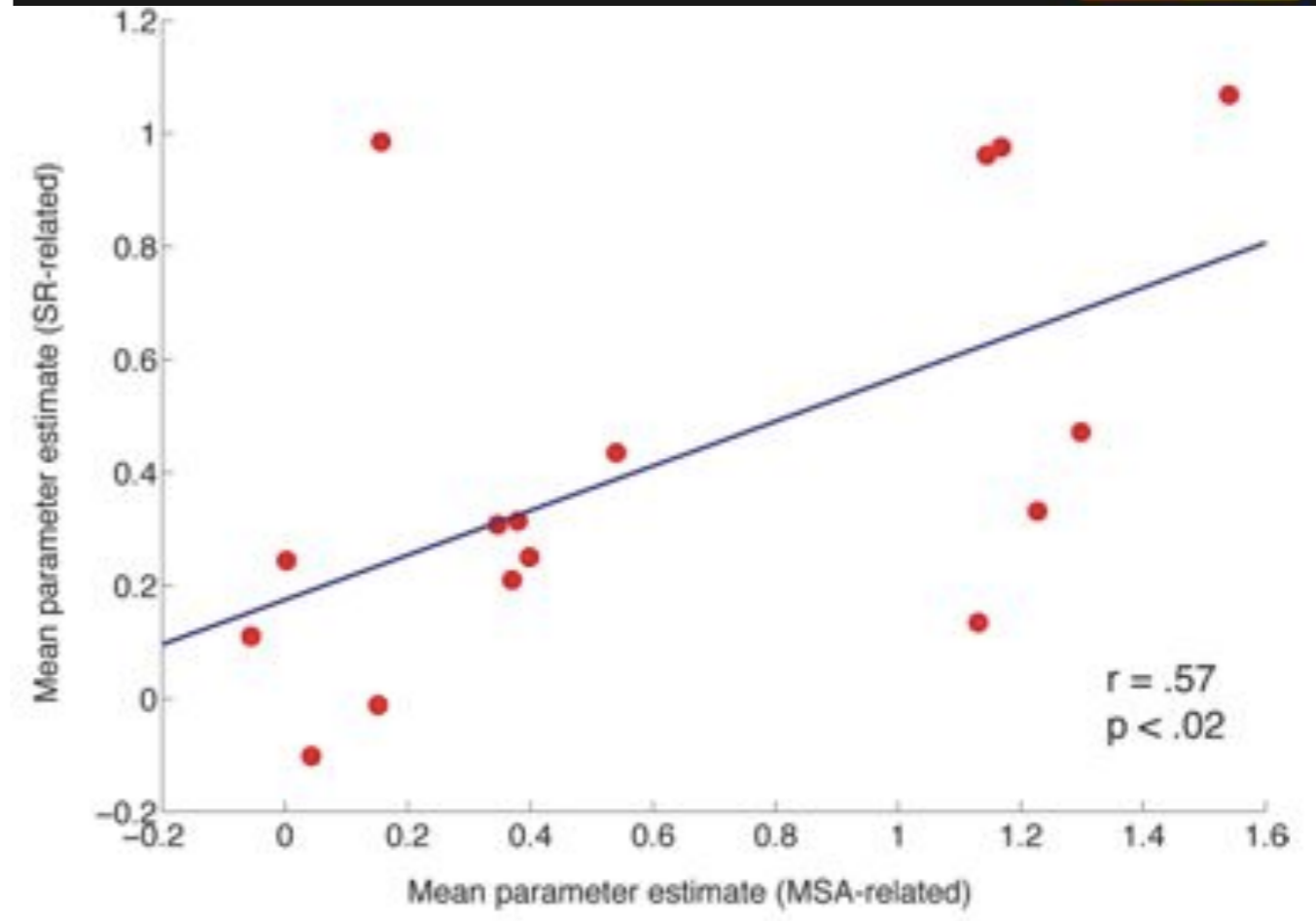
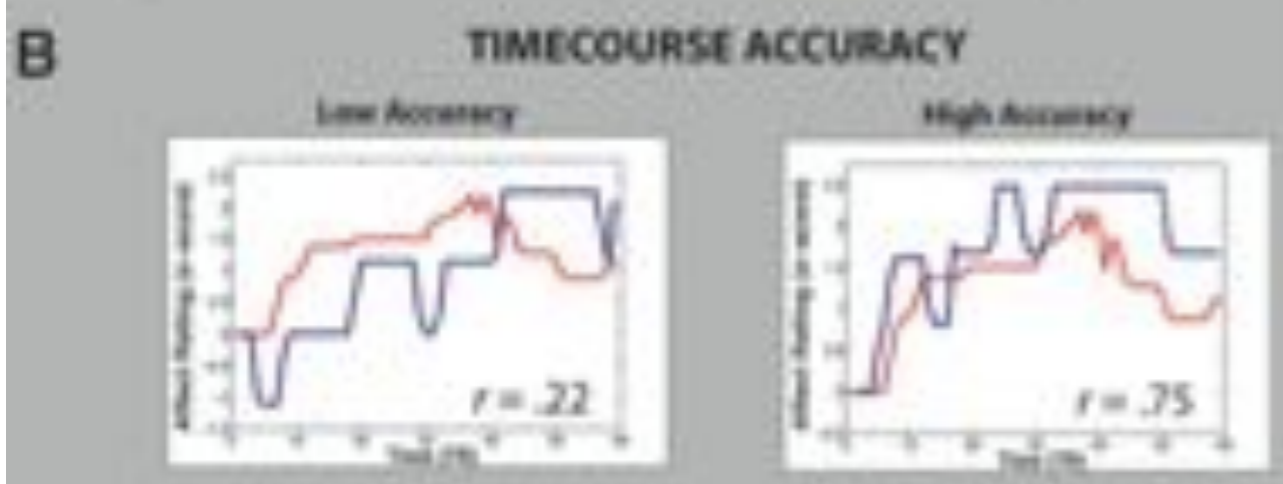
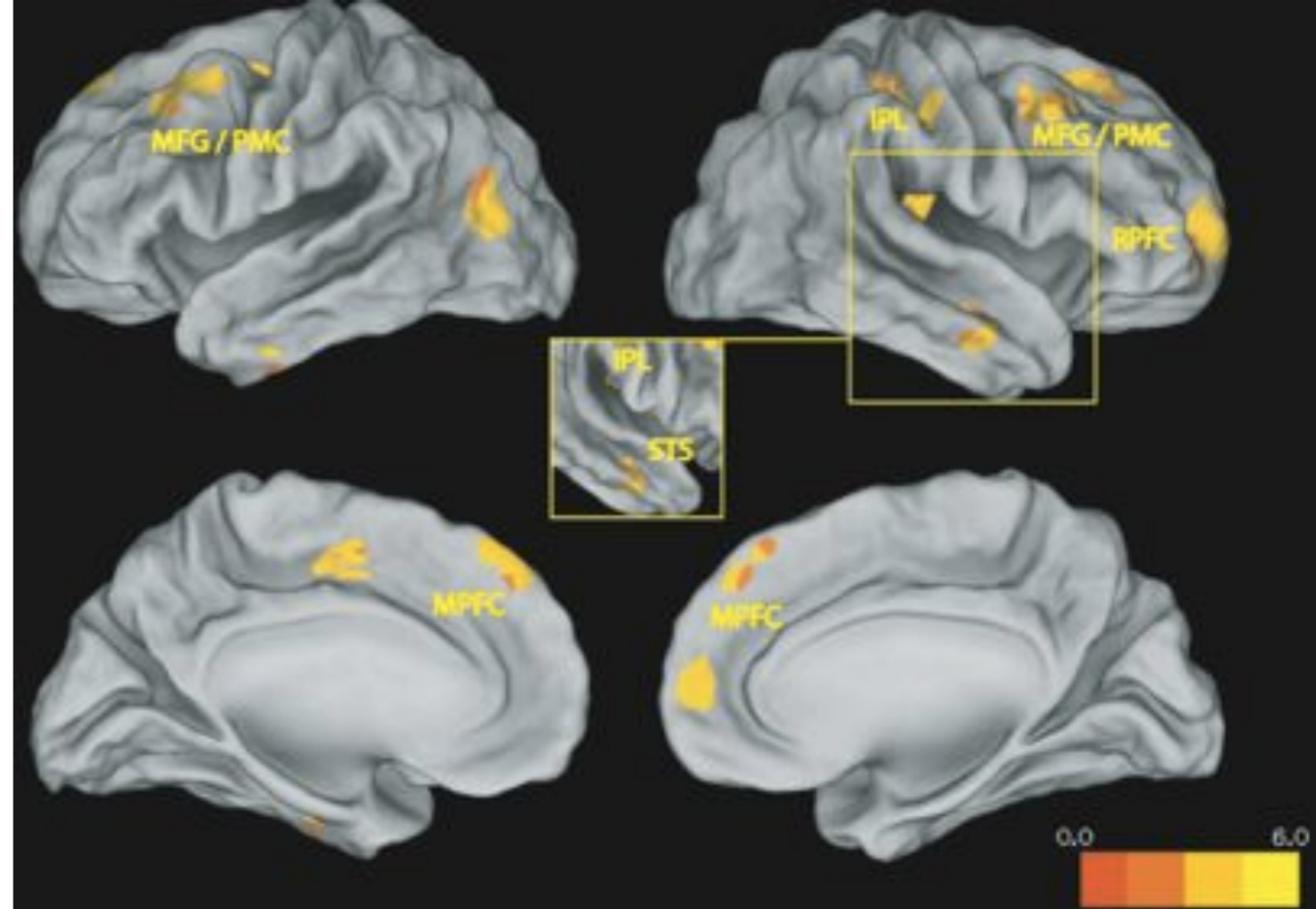
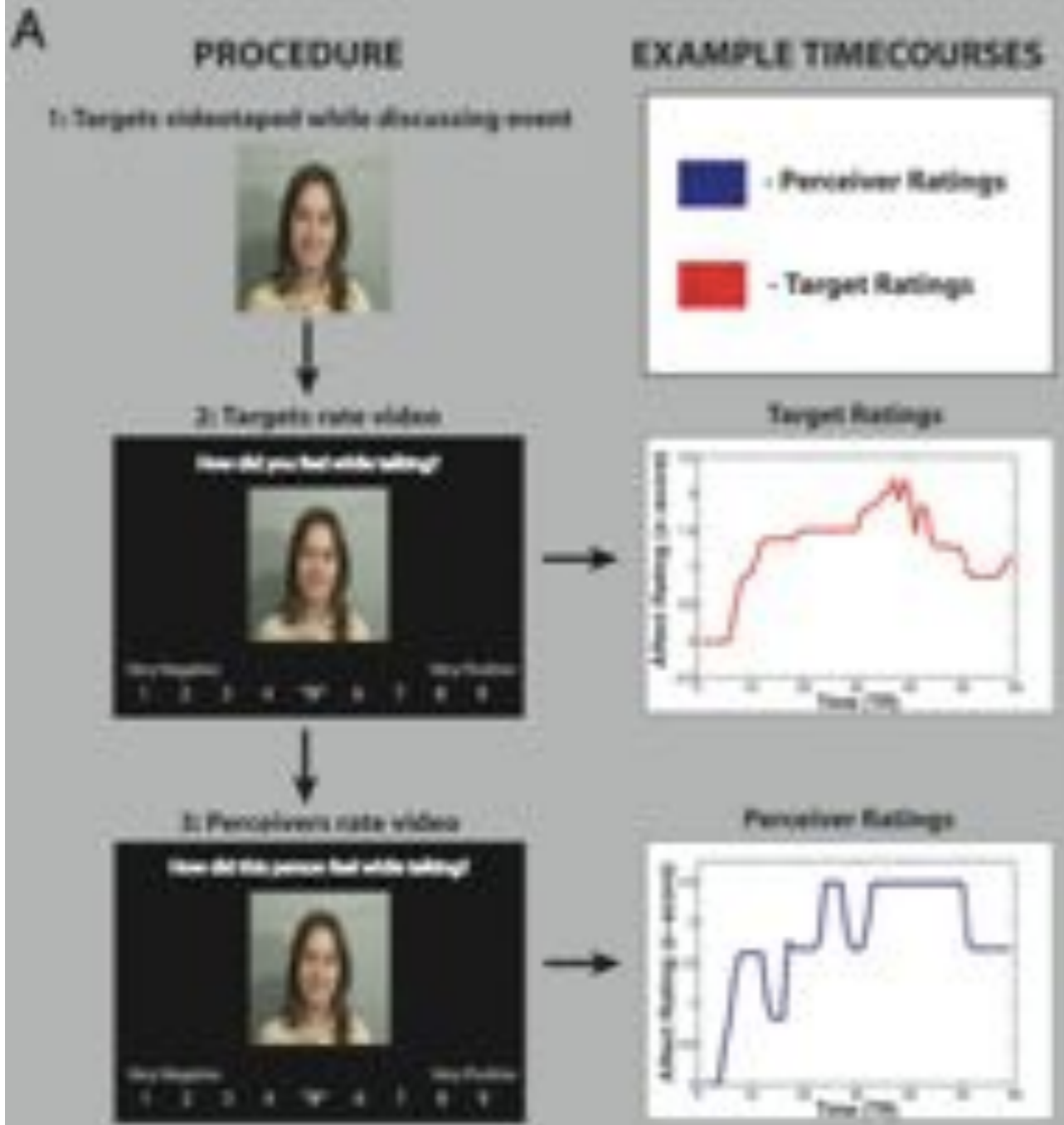


# Shared Mentalizing Circuits



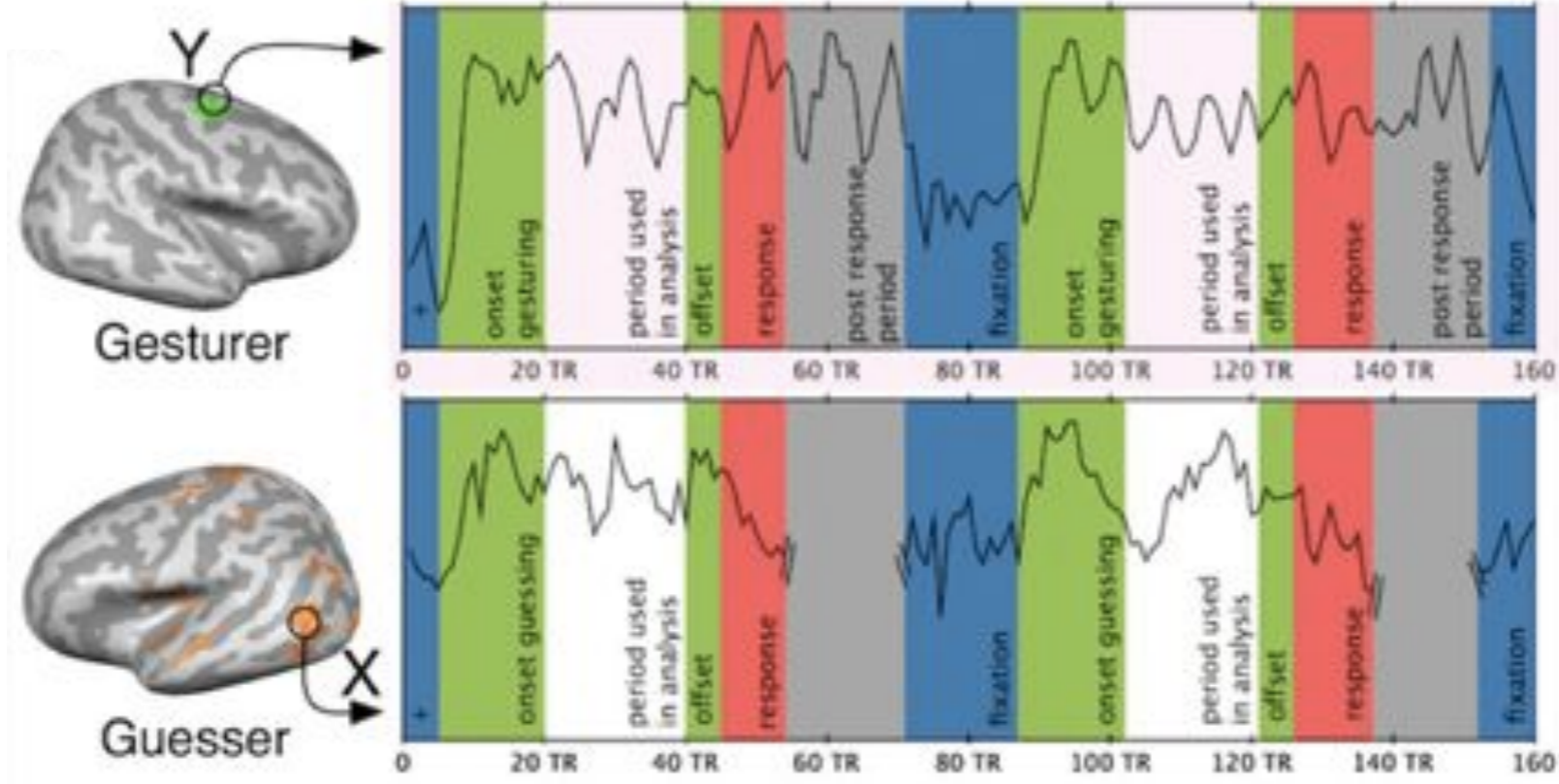
Lombardo et al., 2010, *J Cogn Neurosci*

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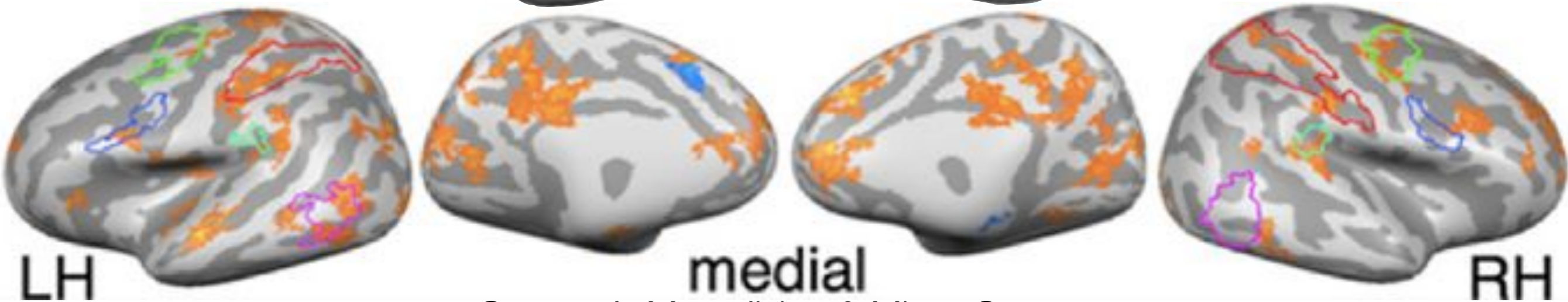
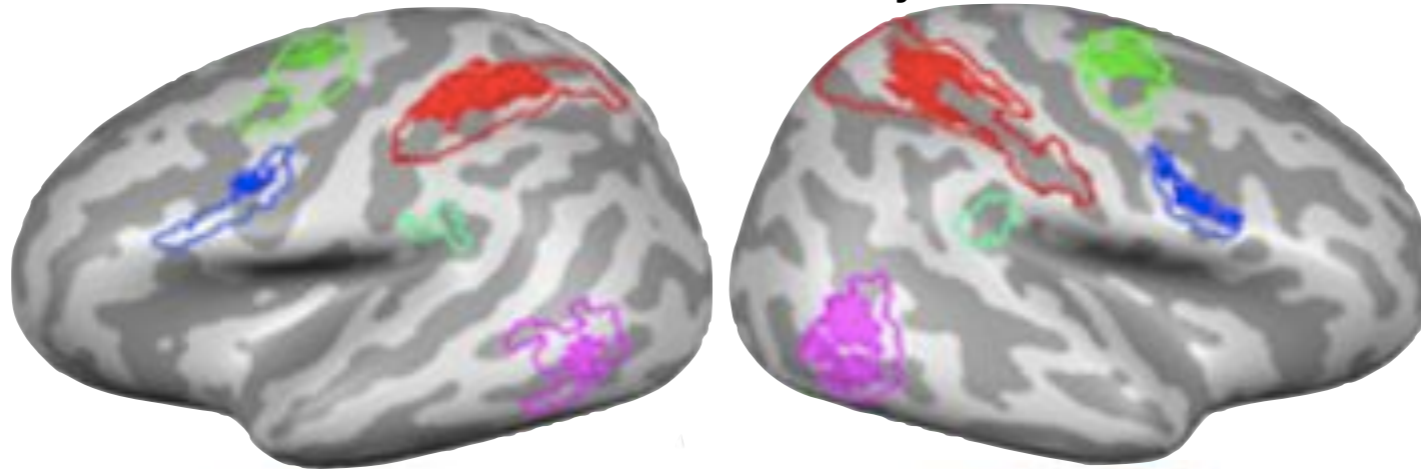


Zaki et al., 2010, *PNAS*

<http://sites.google.com/site/mvlombardo>



Gesturer's Mirror System



Schippers et al., 2010, *PNAS* Guesser's Mentalizing & Mirror System

<http://sites.google.com/site/mvlombardo>



# Why is the Self Important in the Social World?

## 1. Asymmetry in Informational Sources and Egocentrism:

- Self is a supraordinate object of knowledge compared to the social world.
- We have direct access to embodied and introspective information for self that we do not possess for others.
- By default we are egocentric in how we construe the world around us... Especially the social world.
- What is this good for? It allows self to be leveraged for the task of understanding other's internal worlds, especially in situations where there is a considerable lack of information and uncertainty.

## 2. Simulation or Projection:

- Uses asymmetry to informational sources and egocentrism to an advantage.
- Likely occurs through an automatic process of anchoring on self and then effortful and controlled adjustment away from self when the context or situation suggests that self may not be the best proxy

## 3. Shared Neural Representations for Self and Other:

- assessing the underlying processes involved in social cognition can be facilitated by using functional neuroimaging to isolate similar or different neural mechanisms involved in thinking about the social world.
- the brain tends to share how it represents self with others.
- shared representation can be similar regions of the brain activated for both self and other, or similar neural circuits functionally wired up for processing information about self and other

# The Autistic Self



# Extreme Egocentrism

- Kanner (1943) - 'extreme autistic aloneness'
  - Asperger (1944) - 'egocentric in the extreme'
  - Pronominal reversals - 'you' vs 'I'
  - Clinical accounts - 'locked into their own world'
  - First person accounts:  
"My own conversations and thoughts were always my best friends. I was happy spending time with only me, happy to talk to myself and happy to entertain myself." (Willey, 1999)
  - Inability to put self in other's shoes  
e.g. Deficits in theory of mind/mentalizing
- Egocentrism, allocentrism, and Asperger syndrome

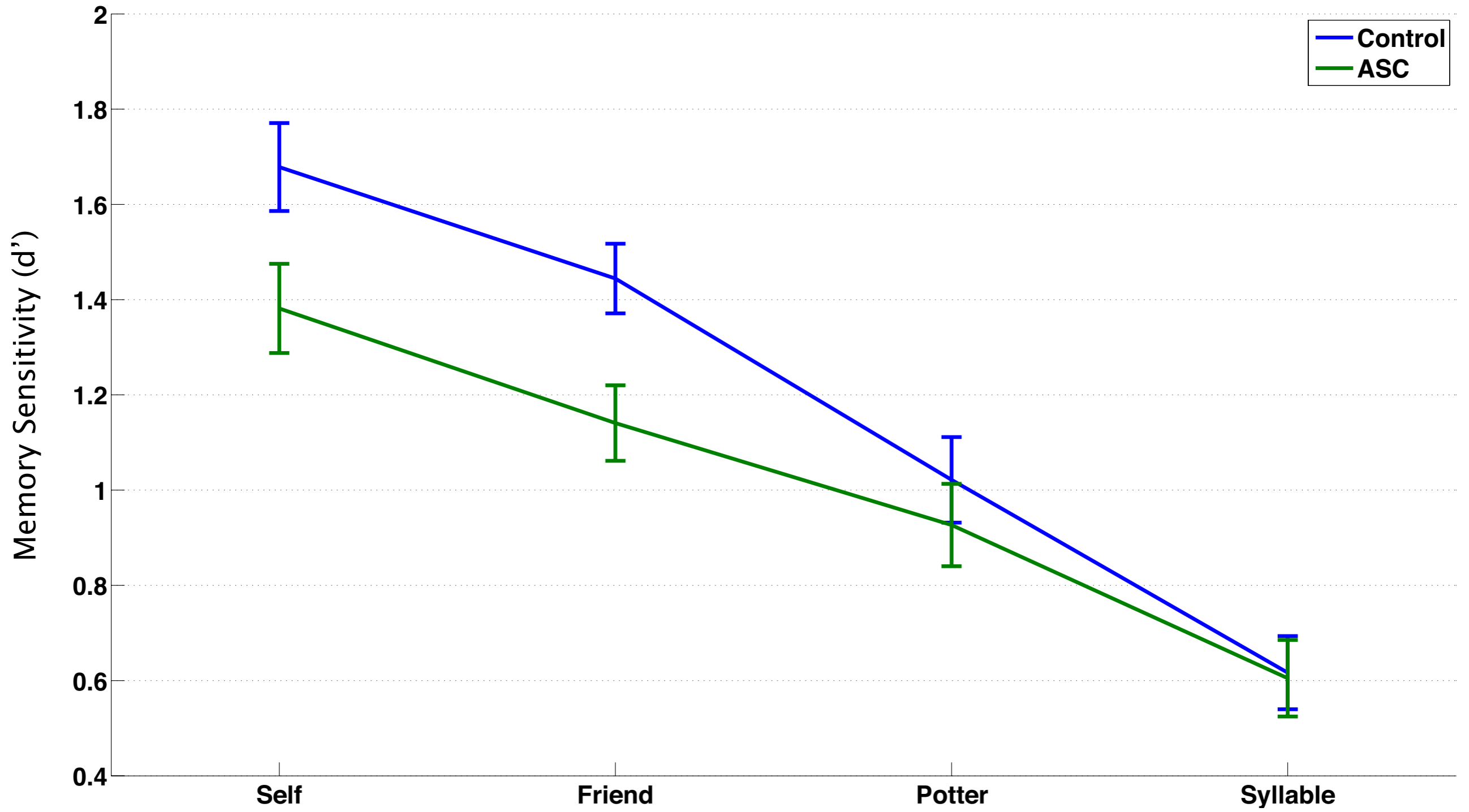
Uta Frith \*, Frederique de Vignemont



# Self-Referential Deficits: 'Absent Self'

- **No self-conscious reaction to mirror self-recognition**  
Neuman & Hill, 1978; Dawson & McKissick, 1984;
- **Early deficits in responding to one's own name**  
Osterling & Dawson, 1994; Zwaigenbaum et al., 2005; Nadig et al., 2007;
- **Deficits in understanding one's own false belief**  
Baron-Cohen, 1989; Perner et al., 1989; Williams & Happe, 2009
- **Monitoring Intentions**  
Phillips et al., 1993; Williams & Happe, 2010
- **Impaired Emotional Awareness ('Alexithymia')**  
Lombardo et al., 2007; Hill, Berthoz & Frith, 2004; Silani et al., 2008; Minio-Paluello et al., 2009
- **Less Self-Conscious Emotion Experience**  
Kasari et al., 1993; Hobson et al., 2006;
- **Impaired Autobiographical/Episodic Memory**  
Klein et al., 1999; Bowler et al., 2000; Crane & Goddard, 2008
- **Atypical Self-Reference Effect in Memory**  
Lombardo et al., 2007; Toichi et al., 2002; Henderson et al., 2009

# Self-Reference Effect in Memory



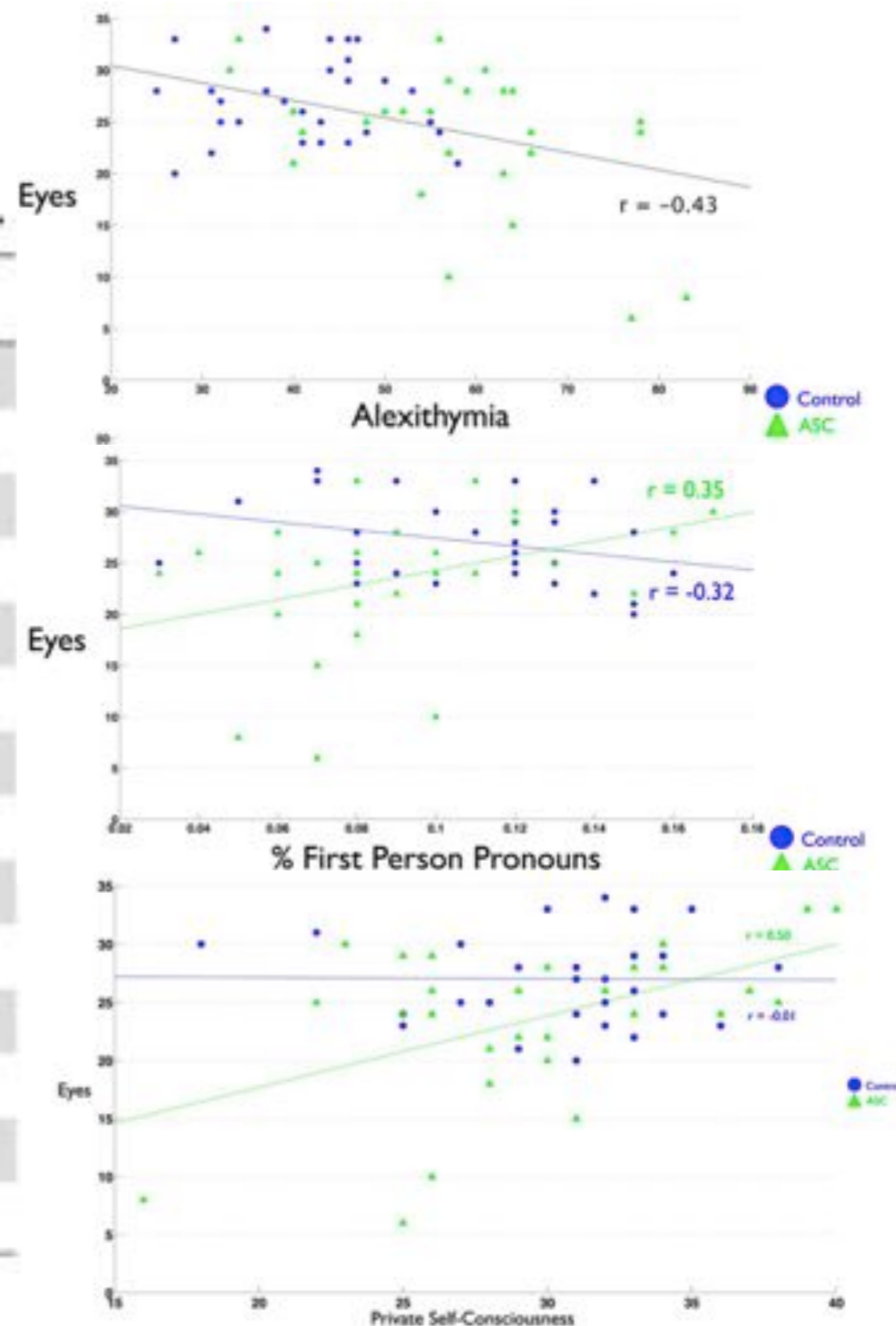
Lombardo et al., 2007, *PLoS One*

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# Related Impairments in Self and Other

**Table 3. Empathy and self-consciousness/awareness data.**

	Control	ASC	t value	p value	Cohen's d
IRI EC	18.93 (5.16)	15.83 (6.09)	2.127	p = 0.038	0.56
IRI PT	18.50 (5.30)	14.33 (5.49)	2.991	p = 0.004	0.79
IRI FS	17.77 (5.69)	13.87 (6.34)	2.507	p = 0.015	0.66
IRI PD	10.60 (4.00)	14.53 (5.42)	-3.195	p = 0.002	0.84
ECS	41.97 (7.99)	37.47 (8.16)	2.158	p = 0.035	0.57
Cognitive EQ	15.27 (5.25)	4.17 (3.81)	9.381	p < 0.001	2.46
Affective EQ	14.47 (6.30)	5.87 (3.83)	6.388	p < 0.001	1.68
Eyes Test	27.03 (3.90)	23.73 (6.67)	2.340	p = 0.023	0.61
PSCS	30.50 (4.16)	29.80 (5.42)	0.561	p = 0.577	0.15
TAS	41.97 (9.19)	58.37 (14.19)	-5.315	p < 0.001	1.40
DIF	13.50 (4.82)	20.03 (6.70)	-4.337	p < 0.001	1.14
DDF	11.10 (4.85)	16.87 (5.62)	-4.252	p < 0.001	1.12
EOT	17.37 (4.16)	21.47 (4.90)	-3.493	p < 0.001	0.92
SFA	0.11 (0.03)	0.09 (0.03)	2.136	p = 0.037	0.56

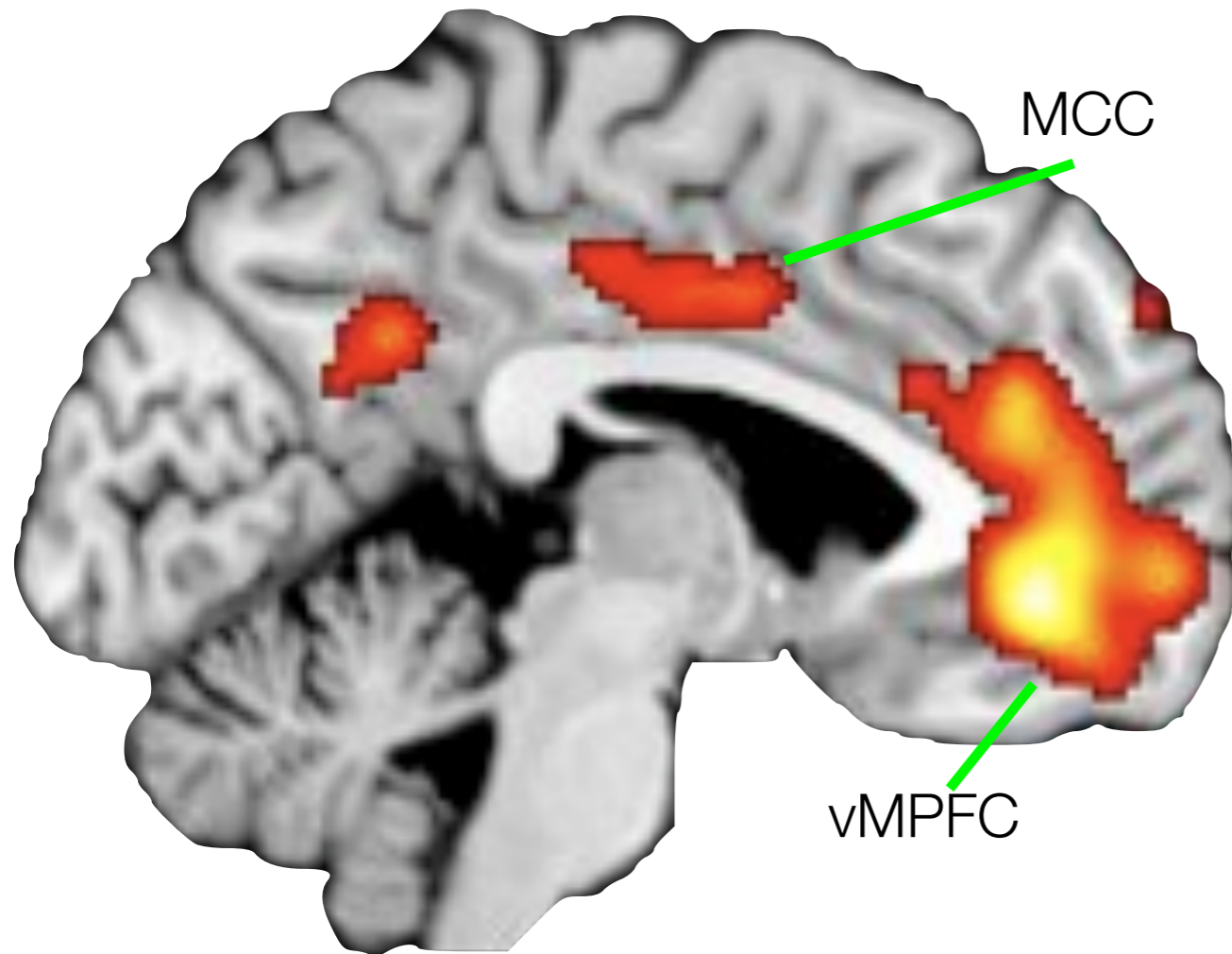


Lombardo et al., 2007, *PLoS One*

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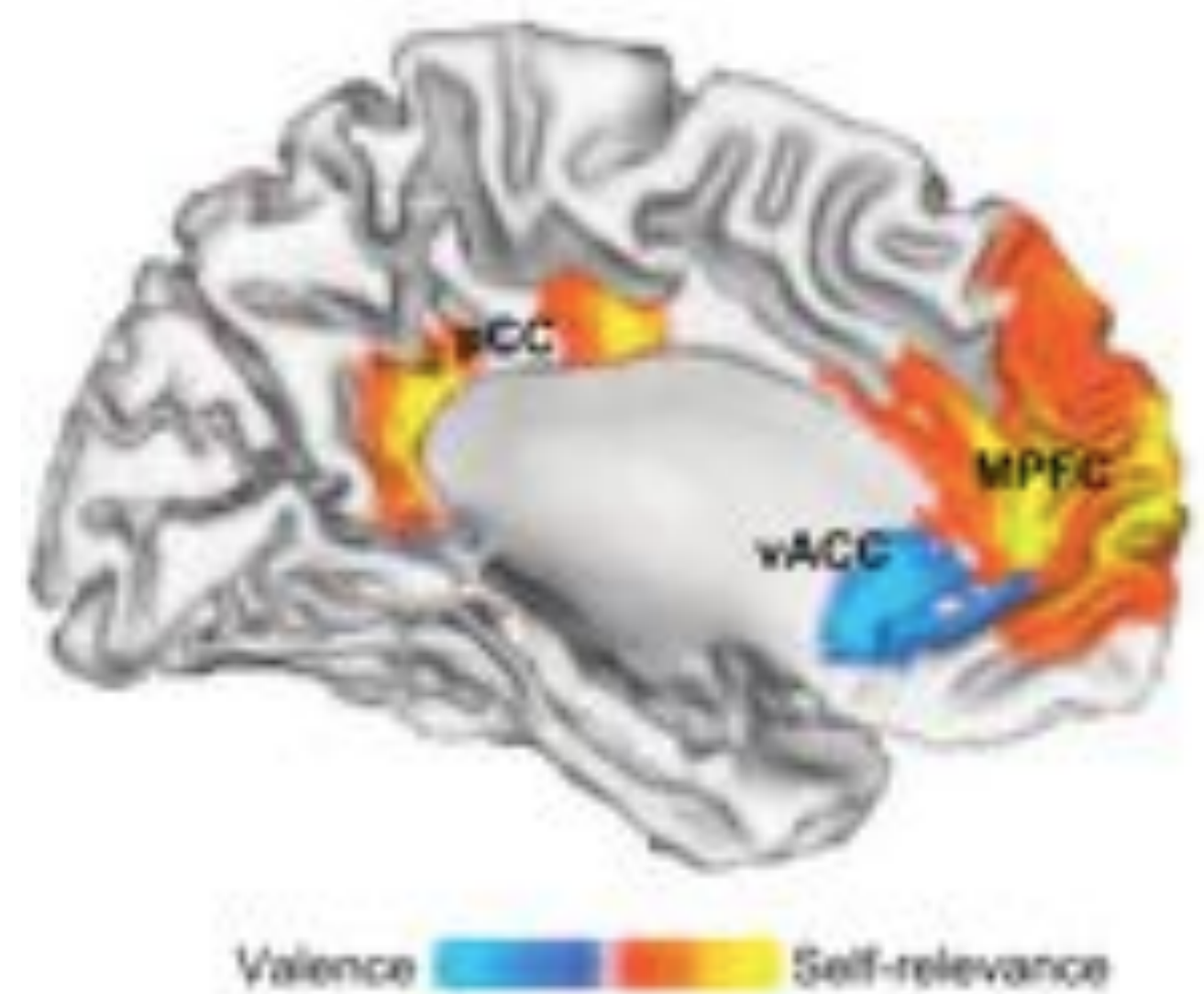
# Atypical Neural Self-Representation in Autism

Meta-Analysis: Self>Other



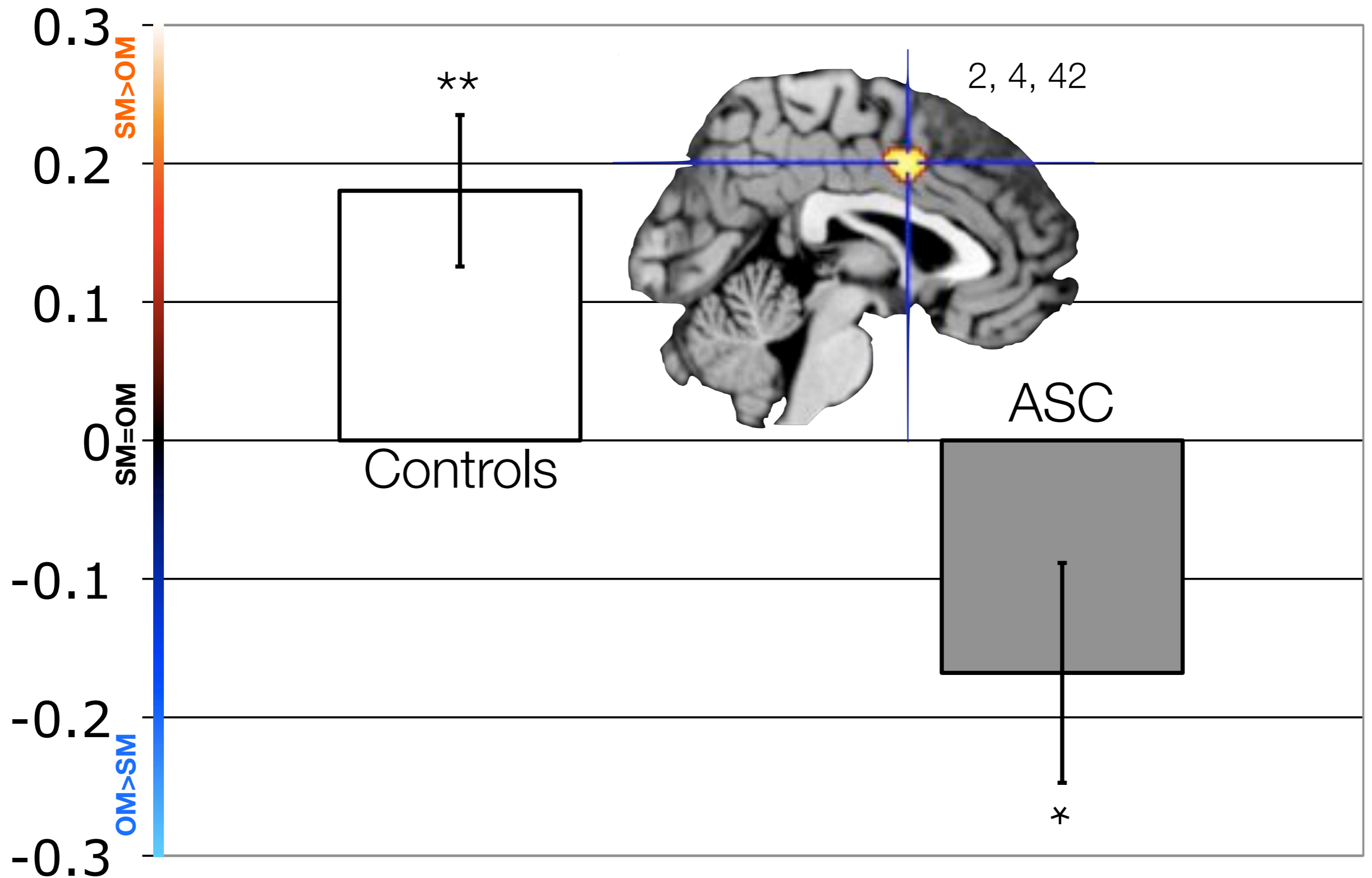
Lombardo et al., 2010, *Brain*

Parametric Effect Self-Relevance



Moran et al., 2006, *J Cogn Neurosci*

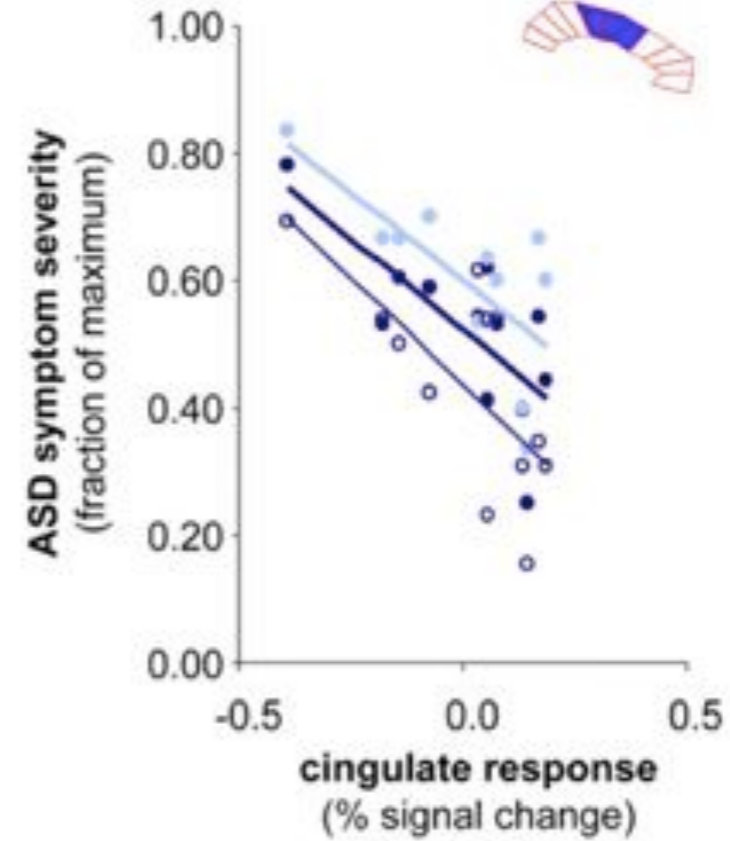
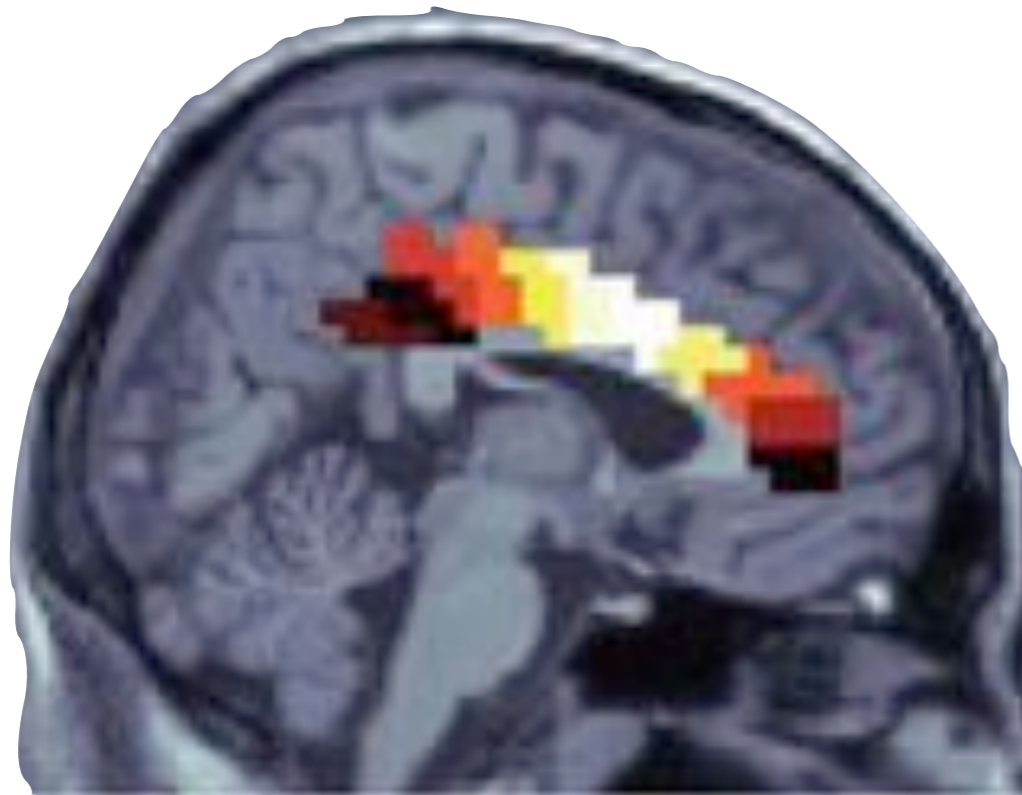
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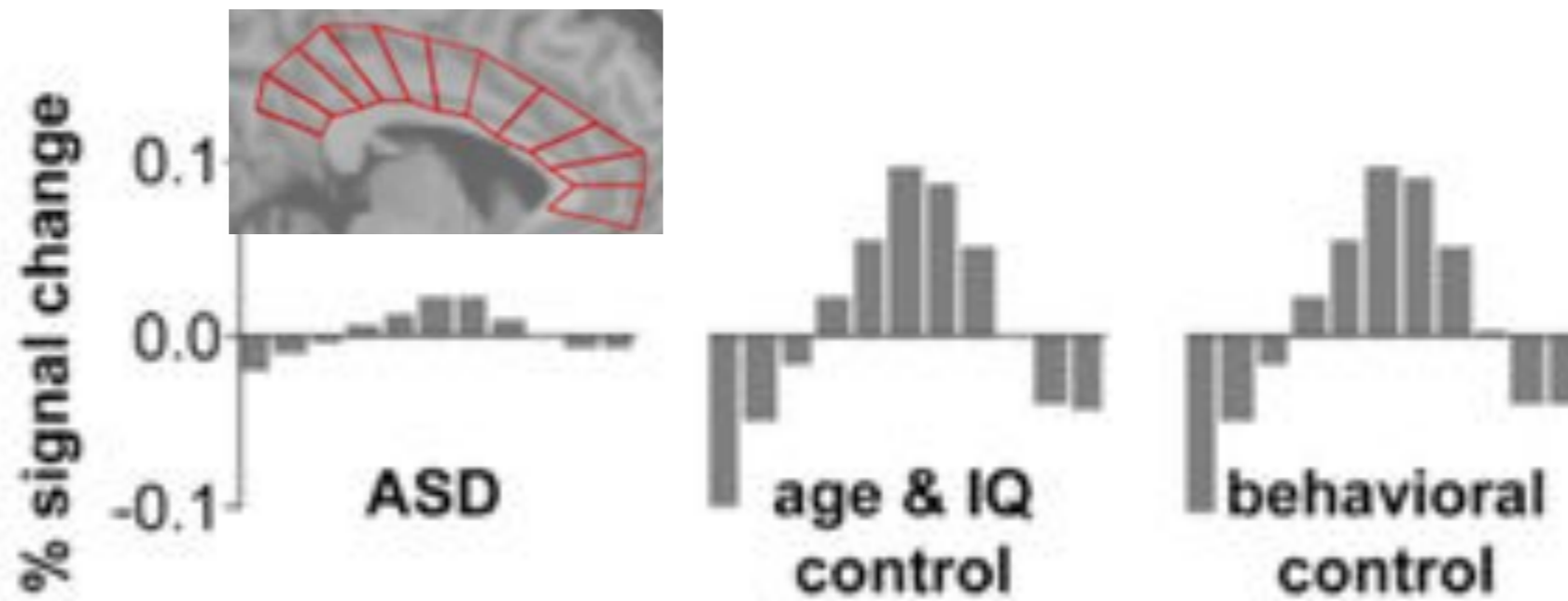
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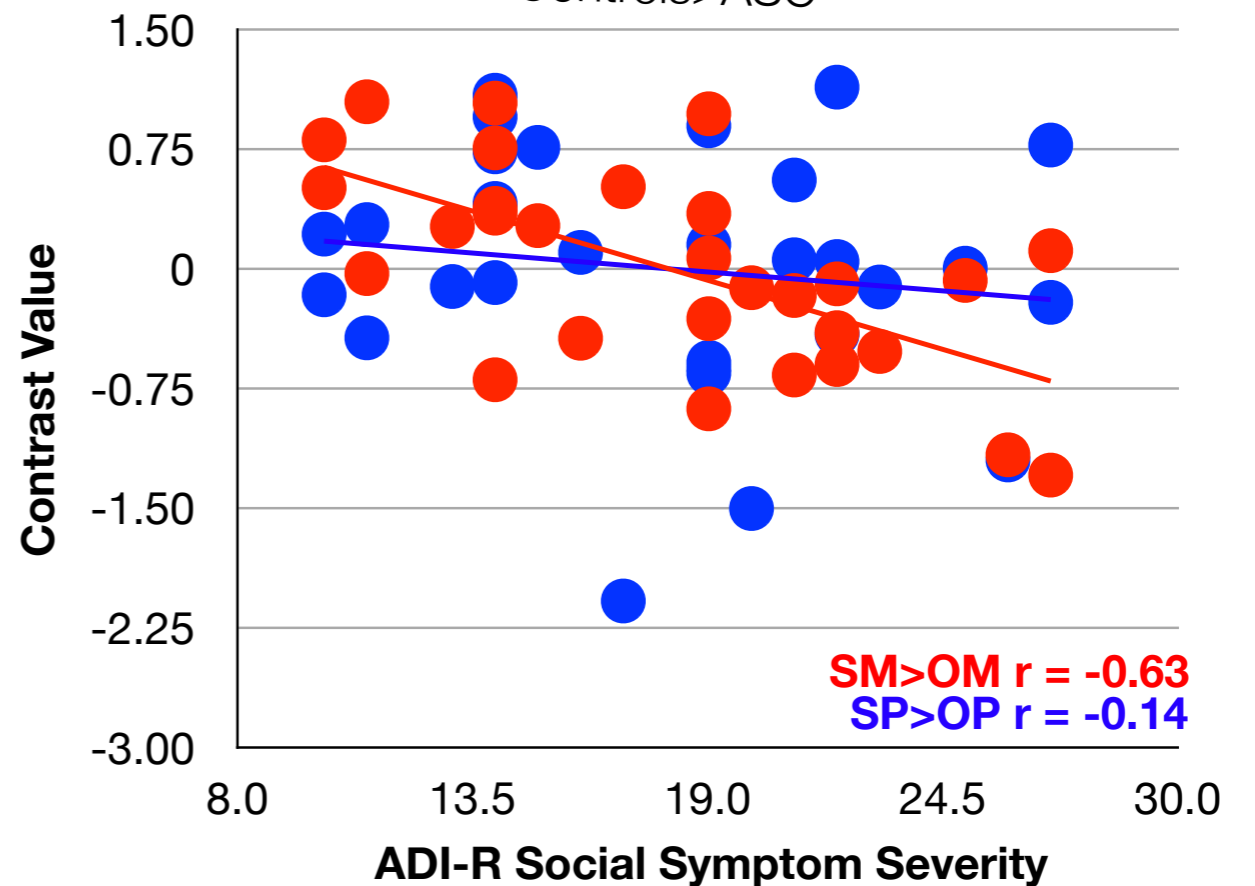
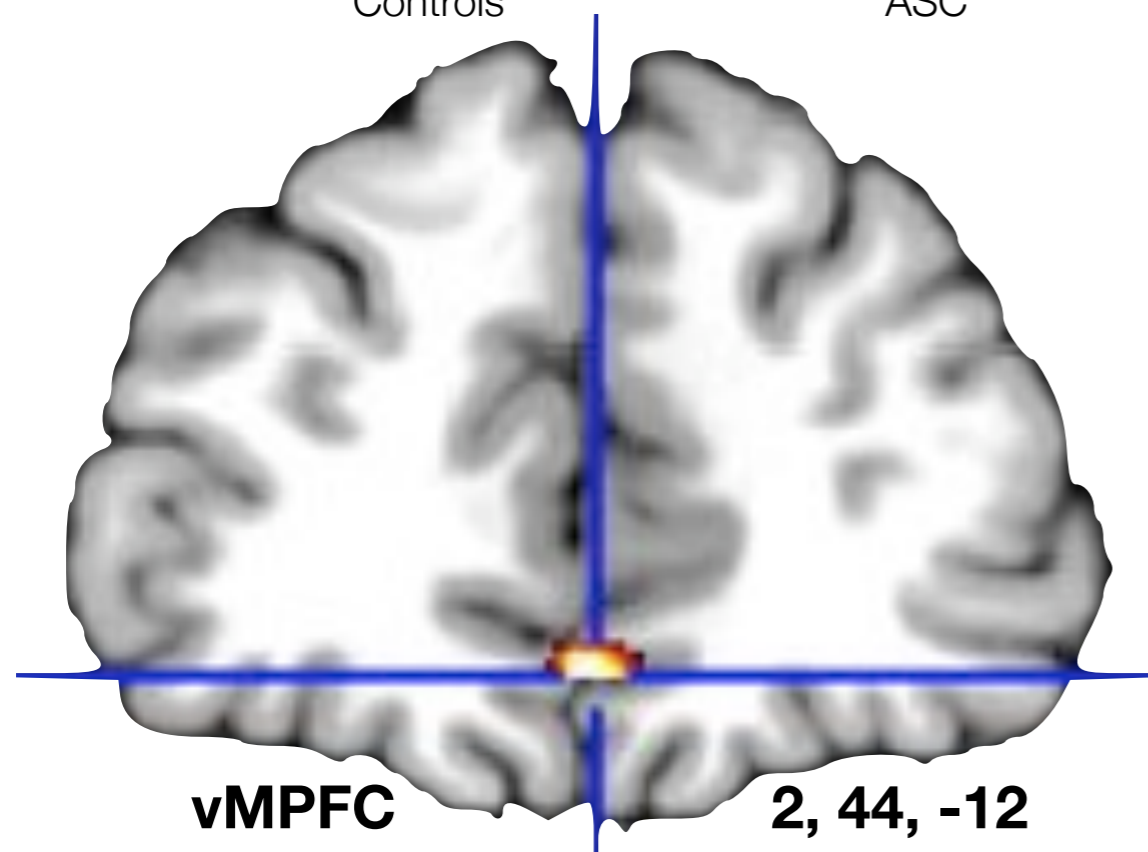
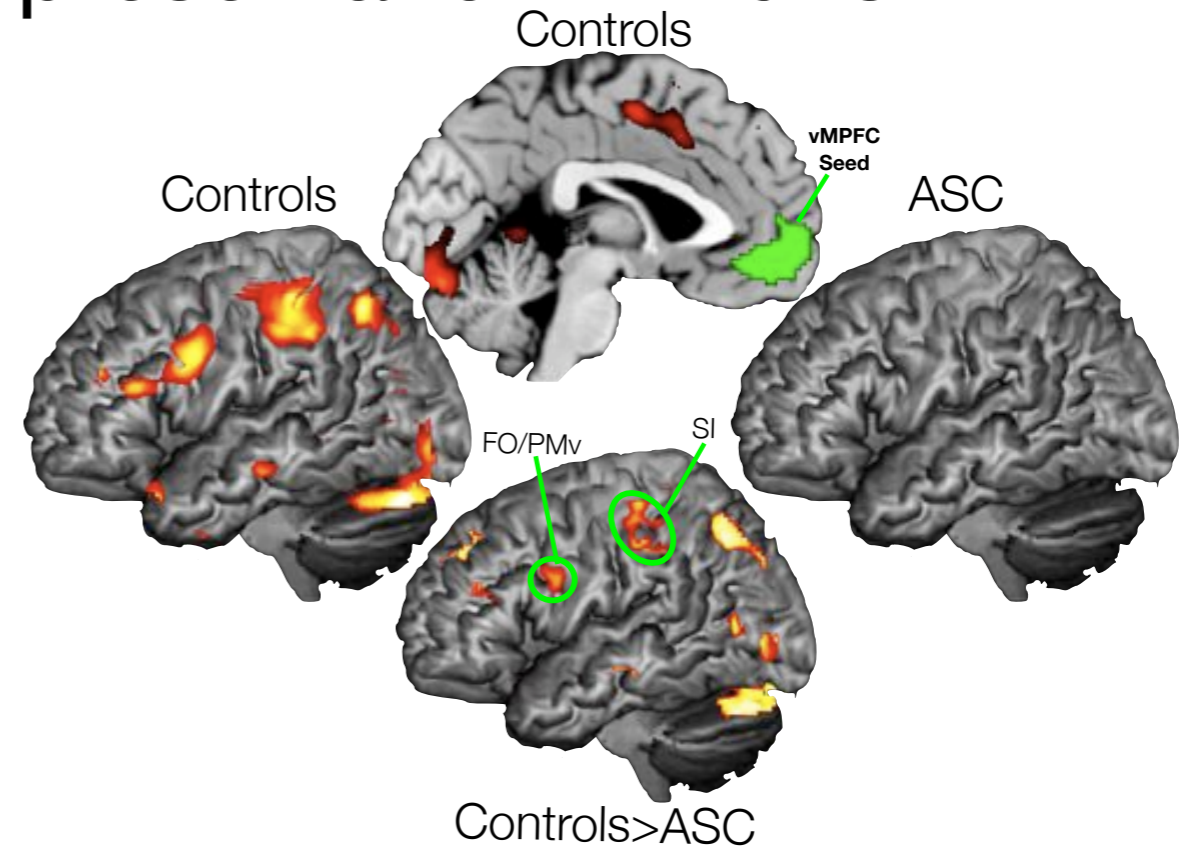
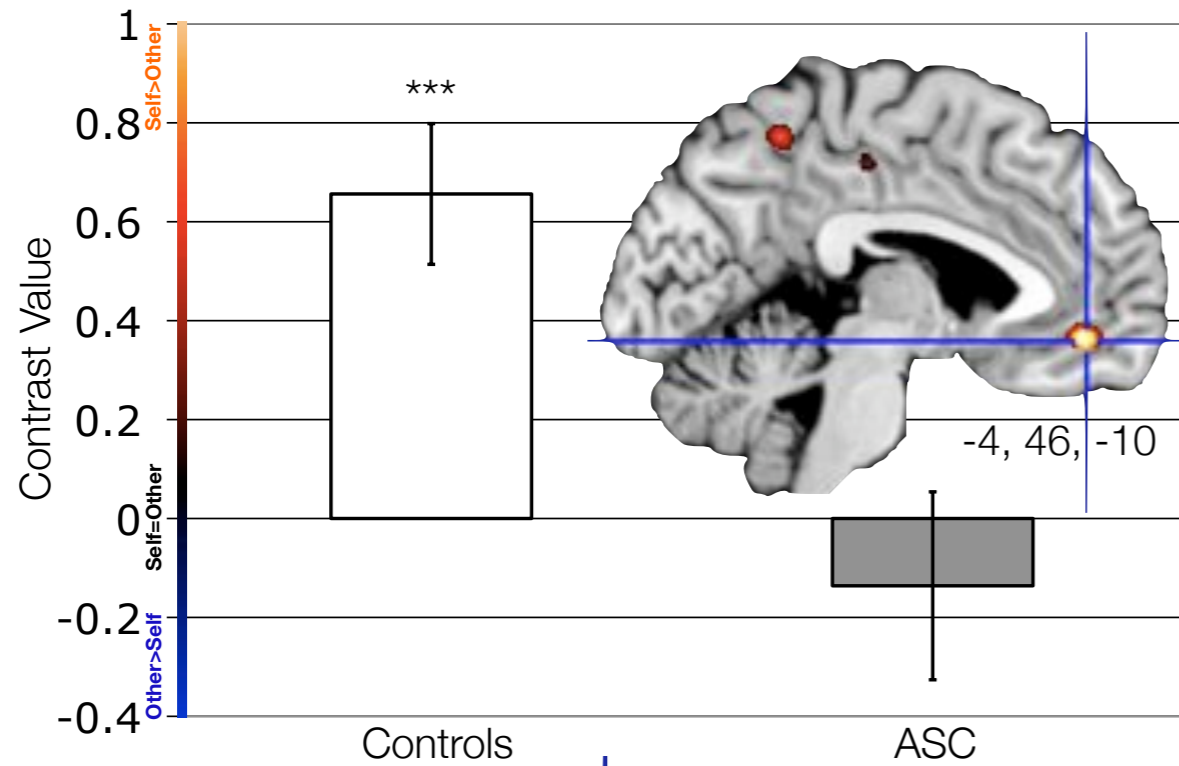
**cingulate projections onto Trust game self eigenmode**



Chiu et al., 2008, *Neuron*

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# Atypical Neural Self-Representation in Autism



Lombardo et al., 2010, *Brain*

<http://sites.google.com/site/mvlombardo>

# Why is the Self Important in Autism?

## 1. Related Impairments in the Self-Referential and Social Domain:

- Deficits in the social domain are related to deficits in the self-referential domain. What are the mechanisms tying these deficits together?

## 2. Atypical Neural Self-Representation:

- The autistic brain atypically represents self-relevant information. This may be an explanation behind the paradoxical observations of both extreme egocentrism and impaired self-referential cognition.

## 3. Derailed Development of Self:

- Understanding the developmental trajectory behind self-referential processing and social processing is an important area for future research. Which is impaired first, if any? Do early deficits in one lead to deficits in the other? How can an understanding of early atypical self-referential ability help in early identification of autism?

## 4. Simulation Deficits:

- Is simulation a route for social inference that individuals with ASC have difficulty with? If so, which aspect of simulation is off track; anchoring on self, adjustment away from self or both?

## 5. Revisiting Egocentrism in Autism:

- If egocentrism is the norm in the general population, how do we know that egocentrism in autism is an extreme of this?

## 6. A Route for Identifying New Mechanisms Involved in Social-Communicative Difficulties in Autism:

- Research on social-communicative difficulties in autism has largely been dominated by an other-centric focus (e.g., reading social cues from others) or a target-agnostic focus (e.g., generalized mindreading mechanisms)? This type of focus ignores all the ways in which self is paramount in the social world.



Thanks!



### **Colleagues**

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Liliana Ruta  
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