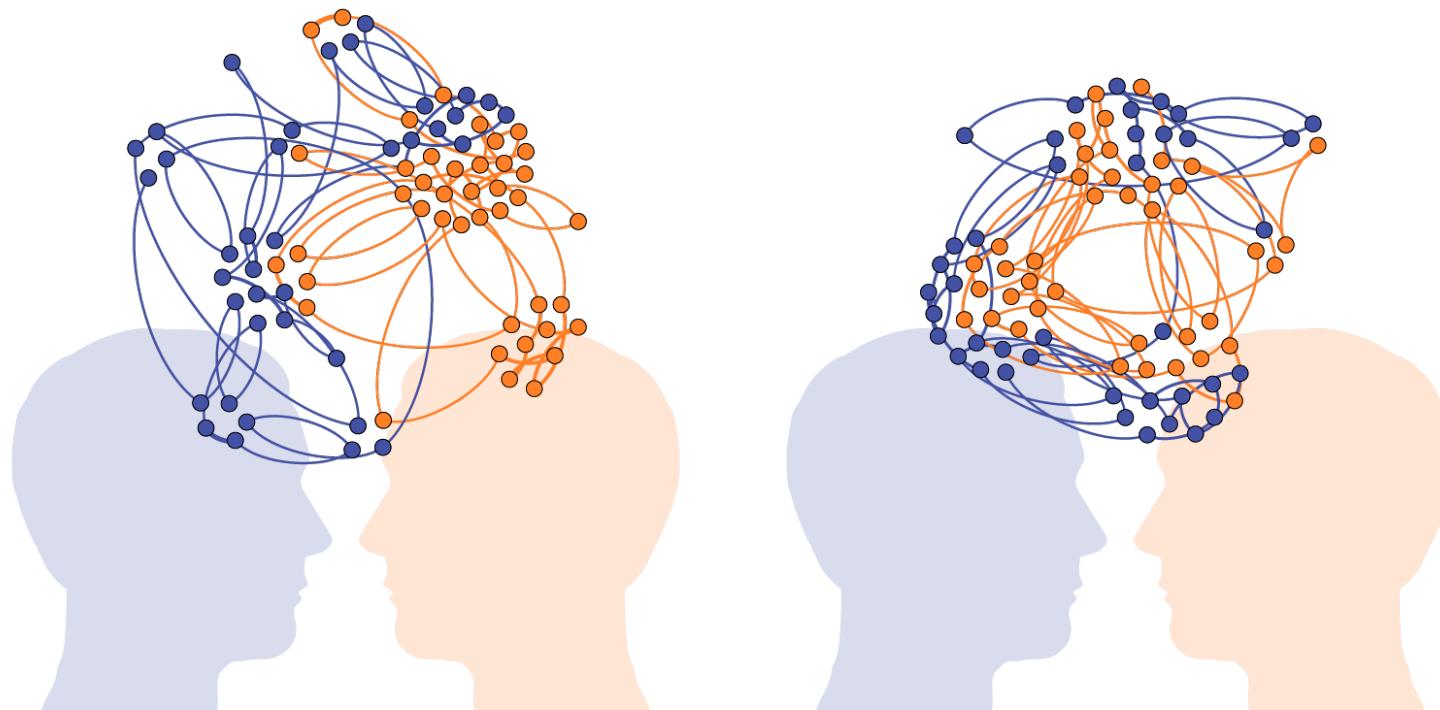




What do we share?



Shared Conceptual Spaces I



1. Theoretical framework

Building a shared conceptual space

2. Neural predictions

Neural activity supporting shared conceptual spaces

3. Neuroscientific evidence

MEG, TMS, and lesion studies



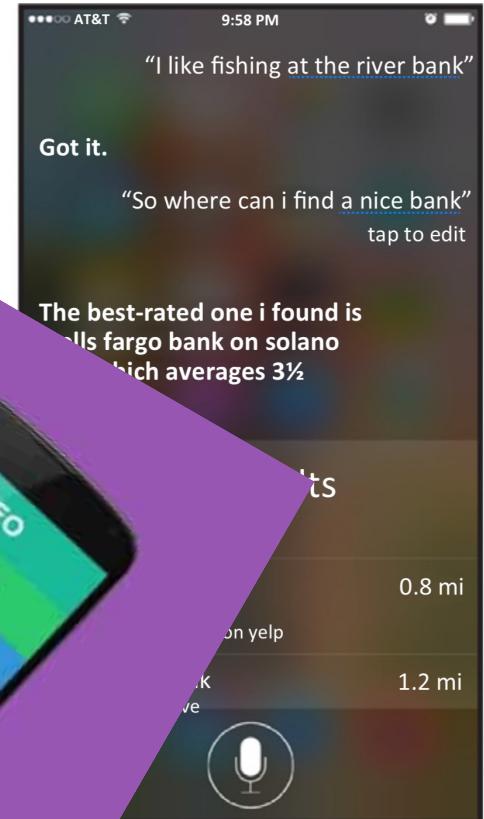
BBC
NEWS
5 July 2013 Last updated 5 July 2013

Human museum guide

Honda's popular robot with gesture recognition can now act as a museum guide at the National Museum of Emerging Science and Innovation in Tokyo.

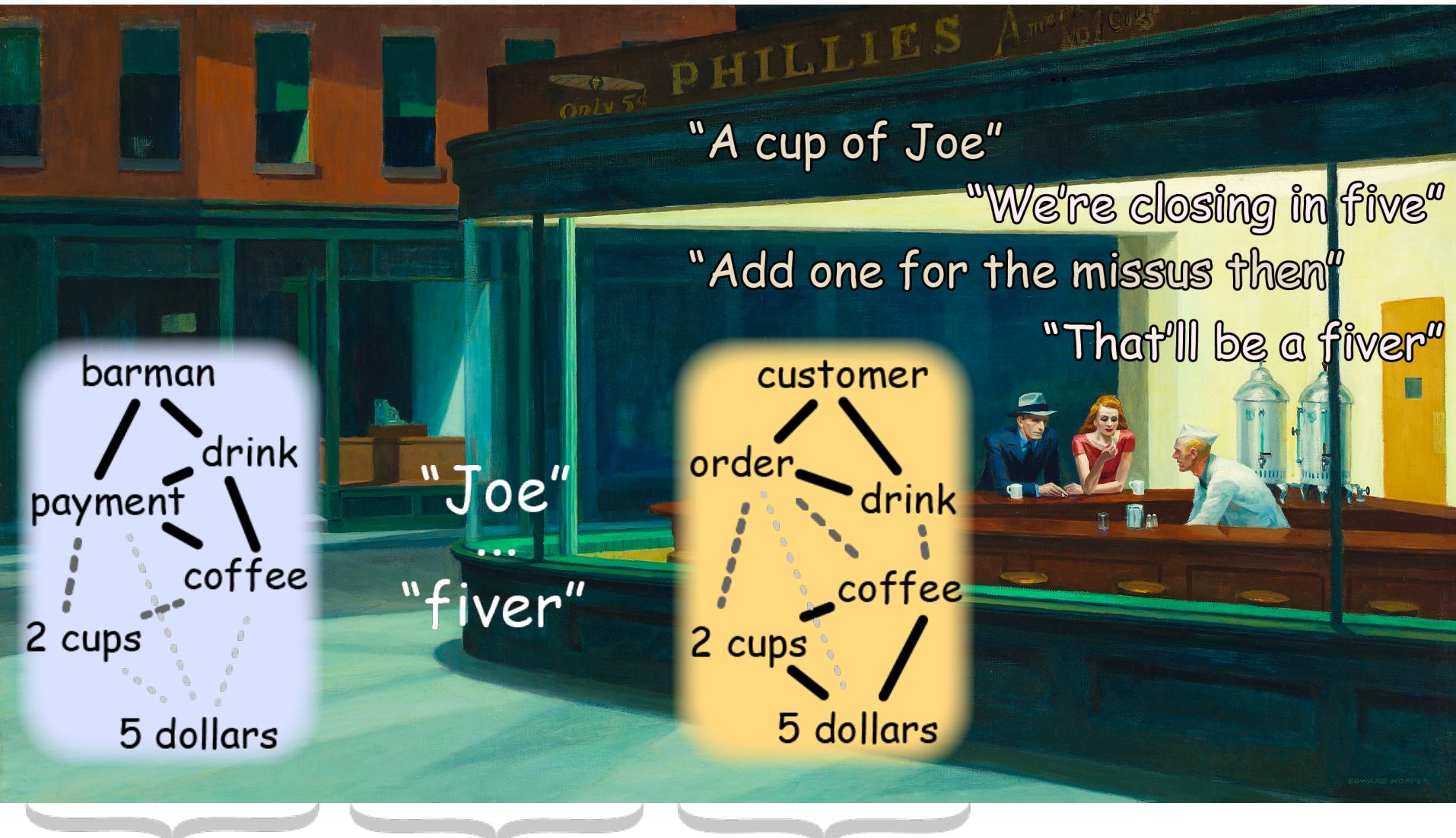
The machine struggled to differentiate between museum-goers raising their hands to ask a question and raising their hands to take photographs, Associated Press reported.

It is "working" as a tour guide at the museum for the next four weeks as a trial.



Problem: You determine the context?

Solution: We build a shared conceptual space?



Customer
concept space

Communicative
signal

Barman
concept space

1. Theoretical framework

Building a shared conceptual space

2. Neural predictions

Neural activity supporting shared conceptual spaces

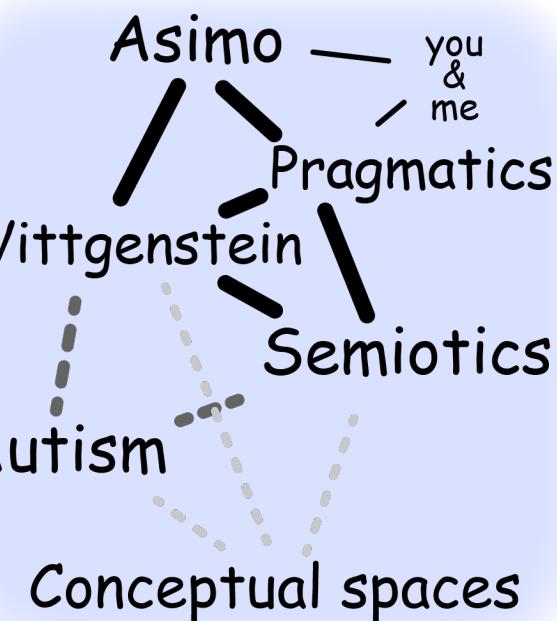
3. Neuroscientific evidence

MEG, TMS, and lesion studies



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 not follow, the occurrence of a communication signal given that the conceptual space is defined by the ongoing communicative interaction rather than the signal itself
4. The temporal dynamics of the shared neural activity should reflect the communicators' access to the shared conceptual space



1. Theoretical framework

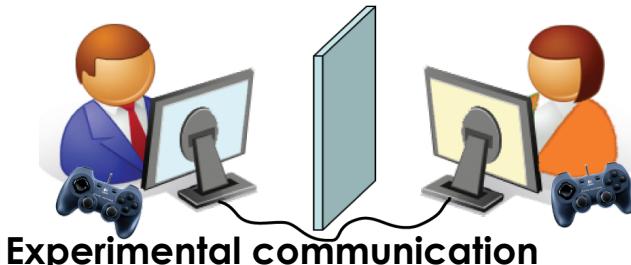
Building a shared conceptual space

2. Neural predictions

Neural activity supporting shared conceptual spaces

3. Neuroscientific evidence

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What's different?

Multiple communication channels
(vocalizations, bodily and facial postures/movements, eye contact)

Access to pre-existing conventions
(a common language, body emblems, facial expressions)

Spontaneous turn-taking

Single communication channel
(movements of a geometric shape:
experimental control over communicative environment)

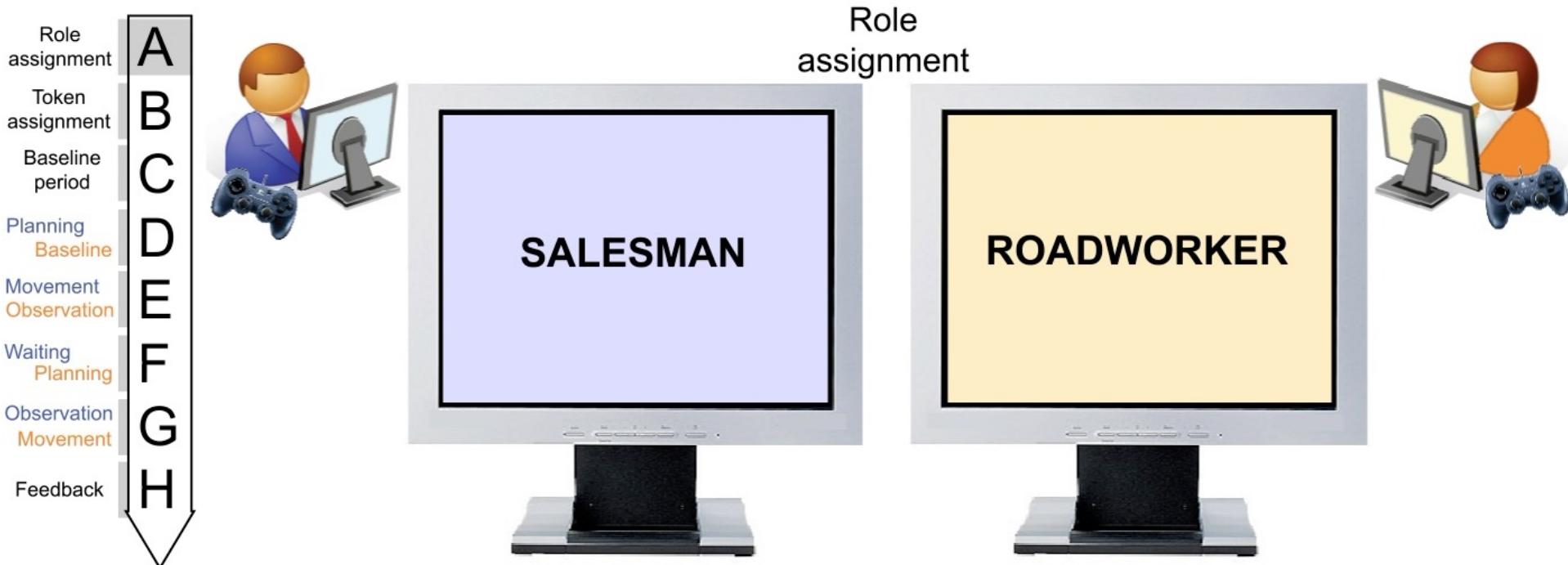
Novel communicative signals
(lack of pre-existing shared representations:
experimental control over shared cognitive history)

Experimentally-controlled roles
(isolation of production and comprehension)

What's identical?

Dynamic communicative context
(jointly built, updated according to the fleeting idiosyncrasies of an ongoing interaction)

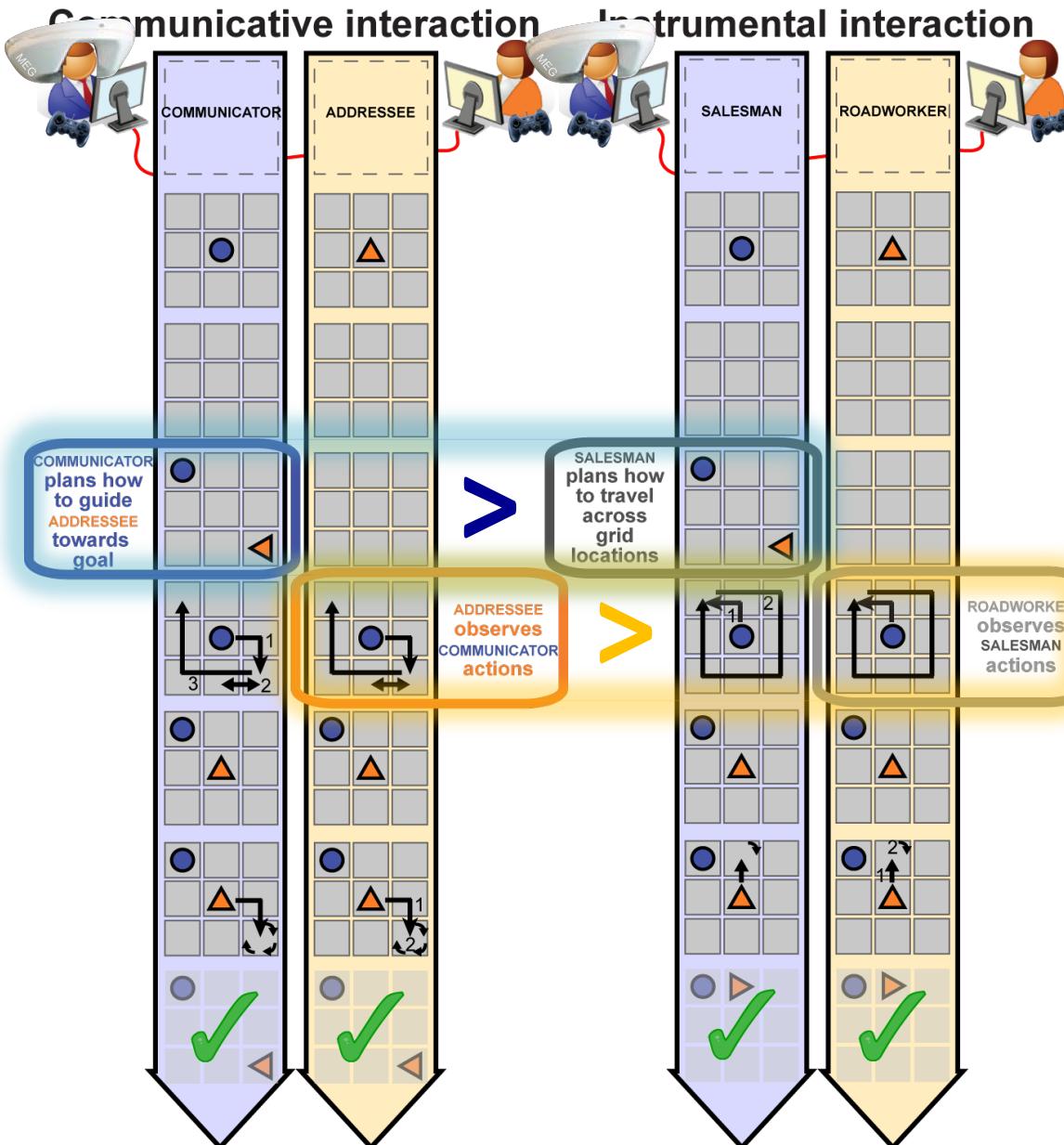
Control interaction task involving the same stimuli, responses, attention and between-subjects dependencies, but no communicative necessities



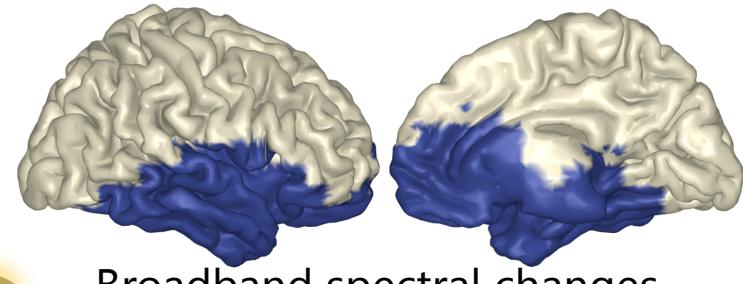


4 predictions of neural activity supporting shared conceptual spaces

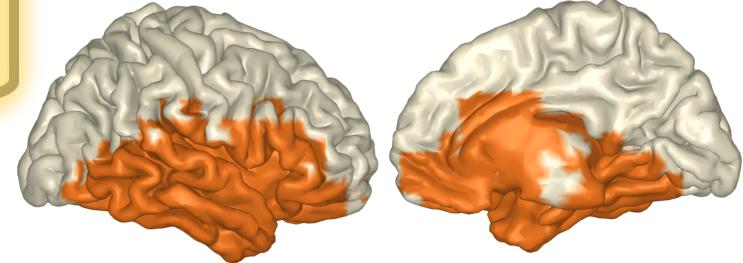
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4. The temporal dynamics of the shared neural pattern should reflect the communicators' adjustments of their shared conceptual space



Production of
communicative actions



Broadband spectral changes



Comprehension of
communicative actions

Neural mechanisms of communicative innovation

Arjen Stolk^{a,1}, Lennart Verhagen^a, Jan-Mathijs Schoffelen^{a,b}, Robert Oostenveld^a, Mark Blokpoel^a, Peter Hagoort^{a,b}, Iris van Rooij^a, and Ivan Toni^a



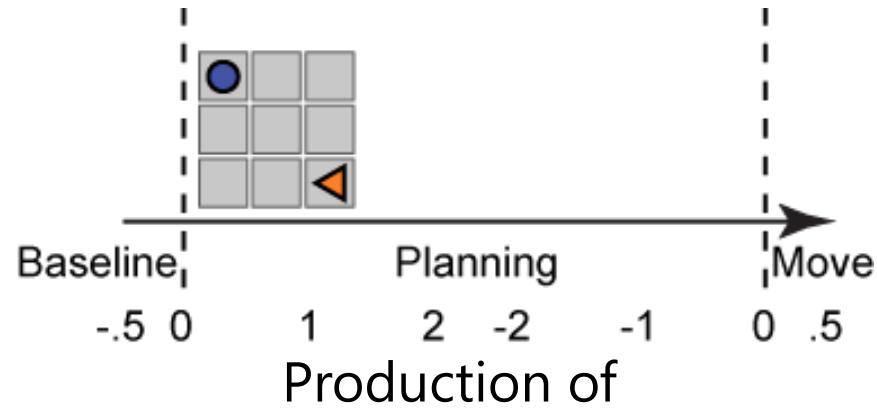
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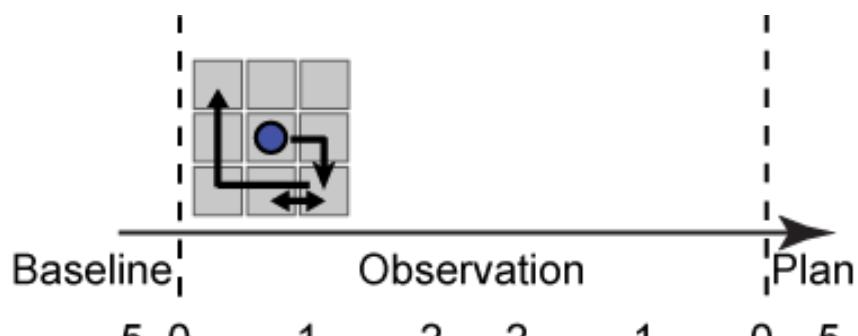


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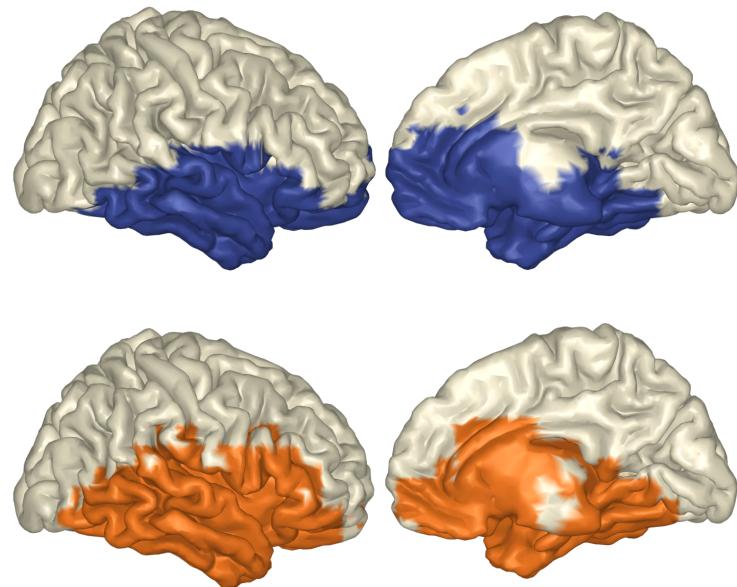
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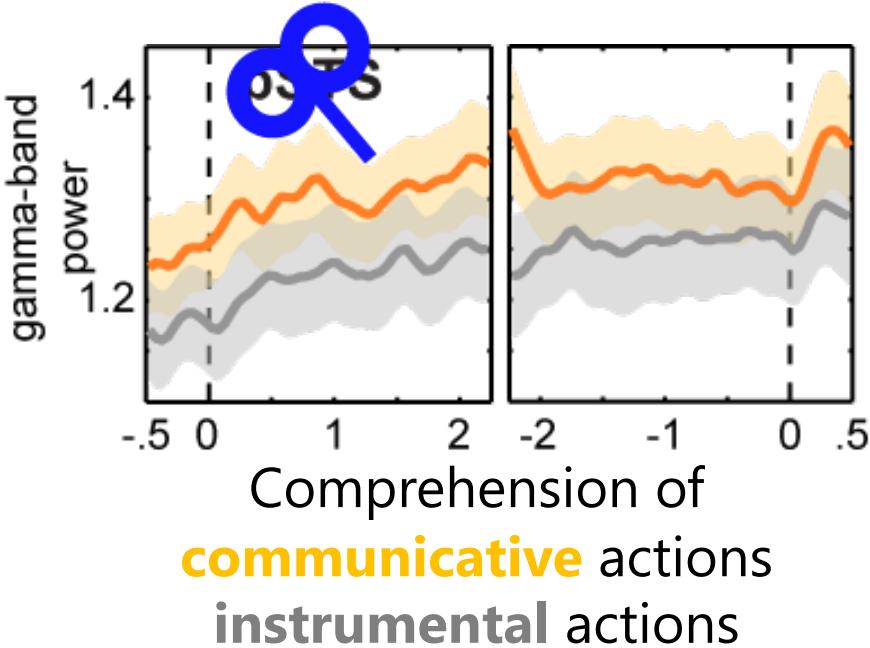
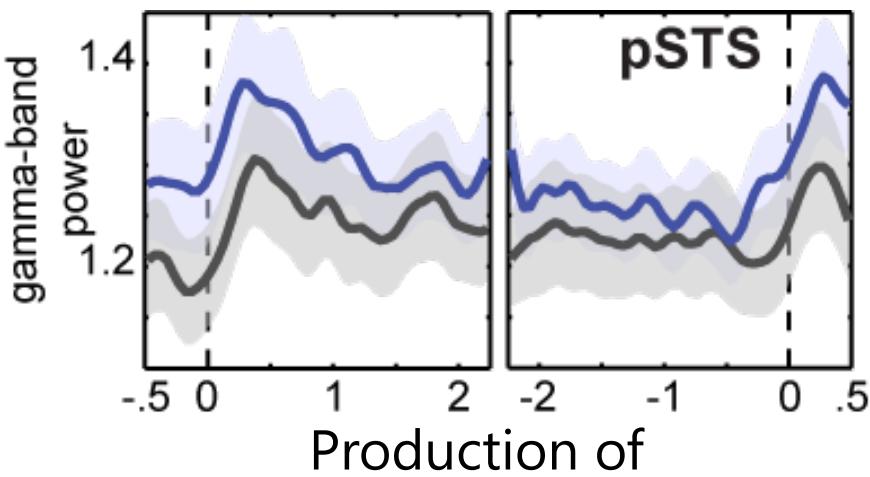


communicative actions
instrumental actions



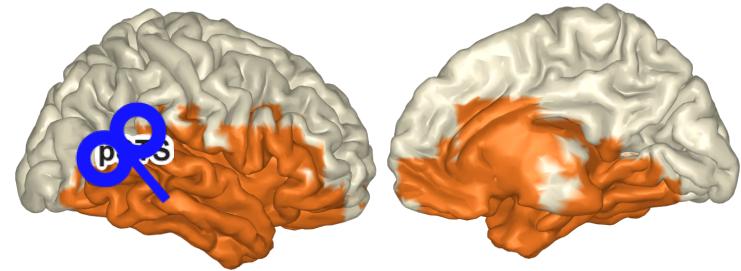
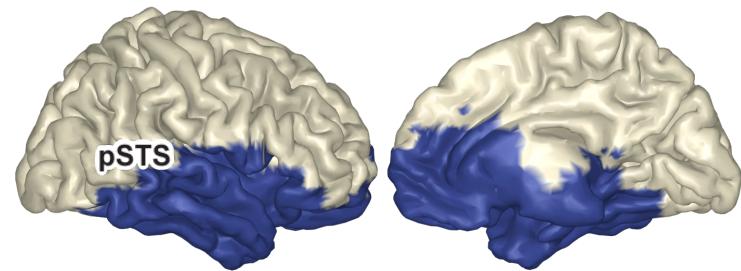
communicative actions
instrumental actions



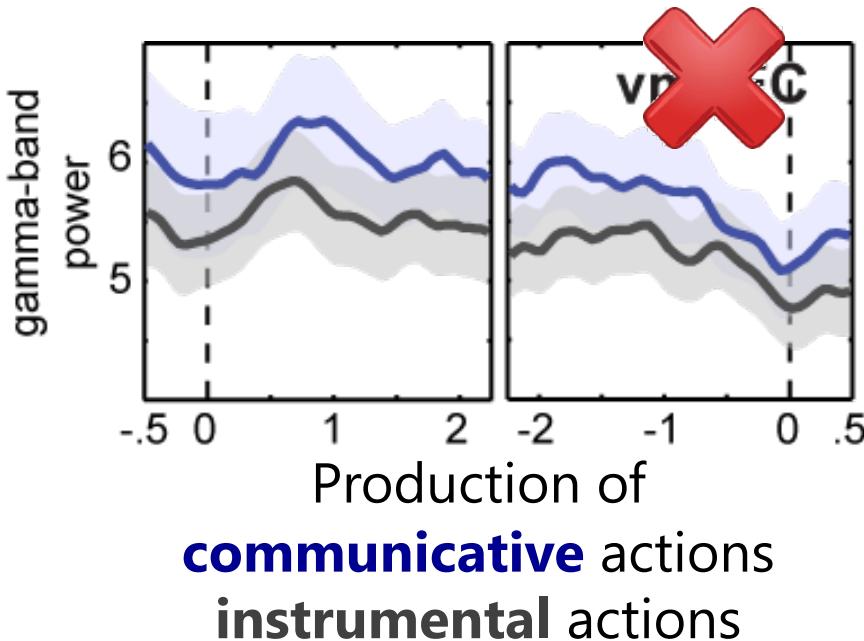


Understanding communicative actions: A repetitive TMS study

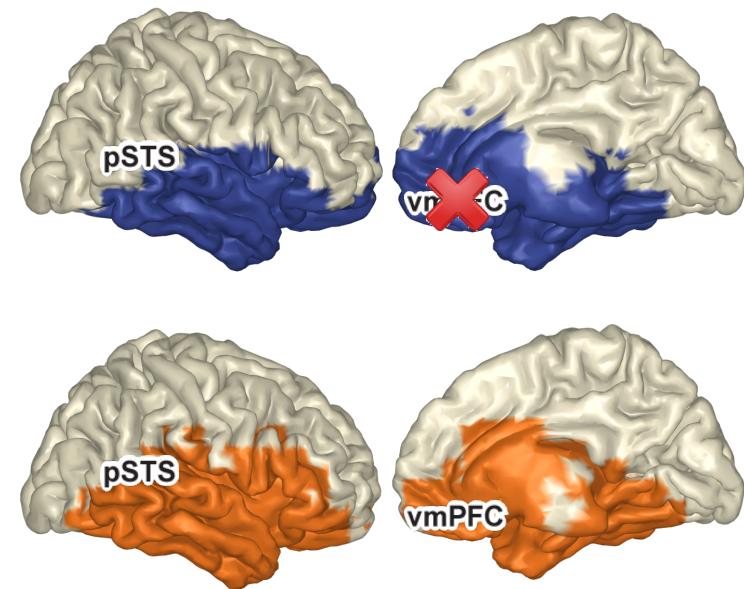
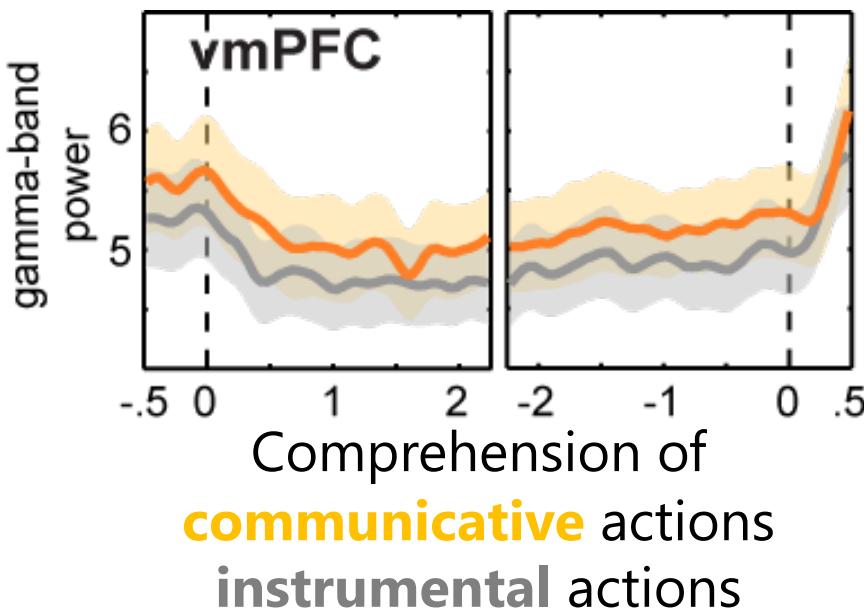
Arjen Stolk ^{a,*}, Matthijs L. Noordzij ^b, Inge Volman ^{a,c}, Lennart Verhagen ^a,
Sebastiaan Overeem ^d, Gijs van Elswijk ^d, Bas Bloem ^d, Peter Hagoort ^{a,e} and Ivan Toni ^a



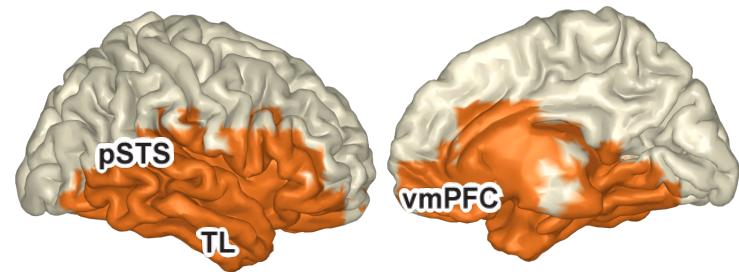
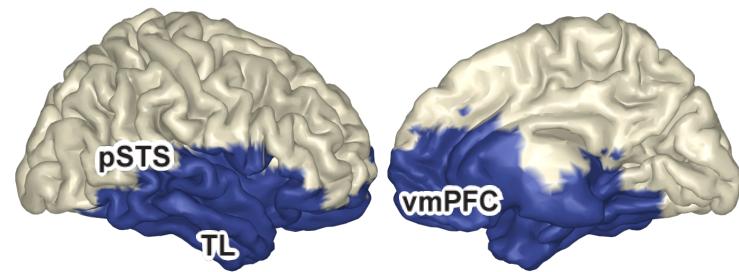
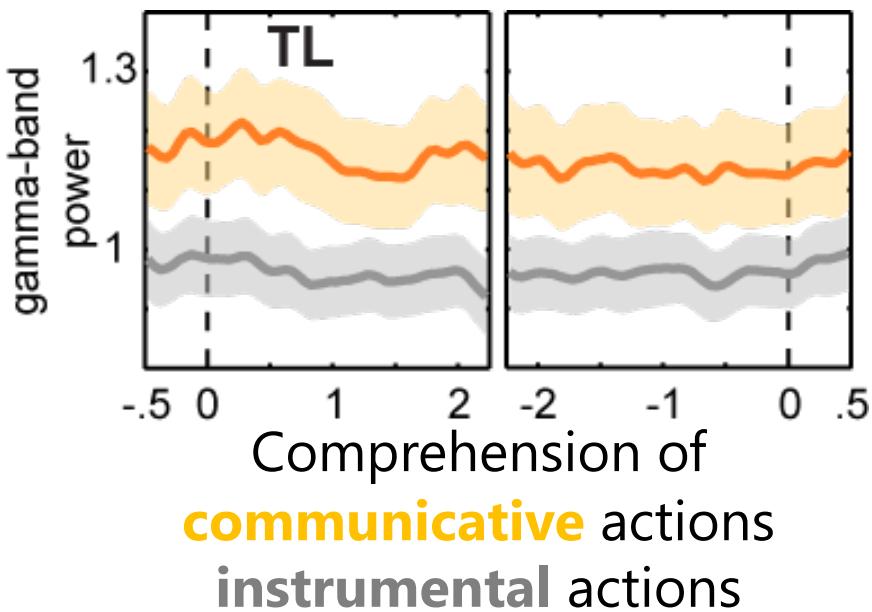
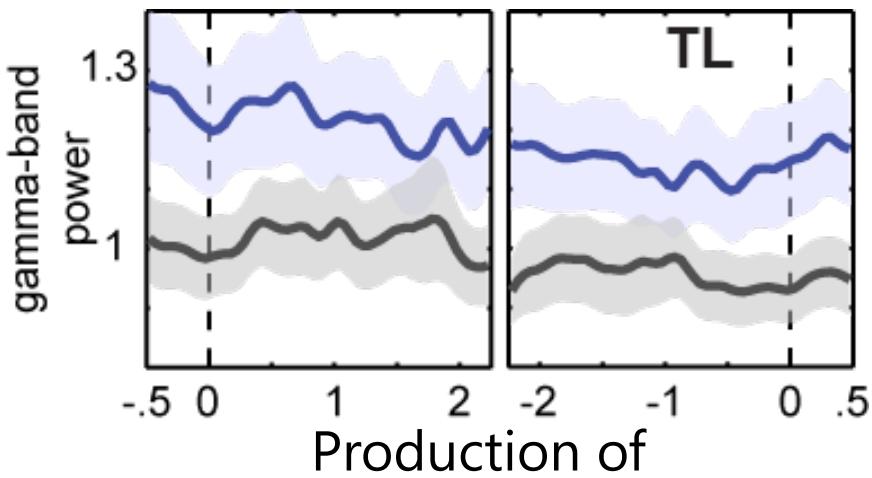
Necessary for
integrating knowledge
of the recent
communicative history



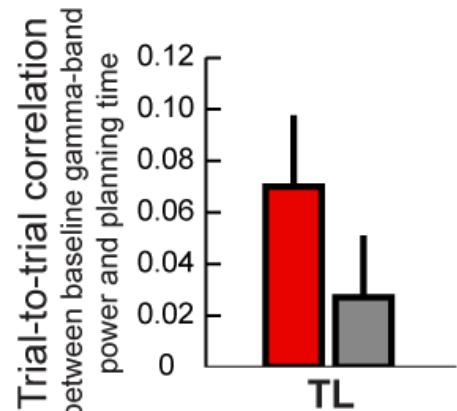
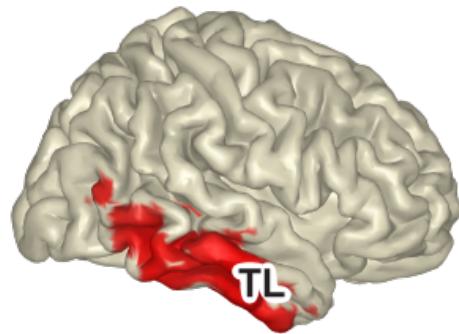
Necessary for tuning decisions with knowledge of a communicative partner



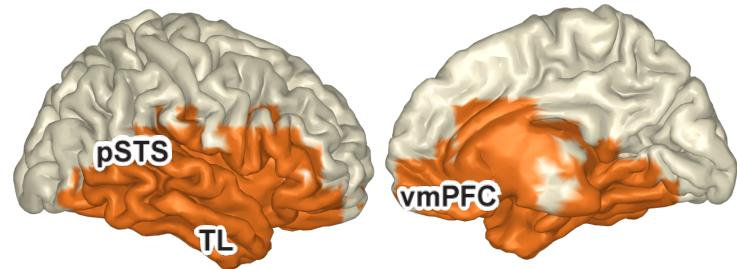
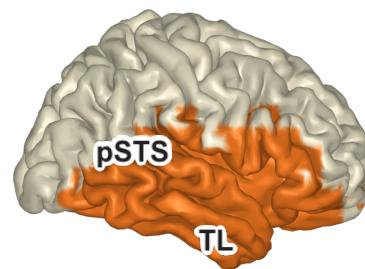
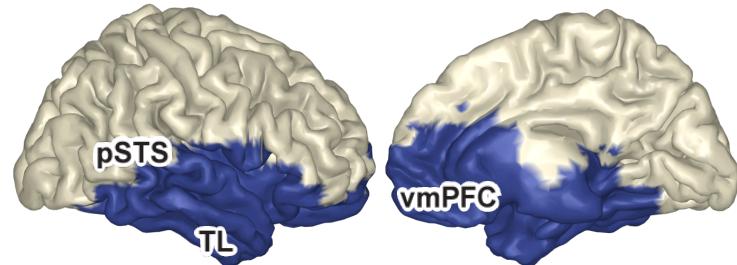
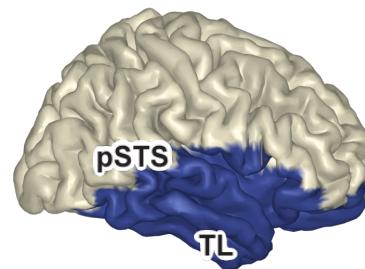
Altered Communicative Decisions following Ventromedial Prefrontal Lesions



Supports communicative behaviors in a state-dependent manner



- *Communicative interactions*
- *Instrumental interactions*





4 predictions of neural activity supporting shared conceptual spaces

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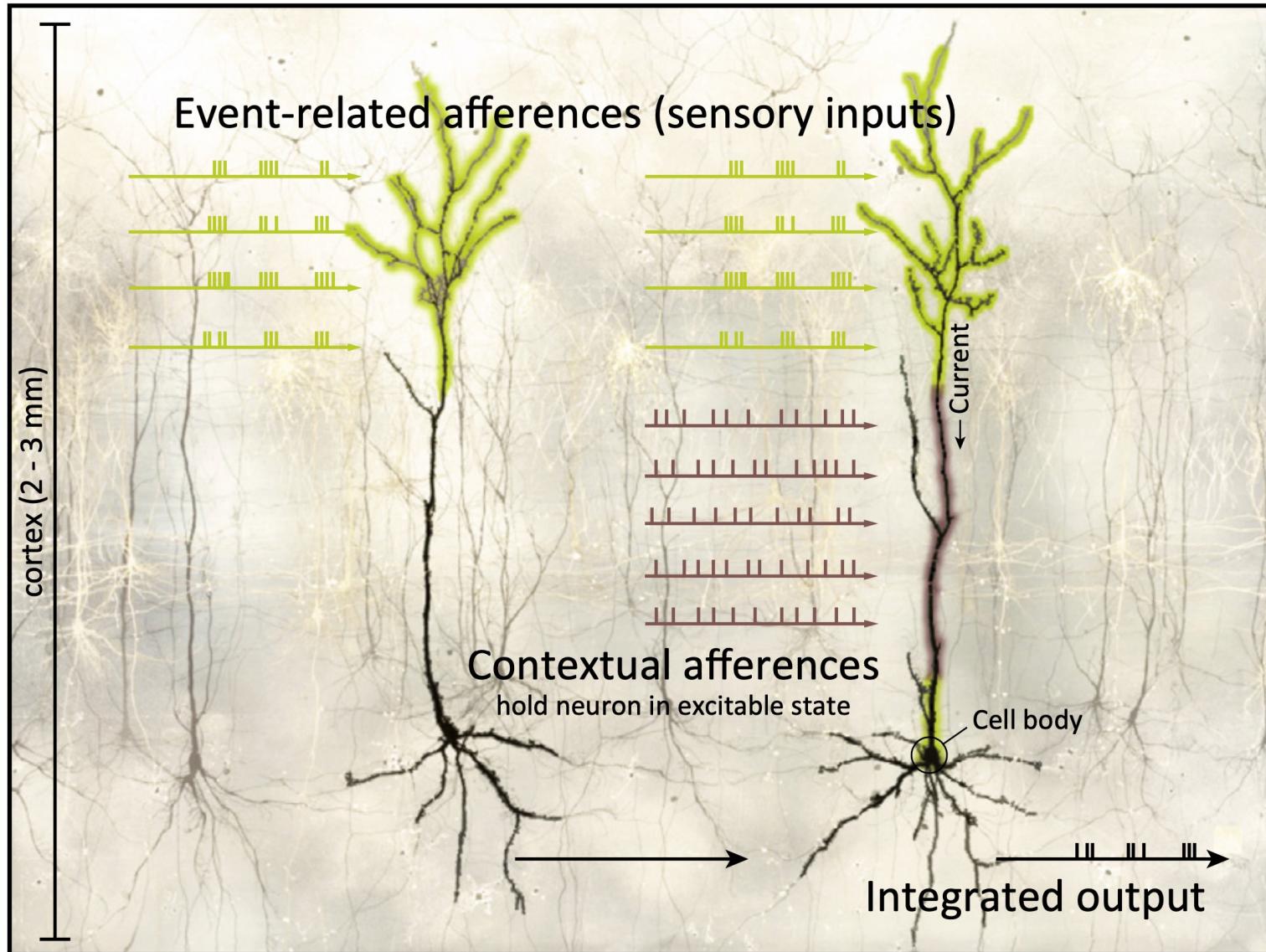
- Communicators and addressees achieve mutual understanding by using the same computational procedures and neuronal substrates
(implemented in a right-lateralized frontotemporal network)
- Brain regions supporting communication are already upregulated before a communicative utterance is produced or observed

- Shared Conceptual Spaces II
- *Paper Review due Wednesday night*
- *Exam Questions (4) due Friday night*



Bonus: A putative neuronal integrative mechanism

DARTMOUTH

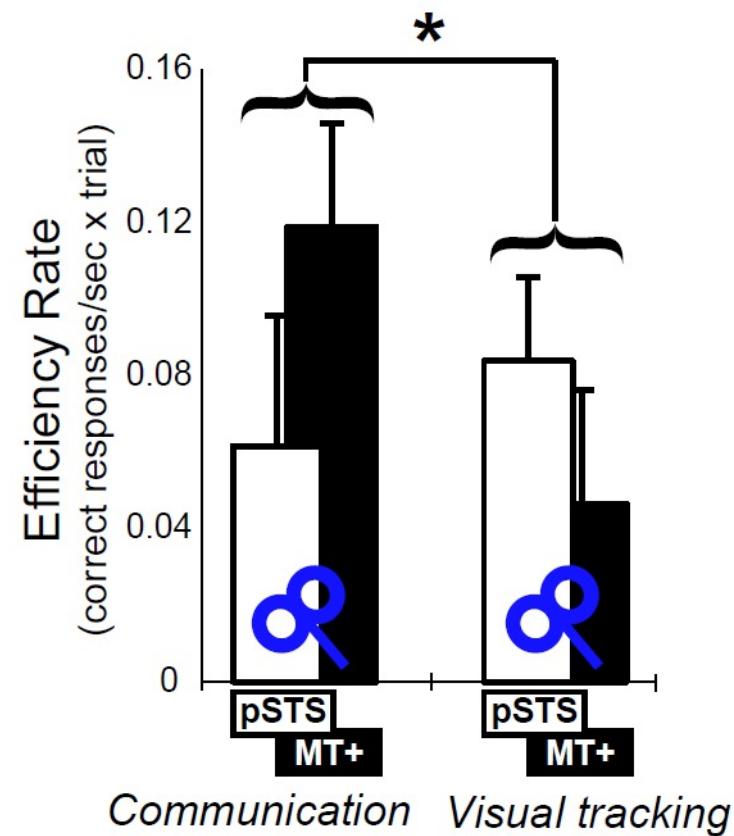
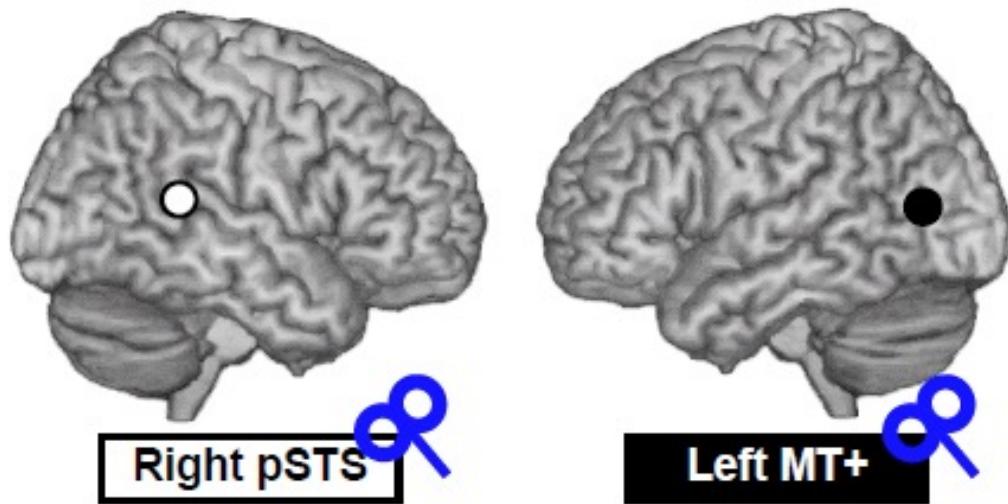


Ongoing contextual inputs can hold neurons near an excitability threshold



Bonus: Perturbing neural integration

DARTMOUTH



Understanding communicative actions: A repetitive TMS study

Arjen Stolk ^{a,*}, Matthijs L. Noordzij ^b, Inge Volman ^{a,c}, Lennart Verhagen ^a,
Sebastiaan Overeem ^d, Gijs van Elswijk ^d, Bas Bloem ^d, Peter Hagoort ^{a,e} and Ivan Toni ^a

Right pSTS is necessary to benefit from the recent communicative history