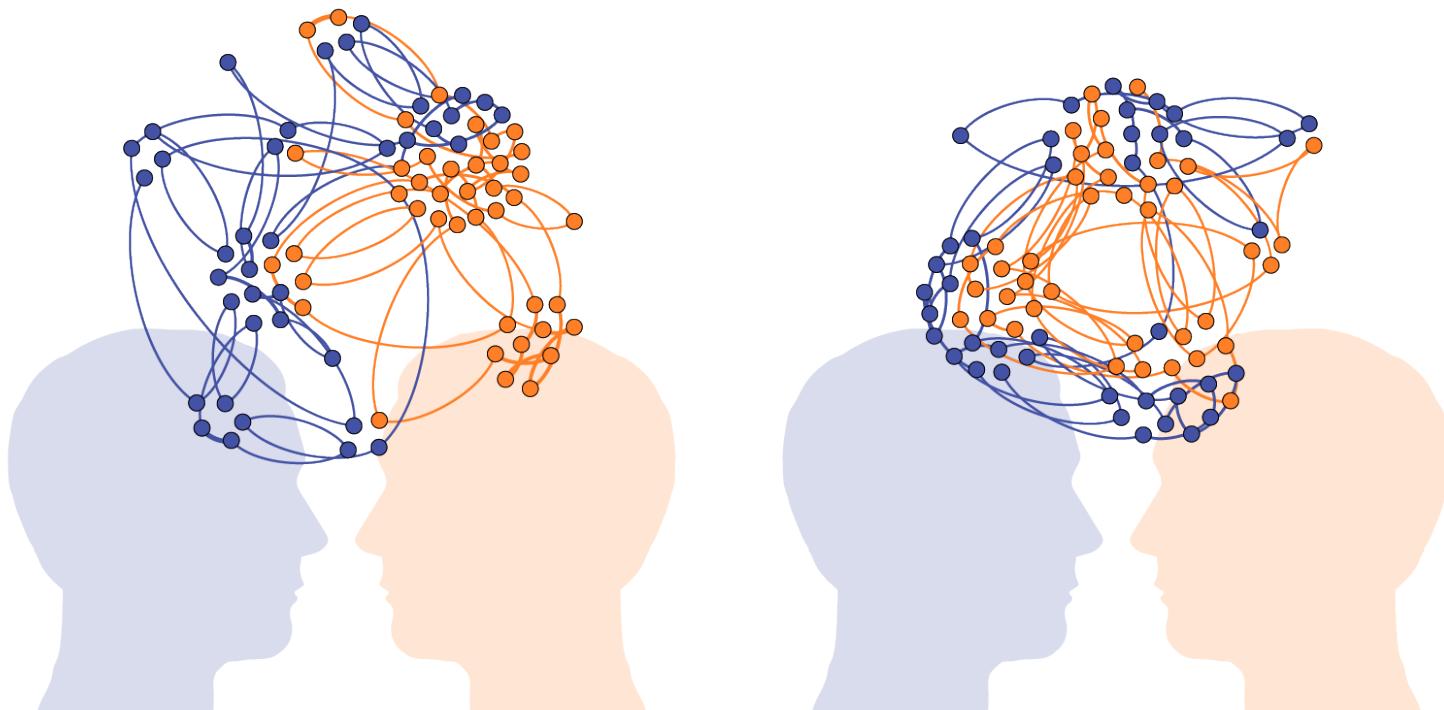




What do we share?



# Shared Conceptual Spaces II



## 1. Neuroscientific evidence

Dual-fMRI

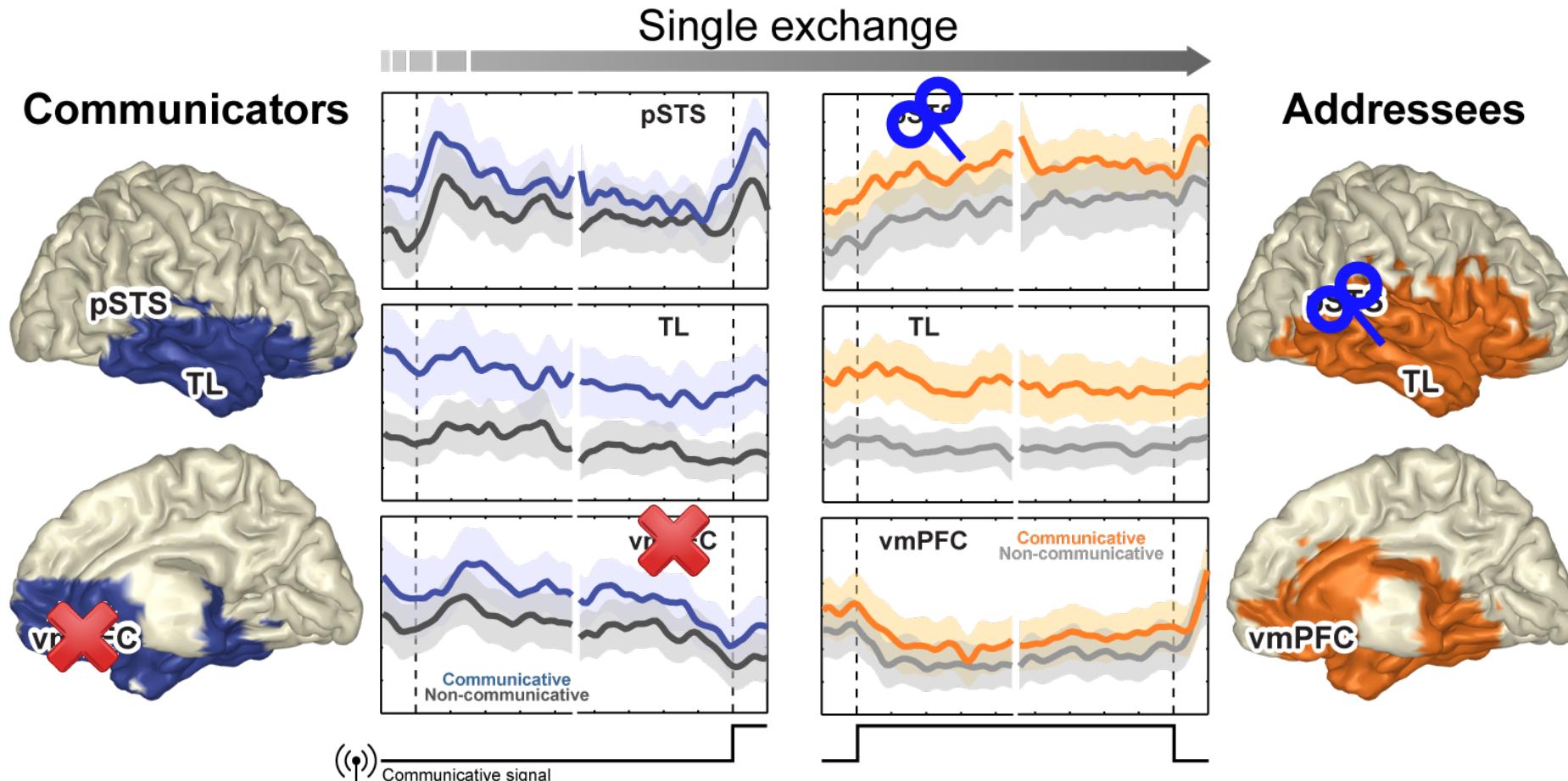
## 2. Interpersonal synchrony

Brain to brain coupling, fundamental communicative obstacles



# 4 predictions of neural activity supporting shared conceptual spaces

1. Achieving mutual understanding should evoke neural activity reflecting flexible conceptual processes, in regions known to support conceptual knowledge
2. There should be shared patterns of neural activity during communicative production and comprehension given that these processes relate to the same conversational context
3. **The timing of this shared neural pattern should lead, not follow, the occurrence of a communicative signal, given that the conceptual space is defined by the ongoing communicative interaction rather than by the signal itself**
4. The temporal dynamics of the shared neural pattern should reflect the communicators' adjustments of their shared conceptual space



The same brain regions in **communicators** and **addressees** are upregulated already before a communicative behavior is produced or observed



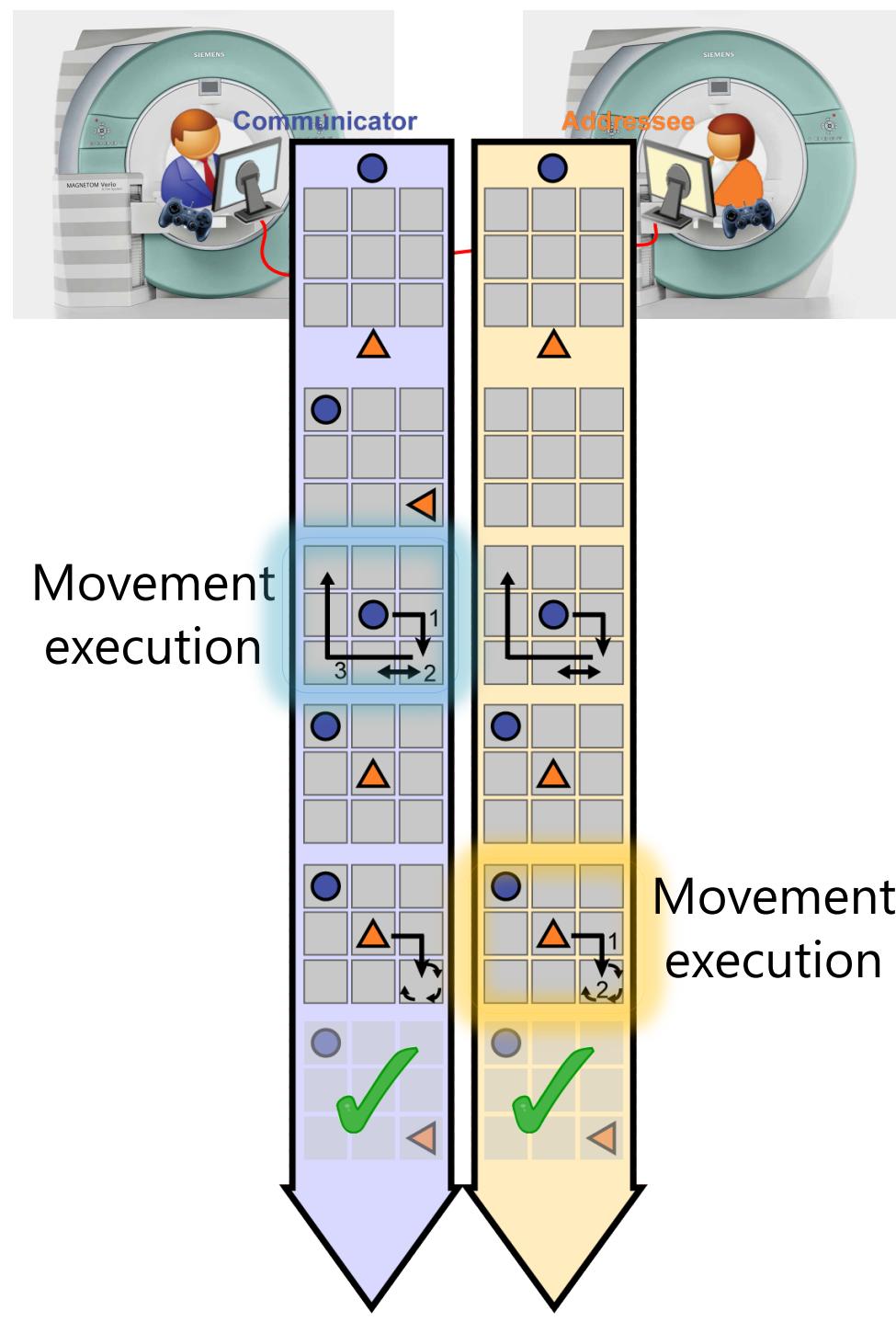
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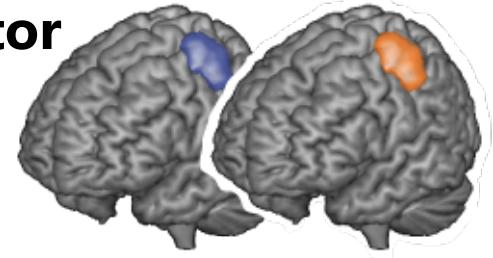


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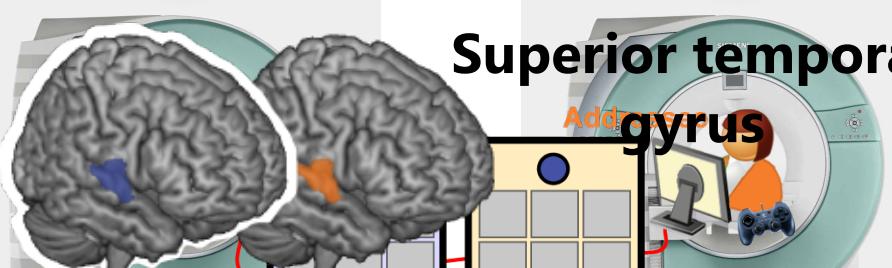


## Sensorimotor cortex (control)

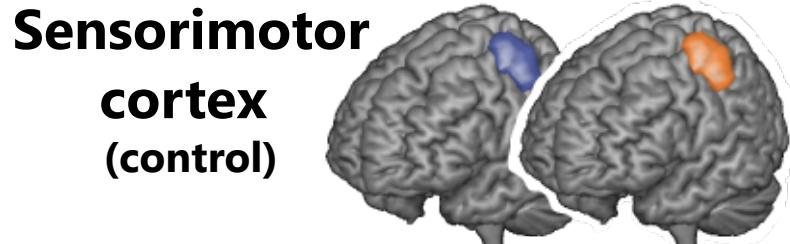
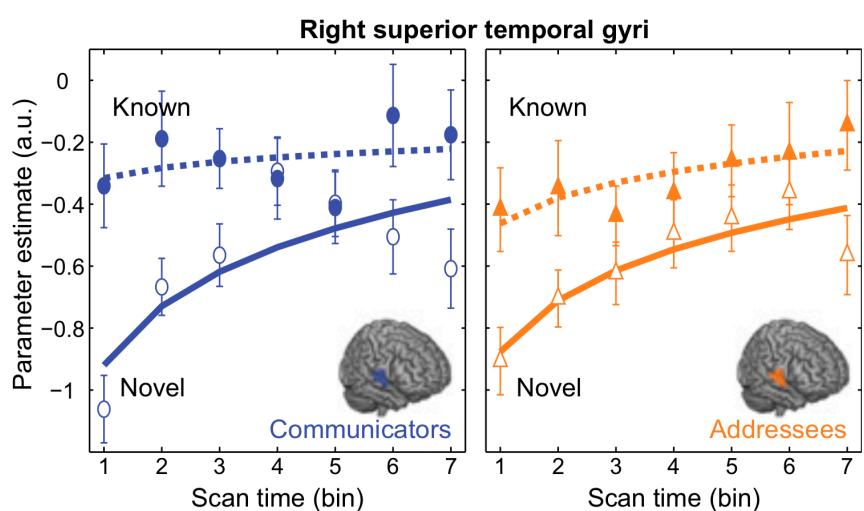


Cerebral coherence between communicators marks the emergence of meaning

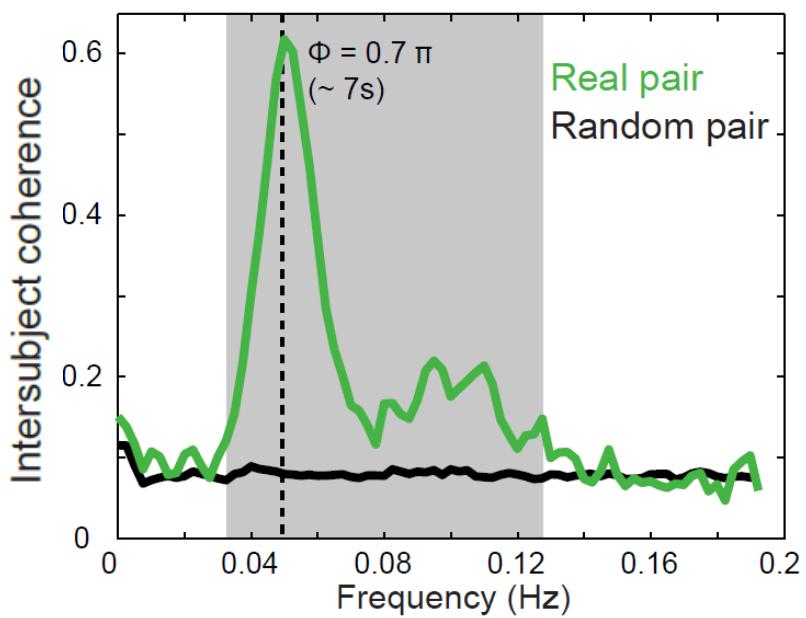
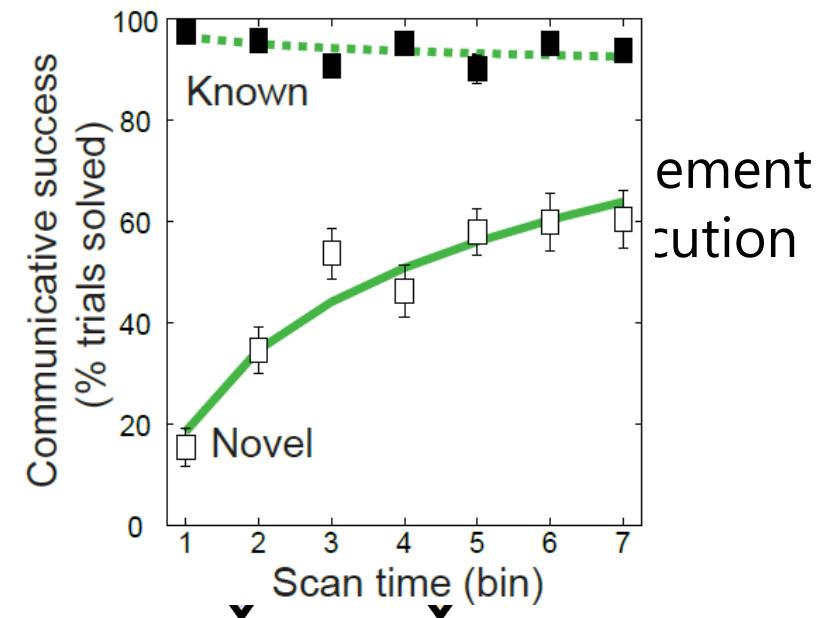
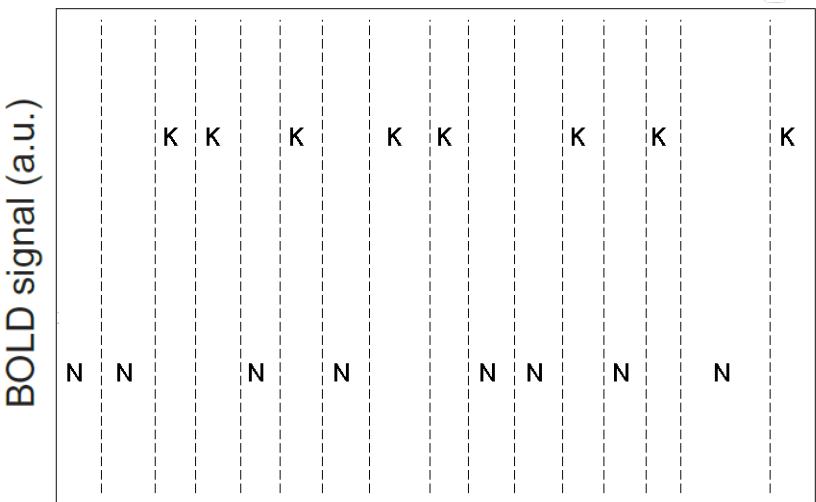
Arjen Stolk<sup>a,1,2</sup>, Matthijs L. Noordzij<sup>b,1</sup>, Lennart Verhagen<sup>b,c</sup>, Inge Volman<sup>a,d</sup>, Jan-Mathijs Schoffelen<sup>b,e</sup>, Robert Oostenveld<sup>a</sup>, Peter Hagoort<sup>a,e</sup>, and Ivan Toni<sup>a</sup>



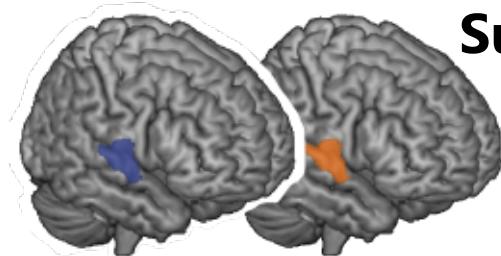
**Superior temporal  
gyrus**



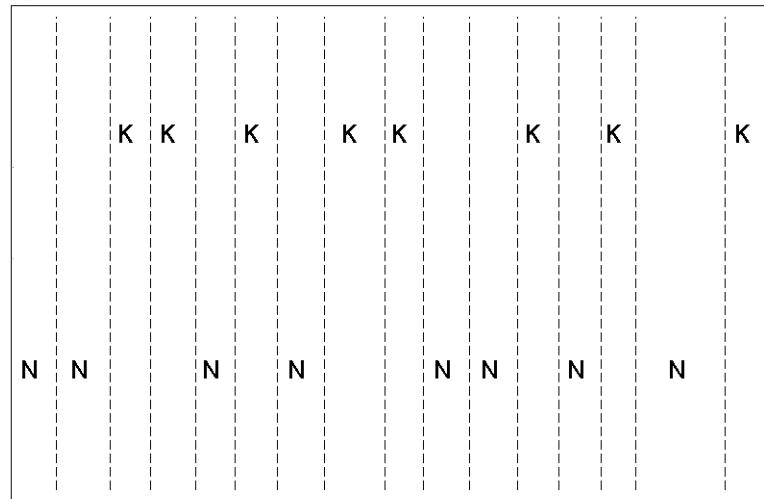
**Sensorimotor  
cortex  
(control)**



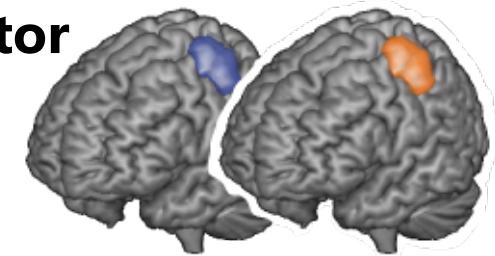
## Superior temporal gyrus



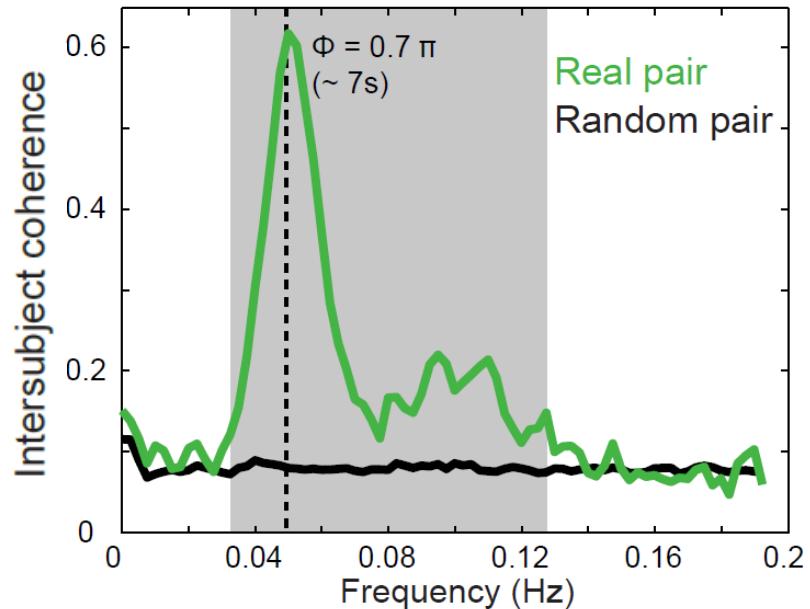
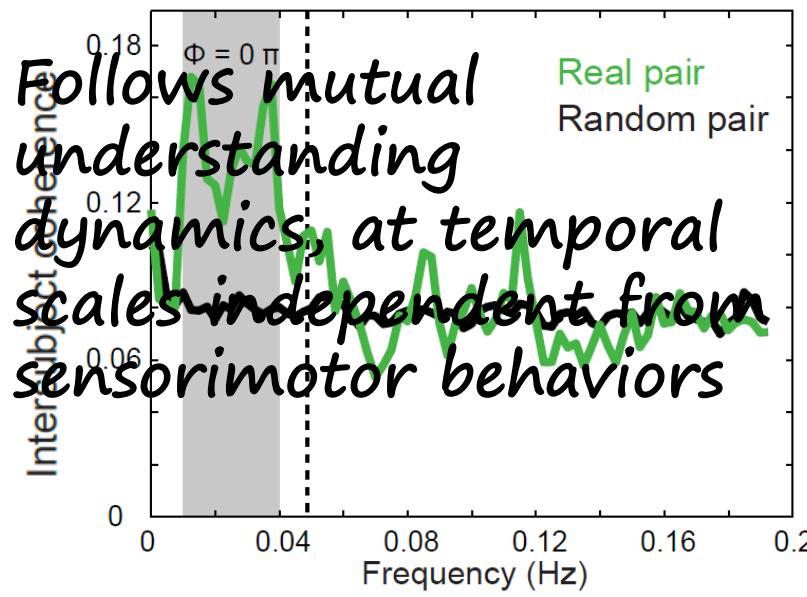
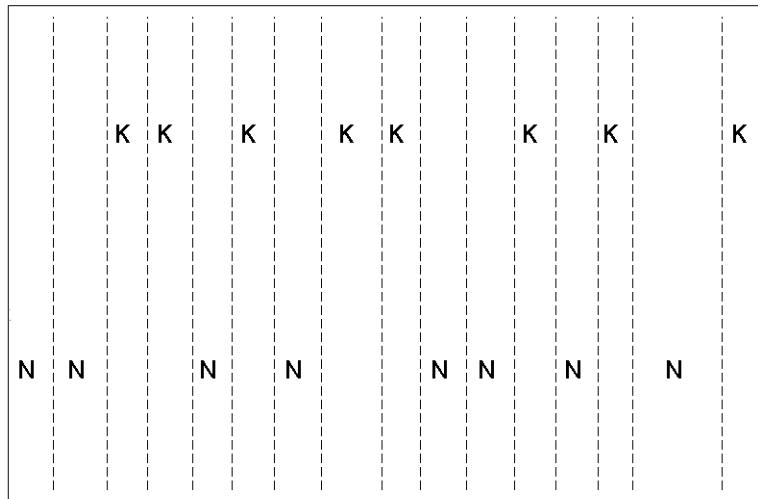
BOLD signal (a.u.)



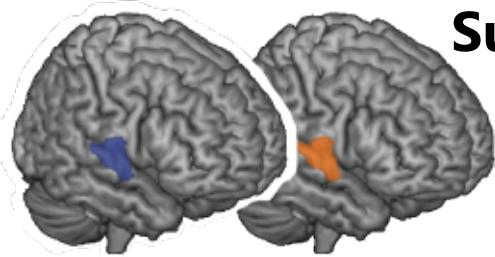
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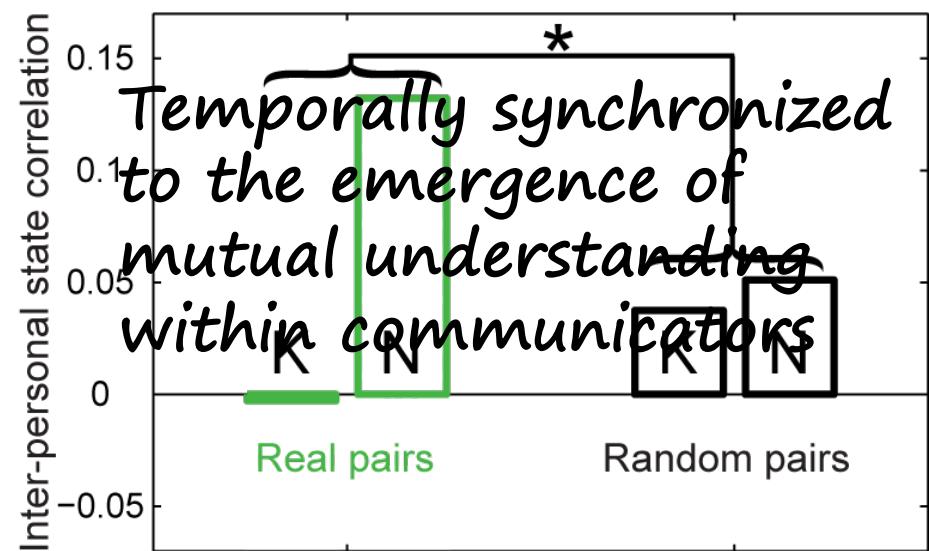
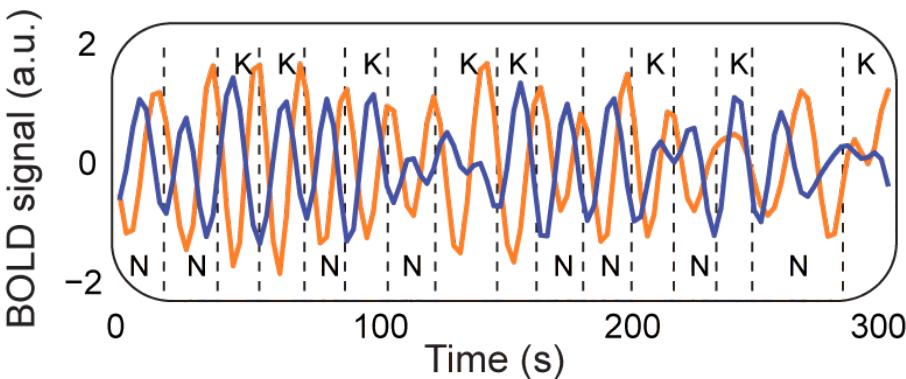
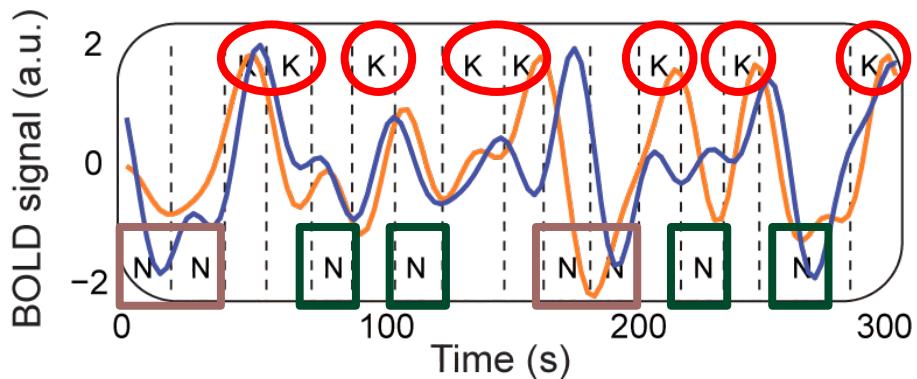
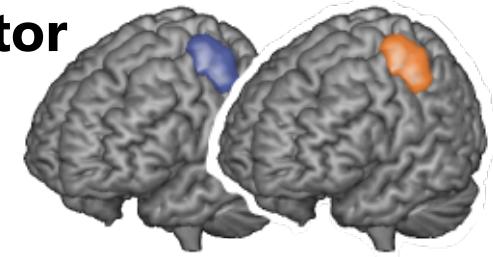
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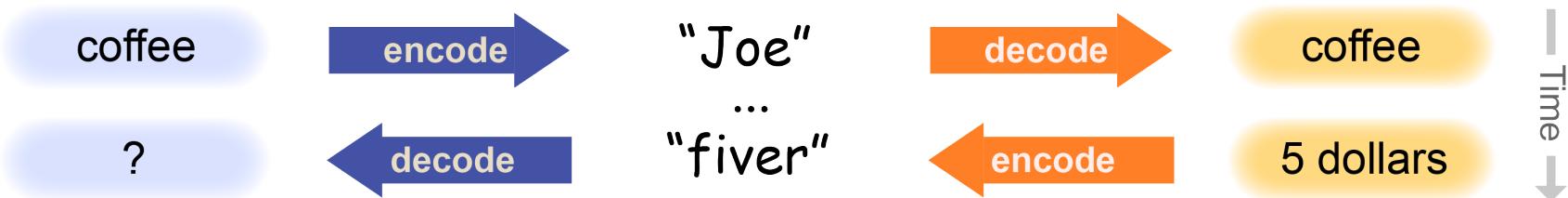
## Sensorimotor cortex (control)





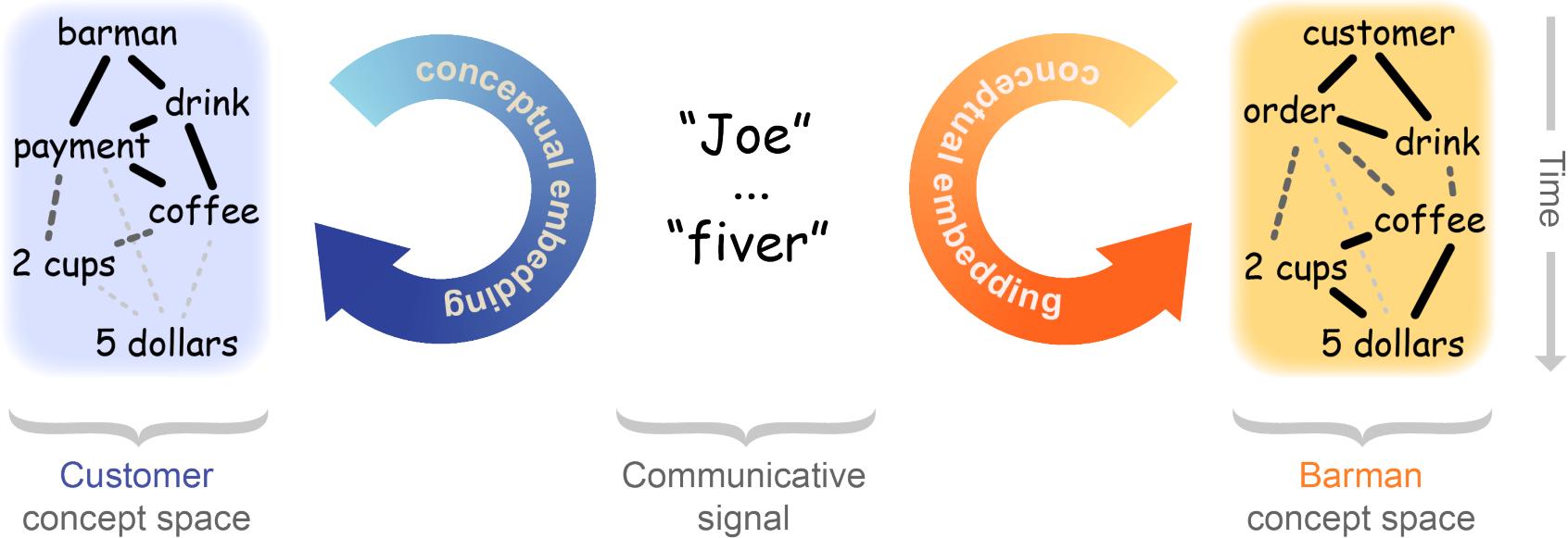
## Signal-centered frameworks

Meaning is a property of the signal



## Conceptual alignment framework

Meaning is a property of a mutually coordinated conceptual space



## 1. Neuroscientific evidence

Dual-fMRI

## 2. Interpersonal synchrony

Brain to brain coupling, fundamental communicative obstacles

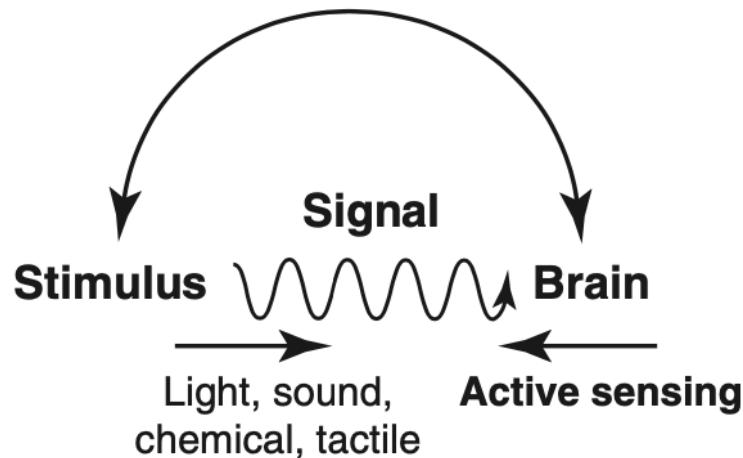


## Interactive alignment meets mirror neurons

(a)

### Stimulus-to-brain coupling

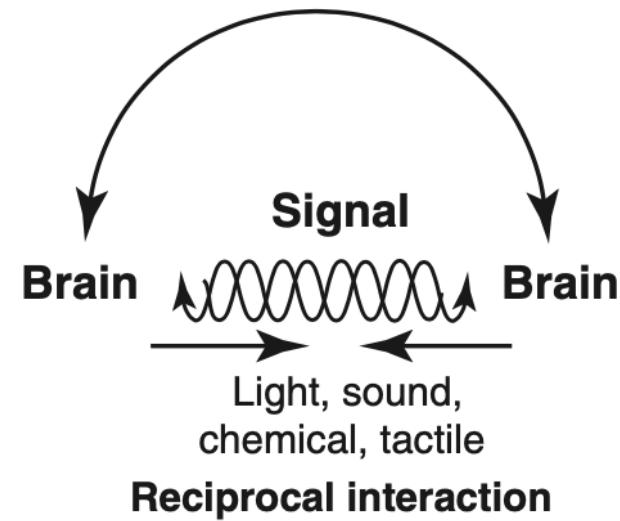
Physical environment



(b)

### Brain-to-brain coupling

Social environment



**Brain-to-brain coupling: a mechanism for creating and sharing a social world**

Uri Hasson<sup>1,2</sup>, Asif A. Ghazanfar<sup>1,2</sup>, Bruno Galantucci<sup>3,4</sup>, Simon Garrod<sup>5,6</sup> and Christian Keysers<sup>7,8</sup>

Presupposes wirelessly coupled brains that are exact copies of one another



Achieving synchrony is slow and requires mechanical causality in a system



## Fundamental communicative obstacles

- Interpersonal asymmetry

No two people have exactly the same experience and expertise

- Signal ambiguity

A communicative signal contains a multiplicity of functions and referents

- Typological inadequacy

Even for highly conventional signals, communicators always needs to consider how their signals will be interpreted in the current context

Synchrony is at best a marker of mutual understanding, not a mechanism

- Brains may become synchronized due to the accumulation of shared contextual knowledge at a scale independent from individual communicative behaviors
- Interpersonal synchrony is at best a marker of mutual understanding, not a mechanism
- Human communication is best thought of as a solution to a *conceptual alignment* challenge

- Dual 6: Promoting Prosociality
- *Exam Questions due next week*