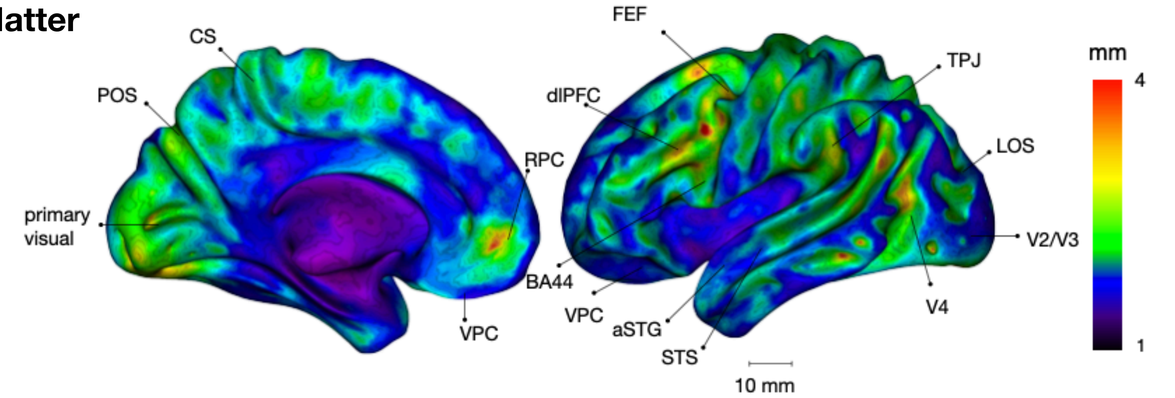
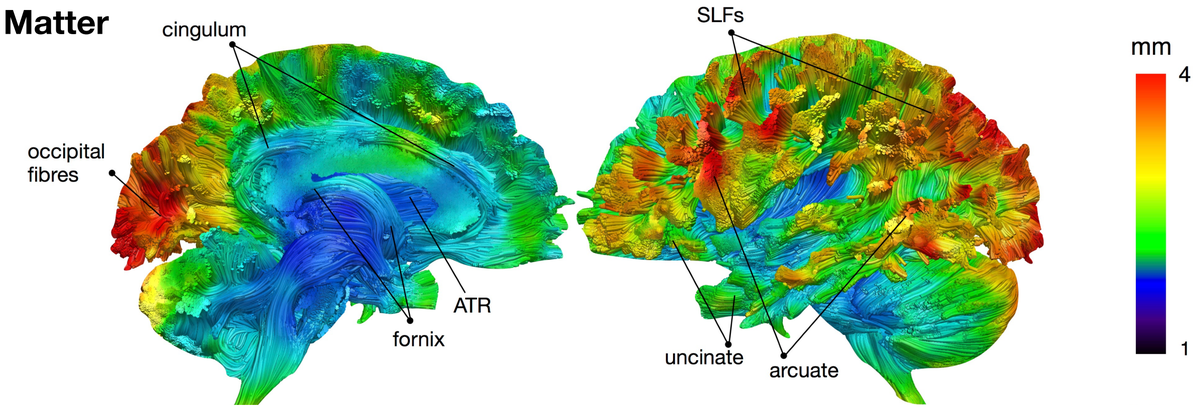
Inter-individual variability

HEALTHY VOLUNTEERS

Grey Matter



White Matter



Croxson, Forkel et al., 2018

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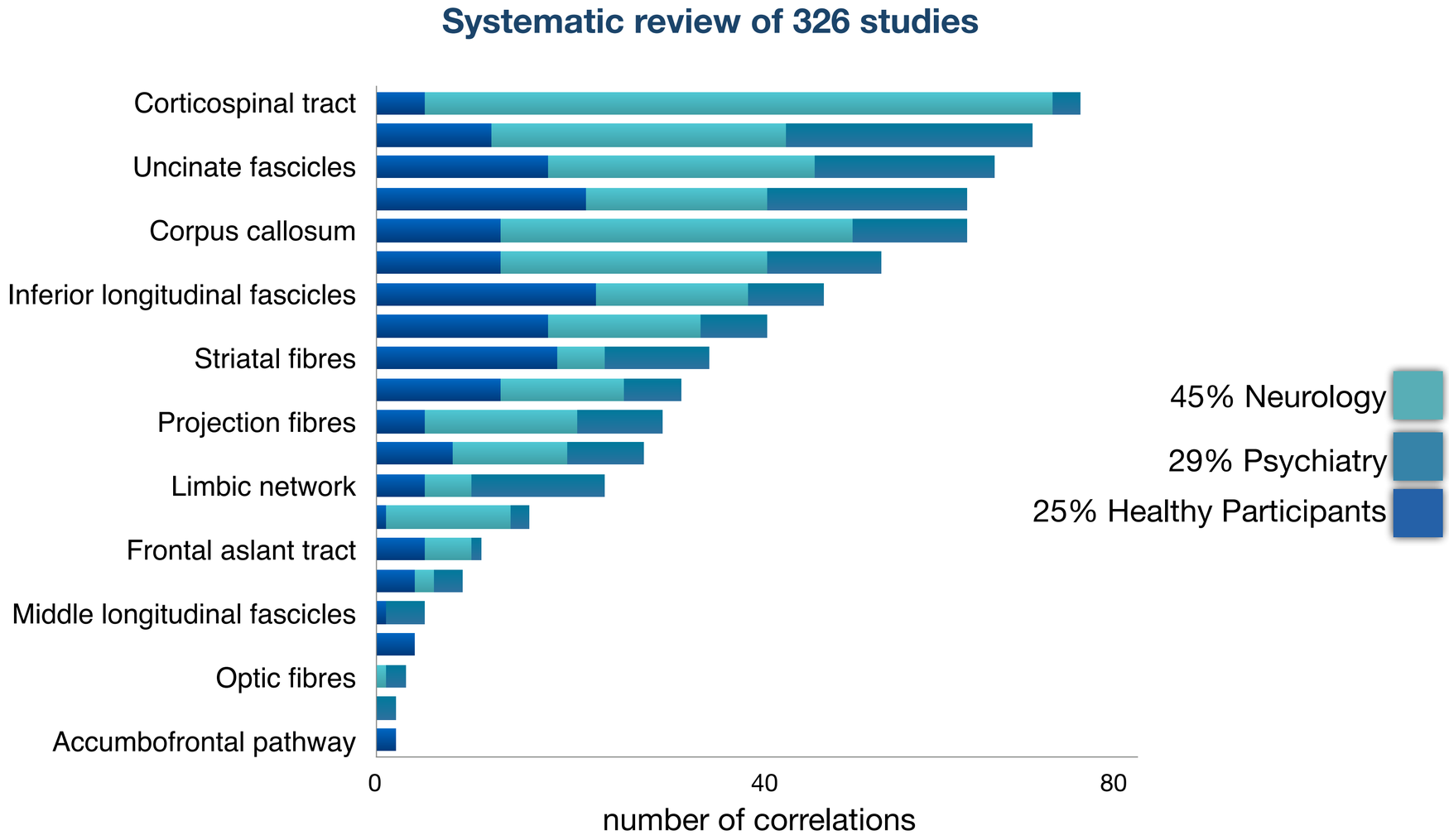
Variability in anatomy



Forkel et al., BSAF 2022

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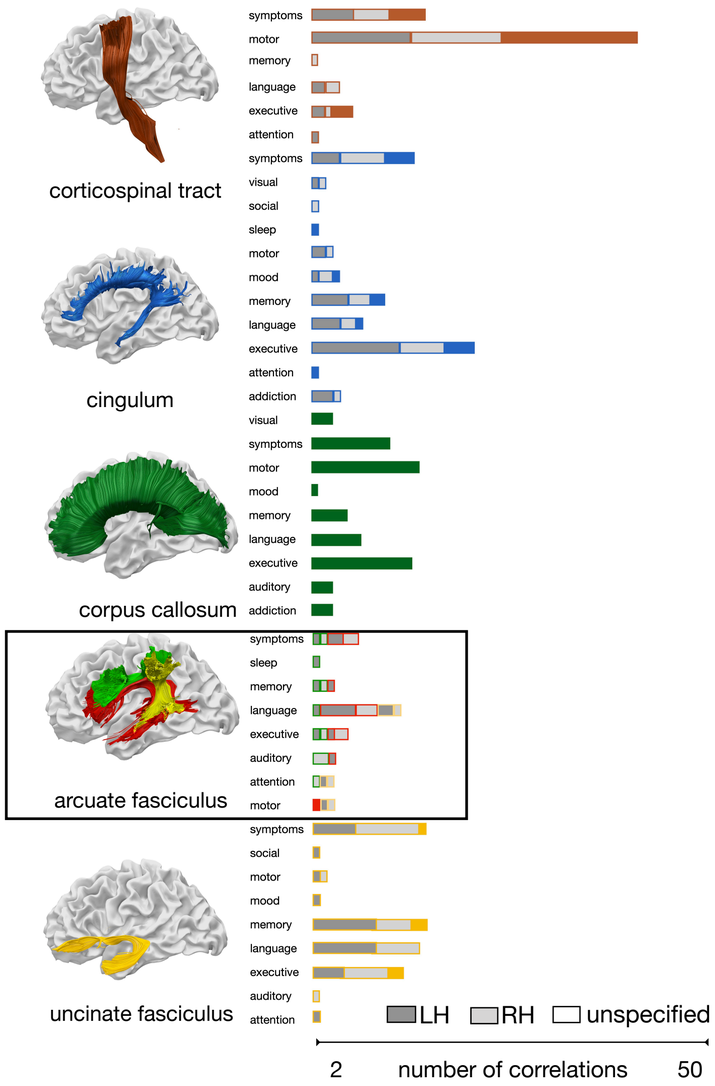
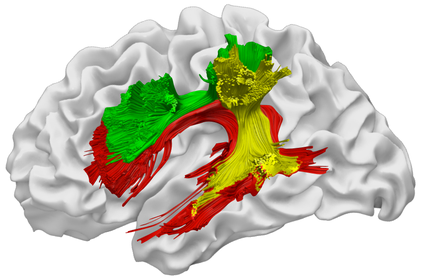
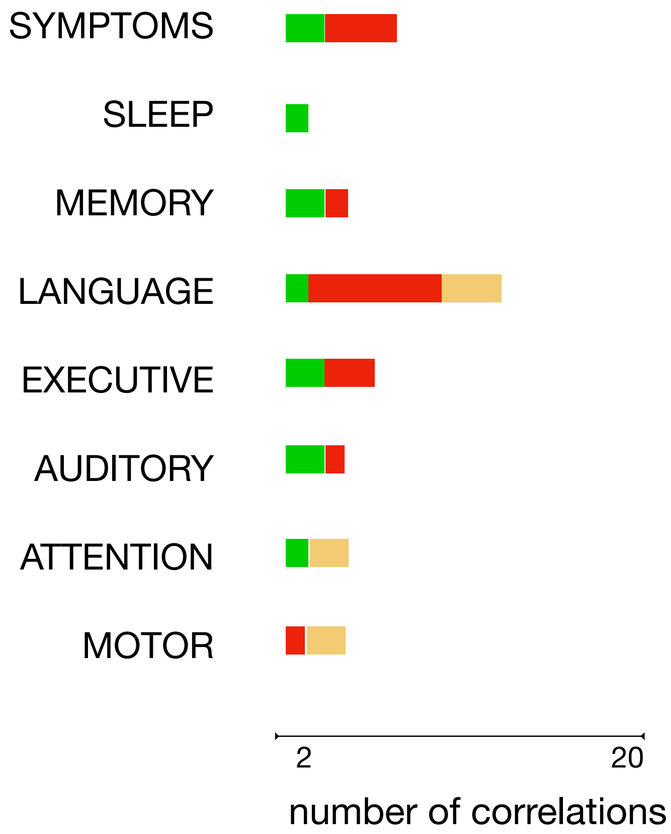
Variability in cognitive profiles





arcuate fasciculus

anterior segment
long segment
posterior segment



Forkel et al., BSAF 2022

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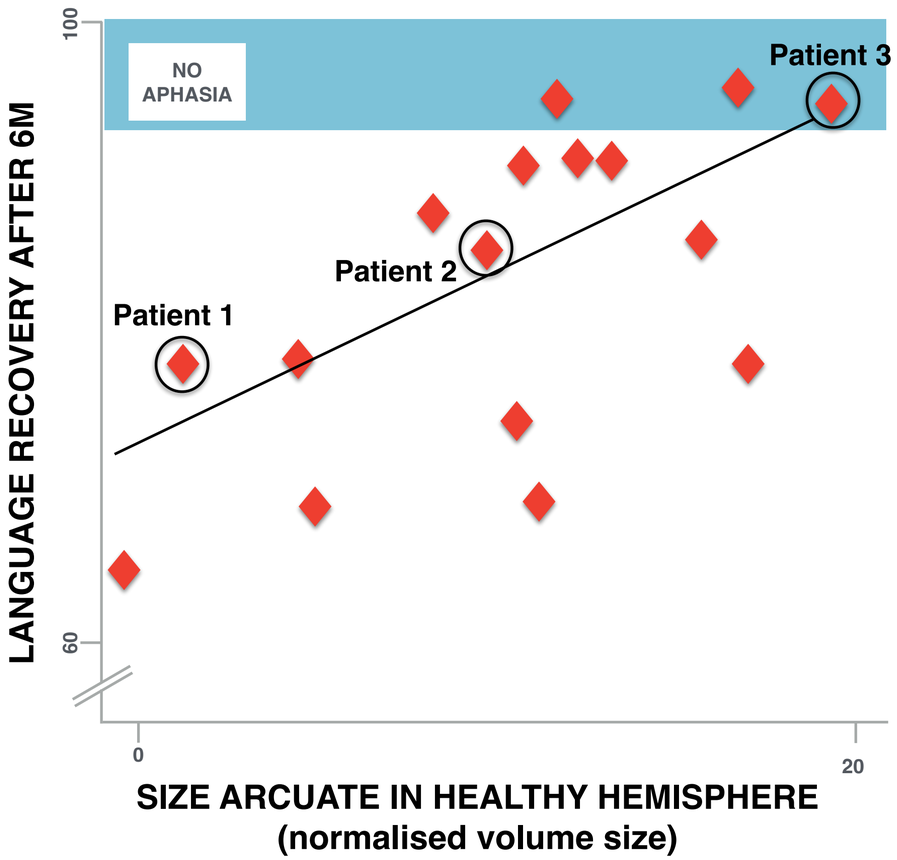
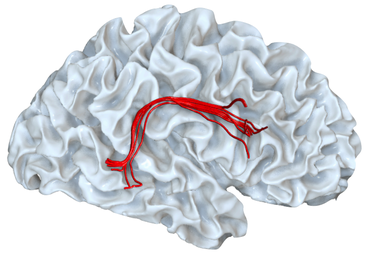
Anatomy doubles the prediction of recovery

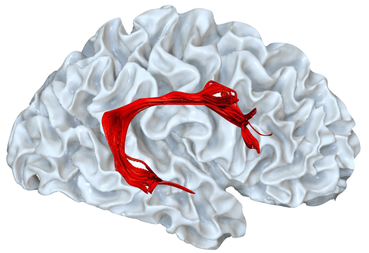
LH STROKE PATIENTS



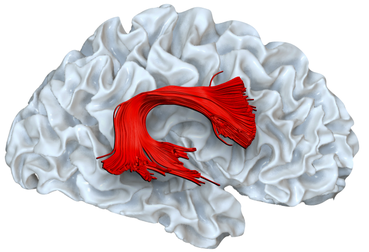
RH HEALTHY HEMISPHERE



Patient 1 (59 yrs man)



Patient 2 (81 yrs woman)



Patient 3 (87 yrs woman)

NHS
Guy's and St Thomas'
NHS Foundation Trust

BRAIN
A JOURNAL OF NEUROLOGY
Volume 137 Part 7 July 2014
www.brain.oxfordjournals.org

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F1000 Research

Forkel et al., 2014

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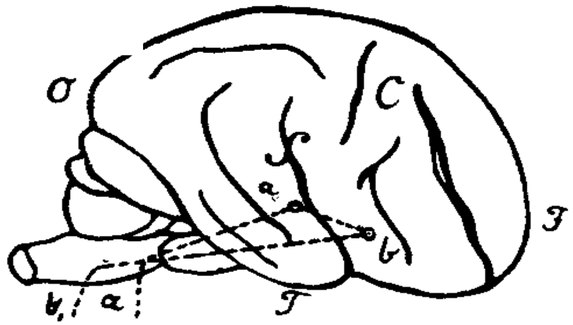
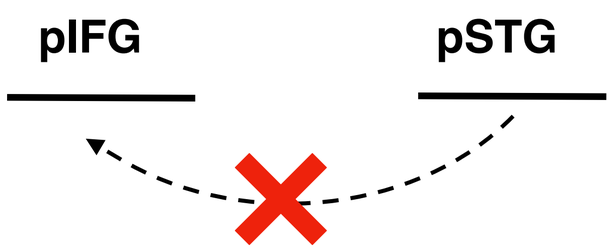
Anatomical models of conduction aphasia

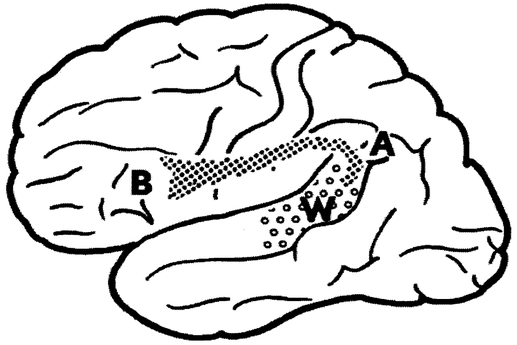
DISCONNECTION

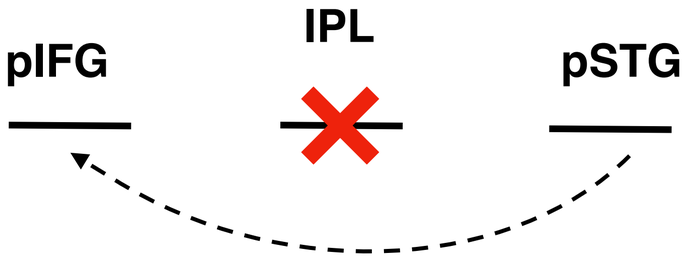




Lichtheim, 1885; Wernicke, 1886

PARIETAL CORTEX

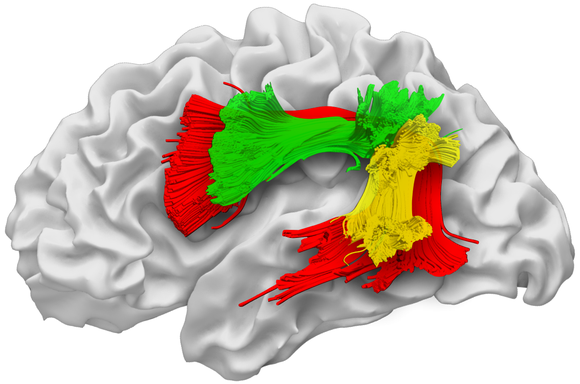




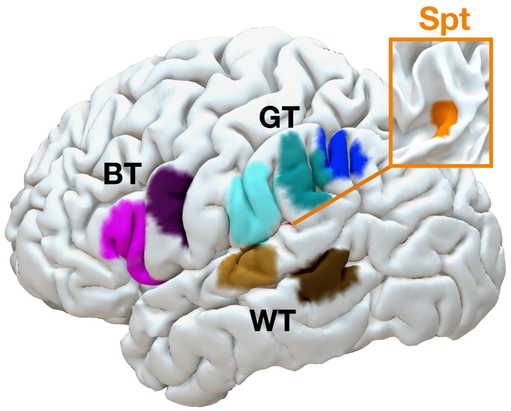
Goldstein, 1948; Geschwind 1965

Anatomical model of conduction aphasia

TRACTOGRAPHY



CORTICAL MORPHOMETRY



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F1000Research

Forkel et al., 2020

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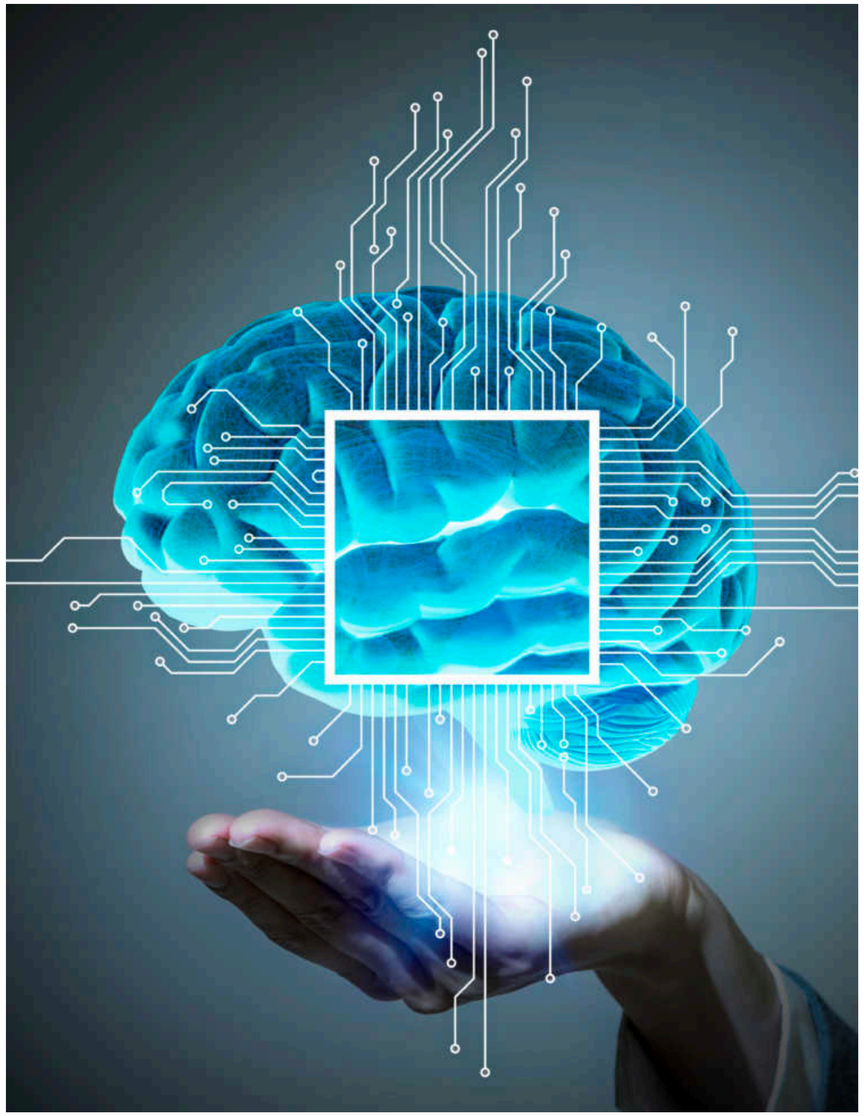
AI and clinical predictions beyond Broca et al.



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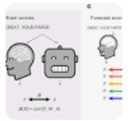
Considerable progress has recently been made in natural language processing: deep learning algorithms are increasingly able to generate,...

2 Mar 2023



Neuroscience News

Machine Learning Uncovers Neural Pathways of Narcissistic Traits

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2 weeks ago

Innovation News Network

Brain injury recovery predicted with Artificial Intelligence

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Deep learning has made significant strides in text generation, translation, and completion in recent years. Algorithms trained to predict...

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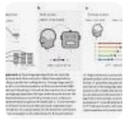
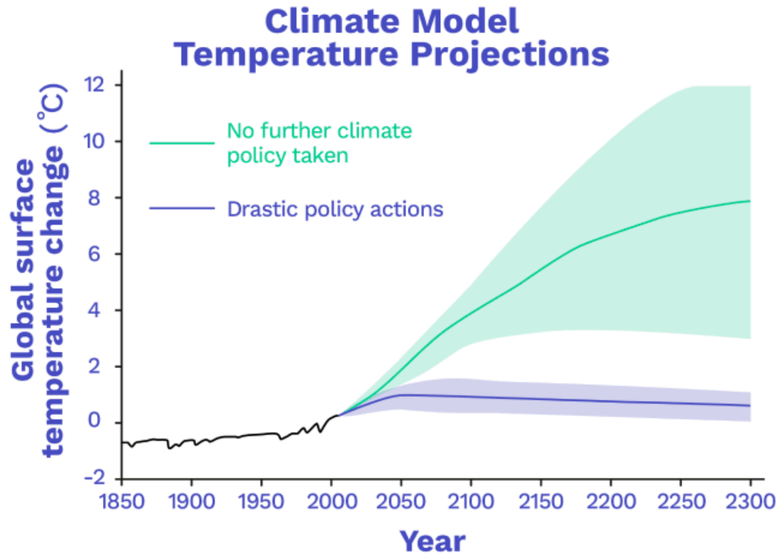


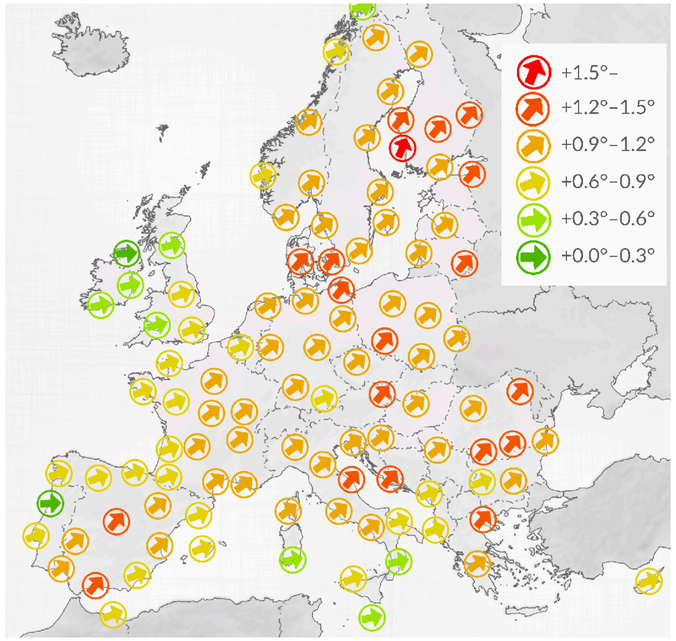
AI and clinical predictions

Overall Model



Source: Collins, M. et al., "Climate Change 2013: The Physical Science Basis, Chapter 12- Long-term Climate Change: Projections, Commitments and Irreversibility", IPCC 5th Assessment Report, 2013

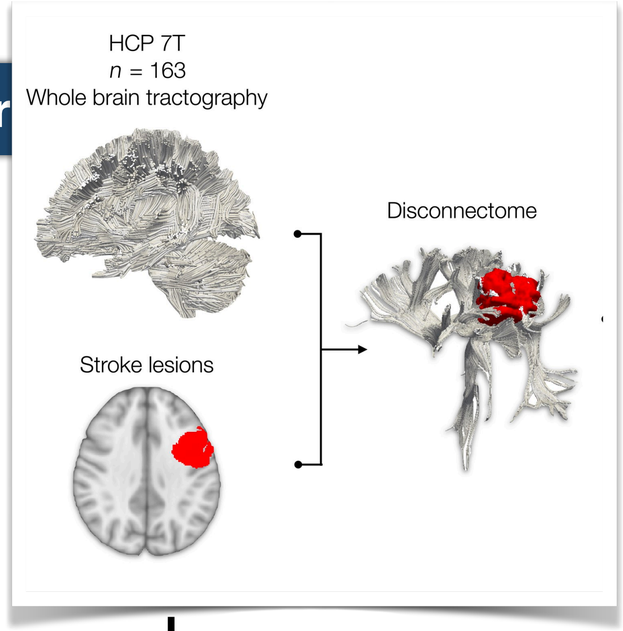
Personalised Predictions



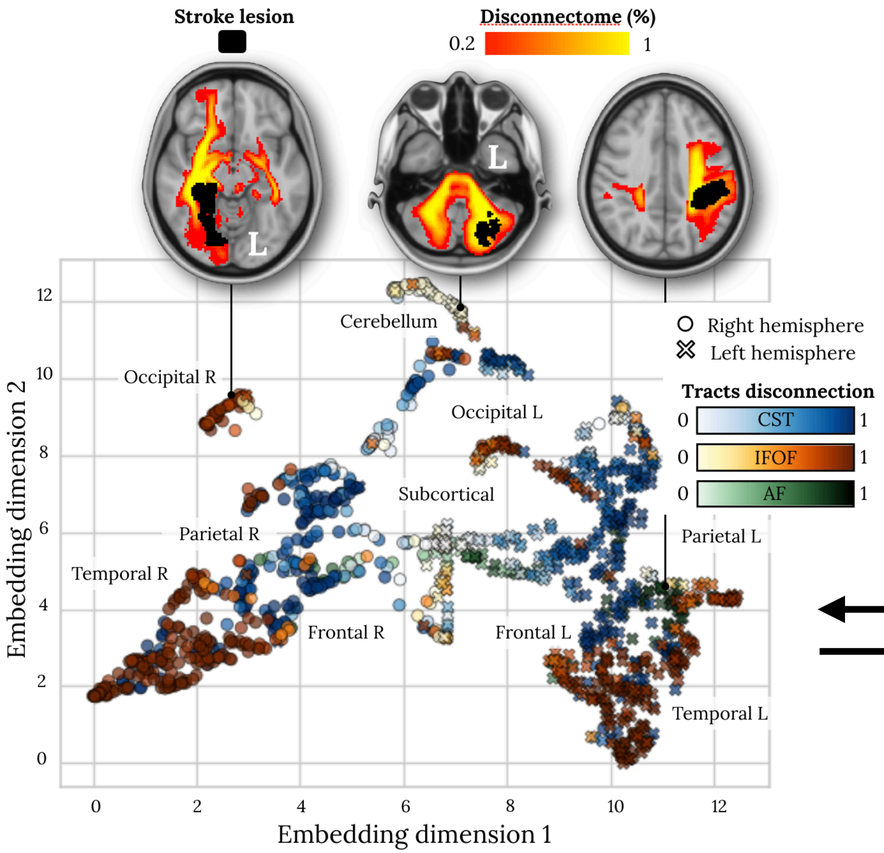
Make Changes

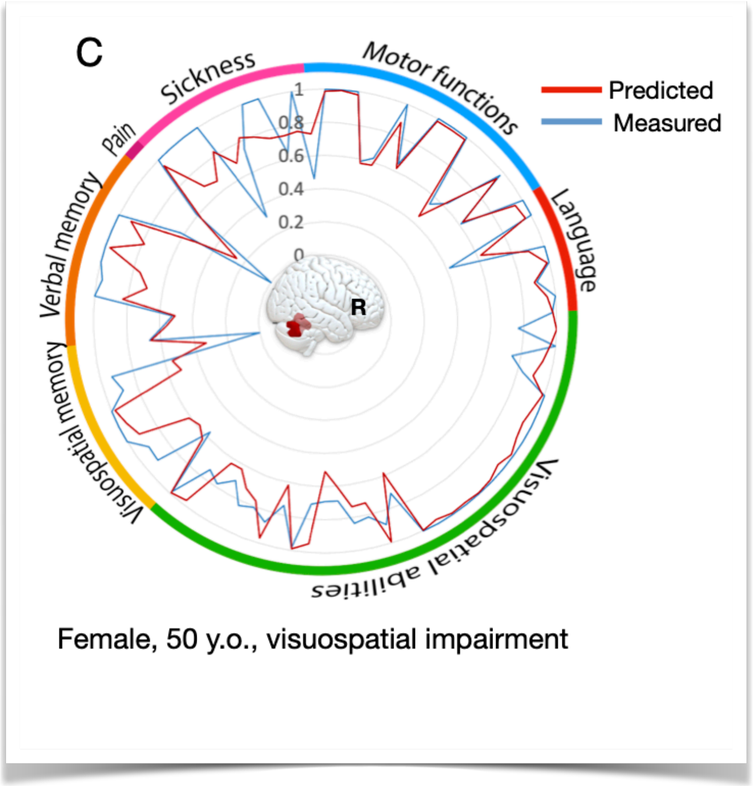
Models ——— **Personalised Predictions** ———→ **Tailored Therapy**

Predicting Recovery using machine lear



Lia Talozzi





Talozzi et al., 2023
BRAIN

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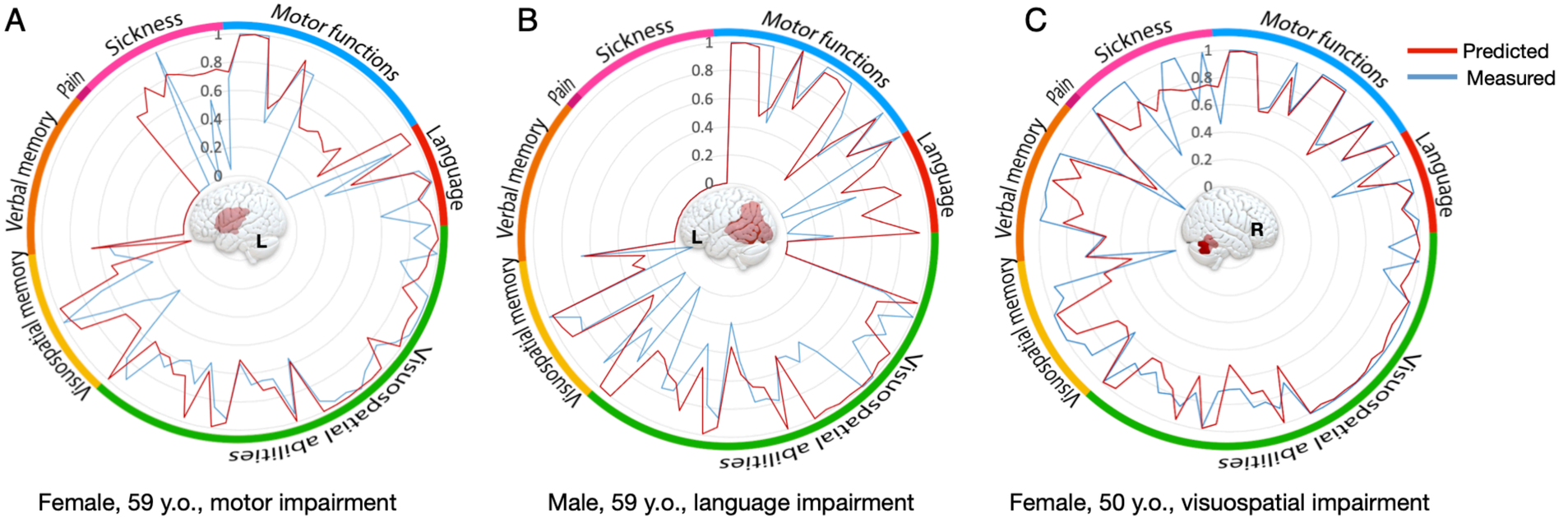
Lia Talozzi

Personalised Neuropsychological profile predictions



Female, 59 y.o., motor impairment

Male, 59 y.o., language impairment

Female, 50 y.o., visuospatial impairment

Talozzi et al., 2023
BRAIN

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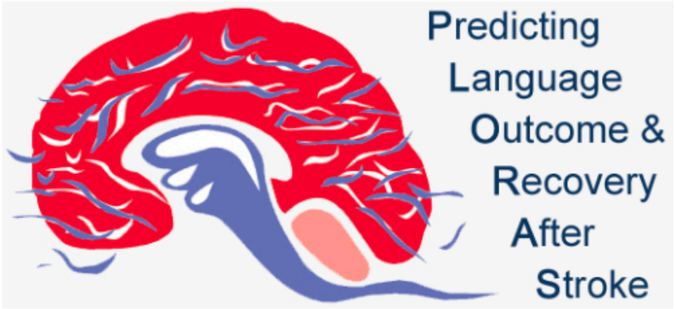
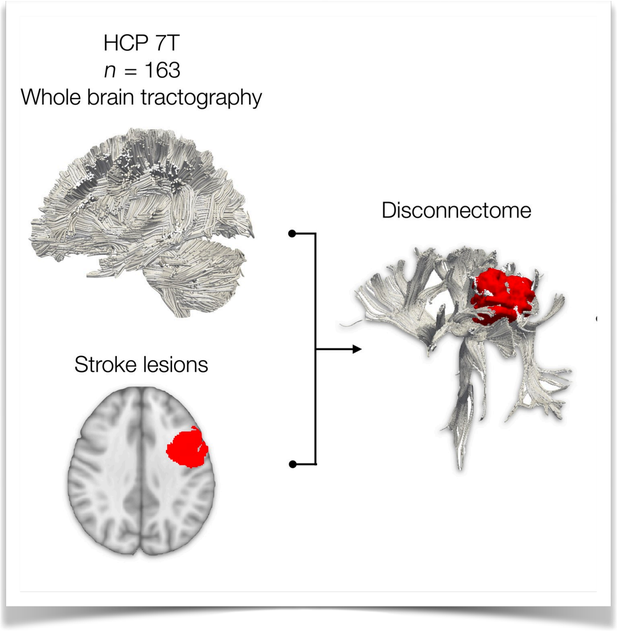
Predicting Language Recovery

Tom Hope Cathy Price

OUT-OF-SAMPLE STROKE DATA



MODEL



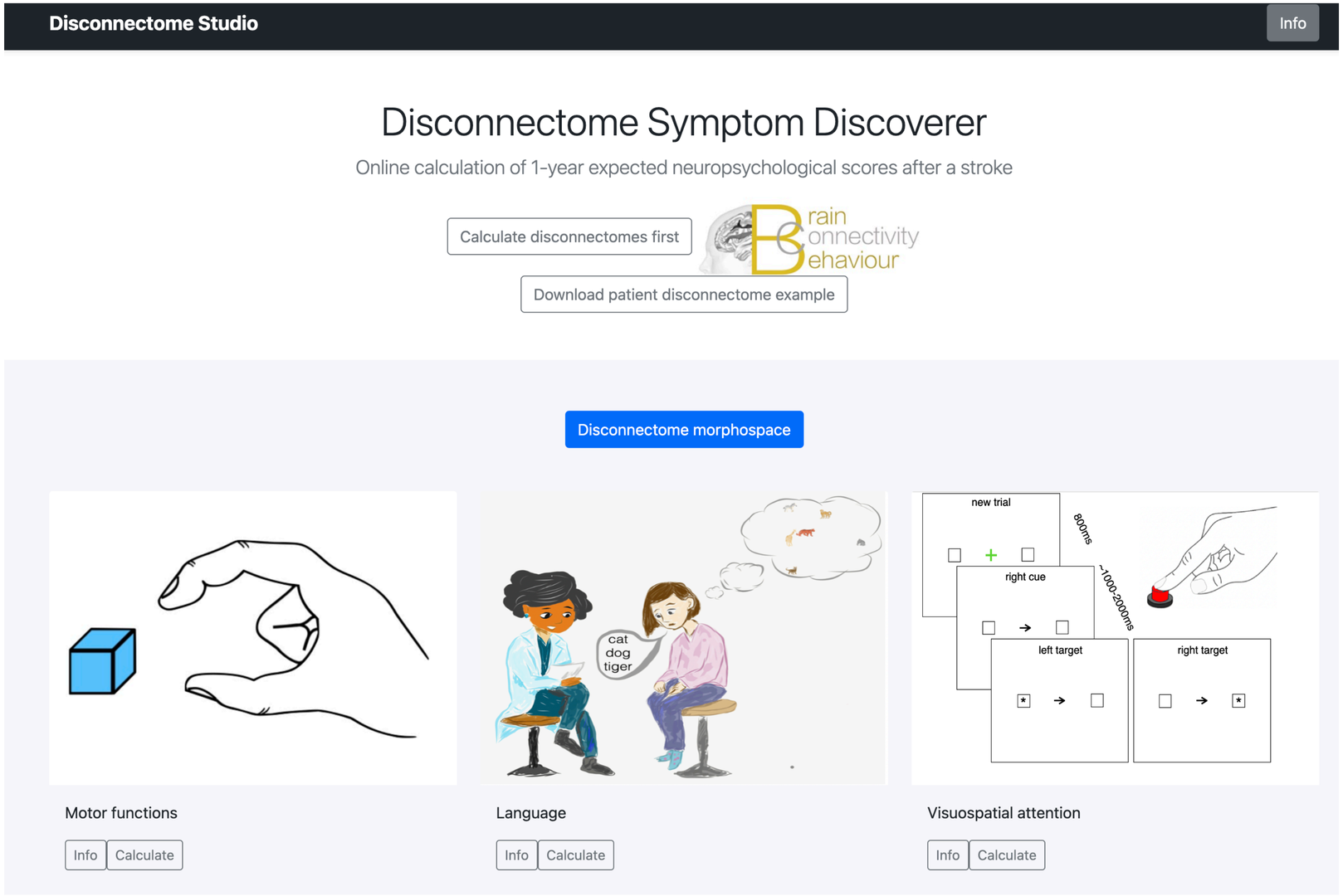
PREDICTION of RECOVERY

	R (predicted vs. empirical) / p			Z (comparing R's) / p		
	Washington	PLORAS 1yr	PLORAS 5+yrs	Washington vs. 1yr	Washington vs. 5+yrs	PLORAS 1yr vs. 5+yrs
NAMING	0.35/0.024*	0.31/<0.001	0.00/0.86	0.28/0.78	2.92/0.004	4.27/<0.001
FLUENCY	0.41/0.003*	0.34/<0.001	0.19/<0.001	0.65/0.52	1.94/0.053	2.07/0.04

Table 2: Predictive results, and comparisons between them. The leftmost three columns report the correlation between predicted scores and empirical scores for both naming (first row) and fluency (second row). The figures in the first column are marked with an asterisk (*) because they are inferred from the report of the DSD model (supplementary table 2), rather than calculated directly.

Hope et al., BRAIN in press

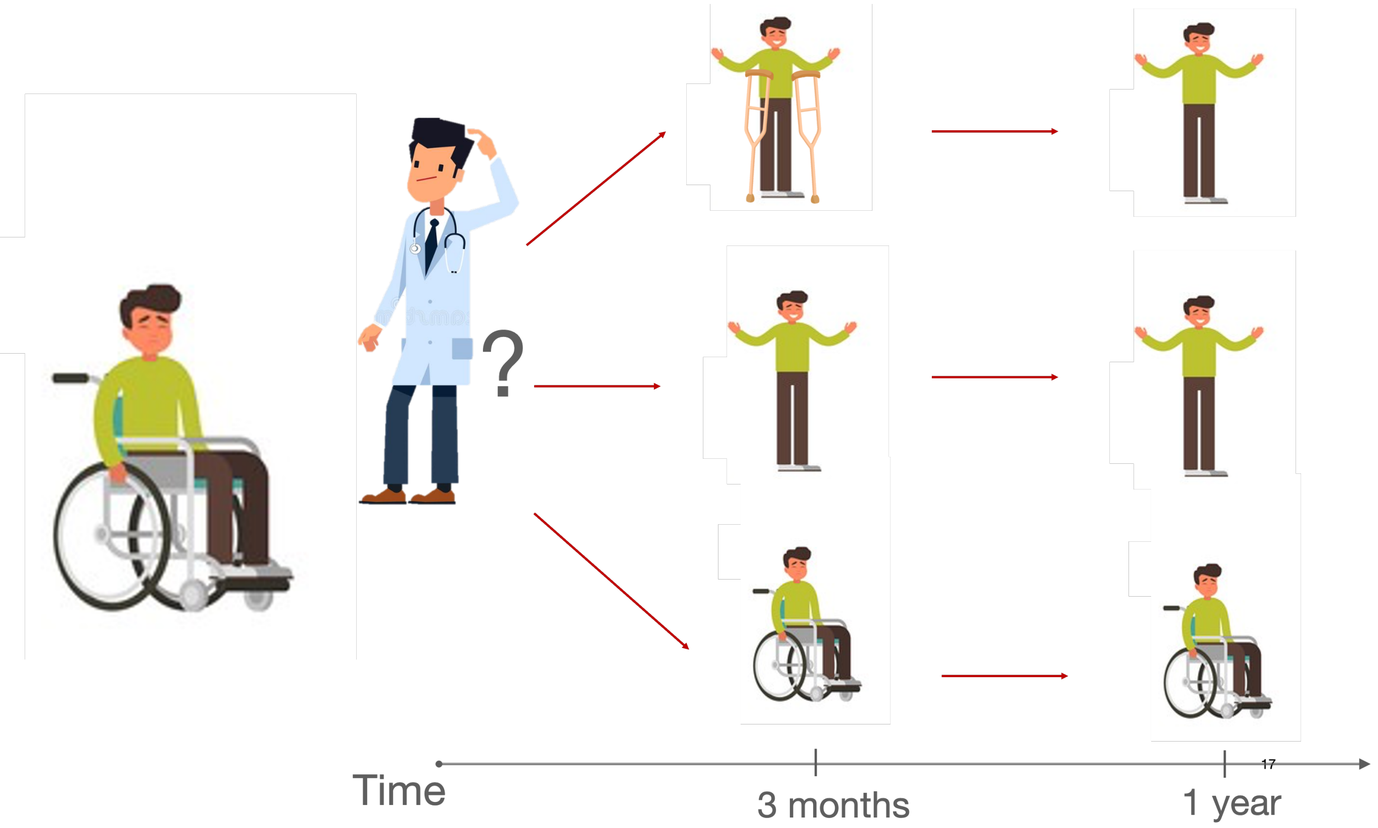
Try the DSD with your data

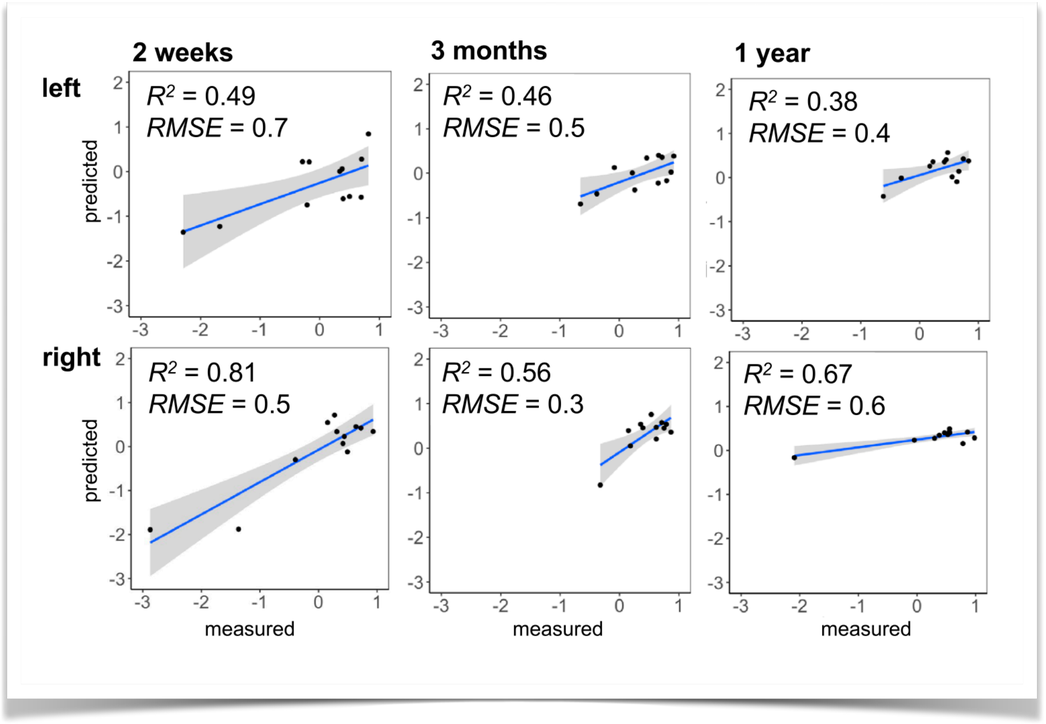


https://www.stephanieforkel.com/opendata

Ways forward: Long term motor predicition

Lilit Dulyan





Dulyan et al., BSAF 2022

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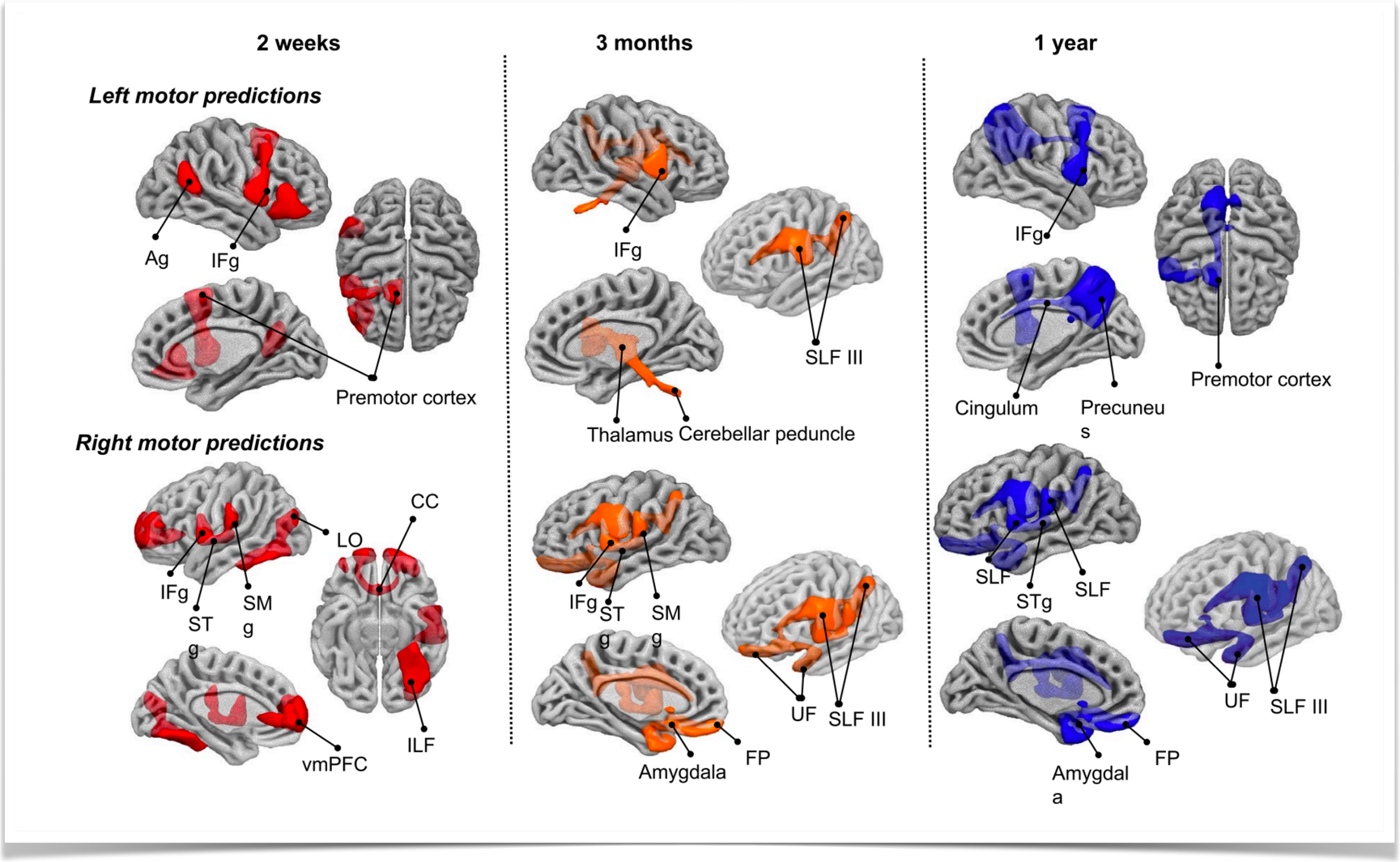
Ways forward: Long term motor predicition

Lilit Dulyan



Dulyan et al., BSAF 2022

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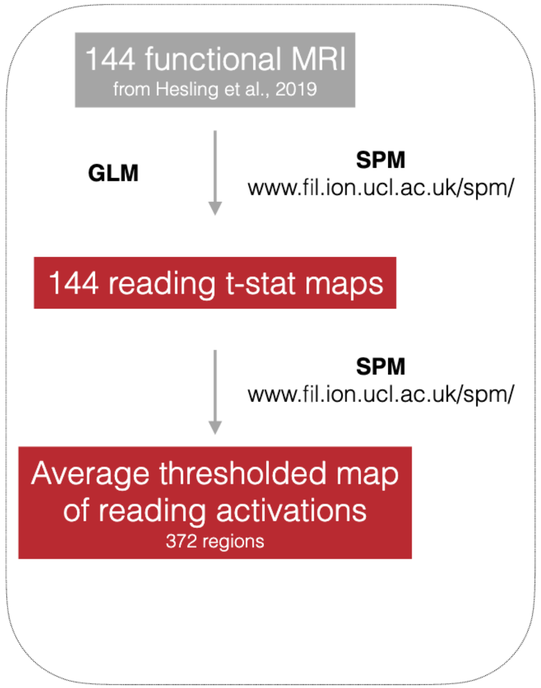
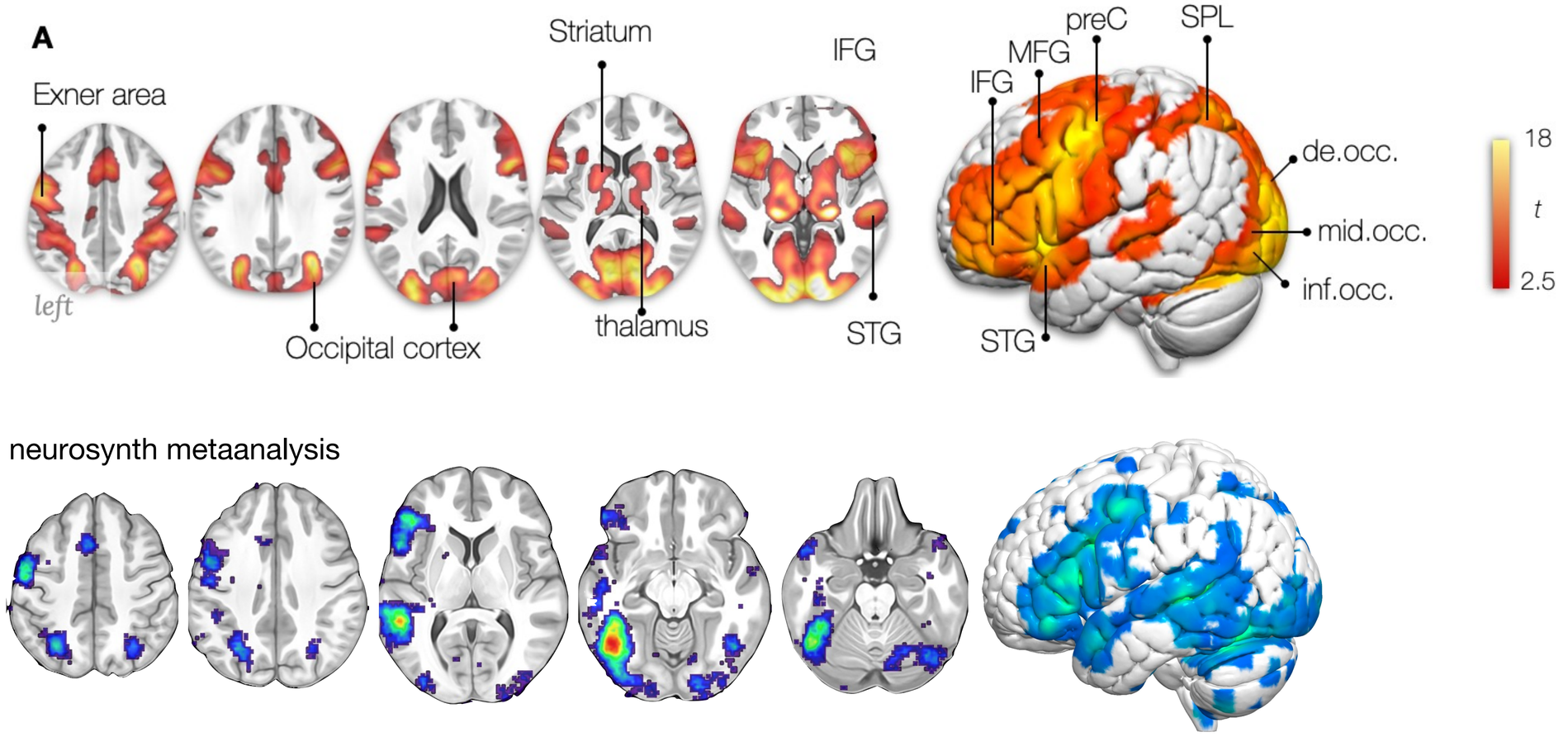
Ways forward: Methodological Advances



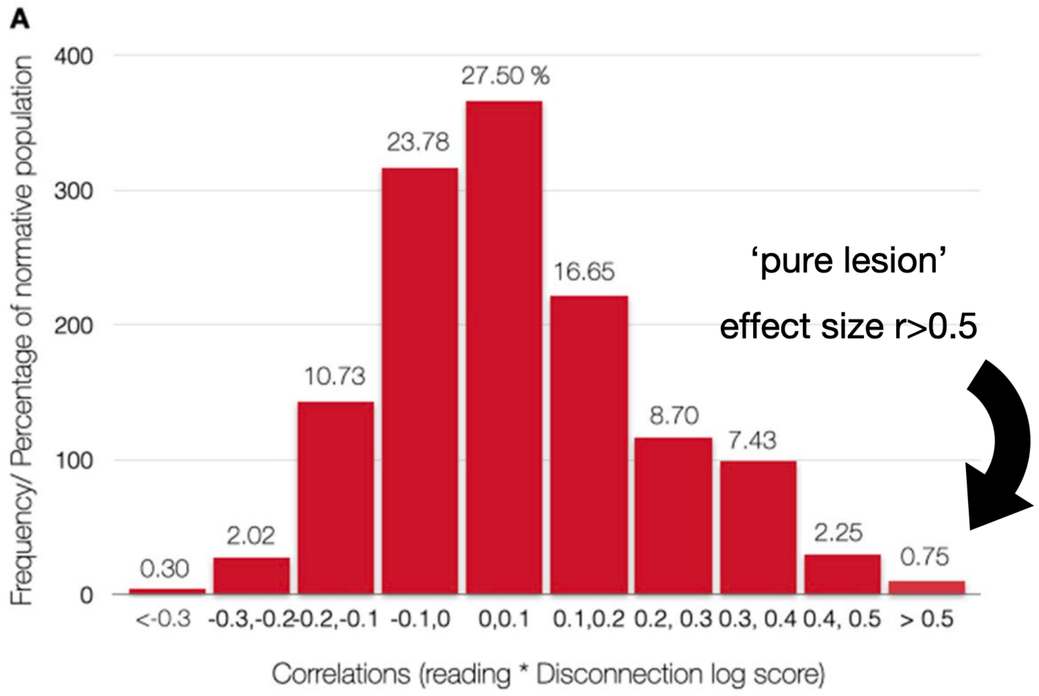
Forkel et al., 2022

Functional findings



Forkel et al., 2022

LESION ANALYSIS

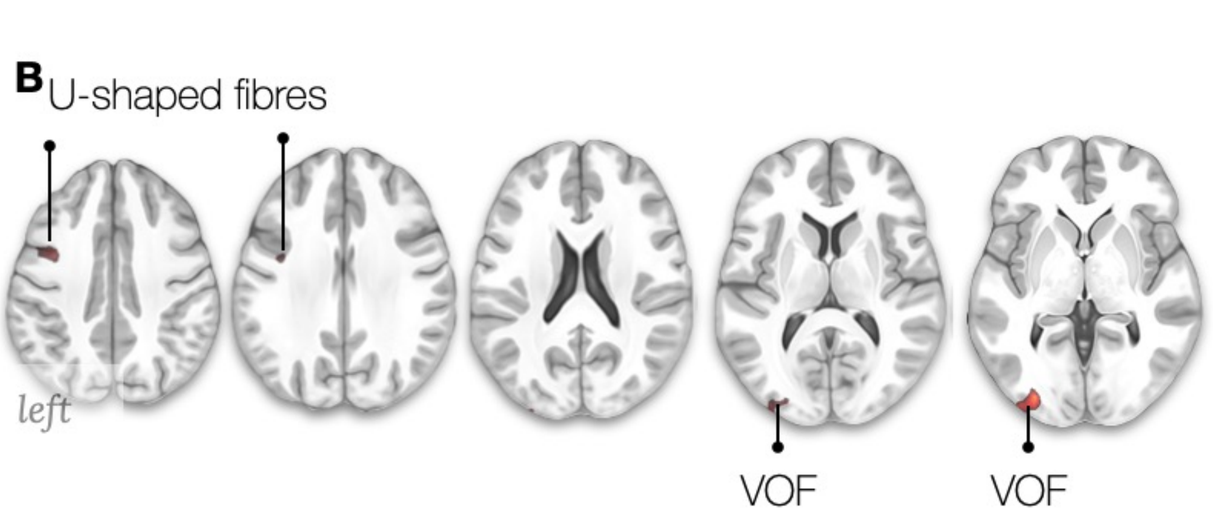


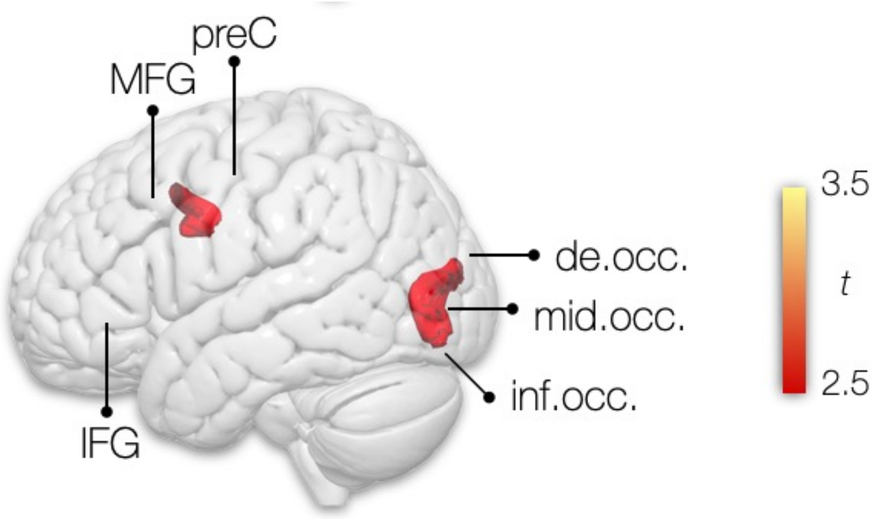
‘pure lesion’

effect size r>0.5

orkel et al., 2022

DISCONNECTOME





VERTICAL OCCIPITAL FASCICULUS

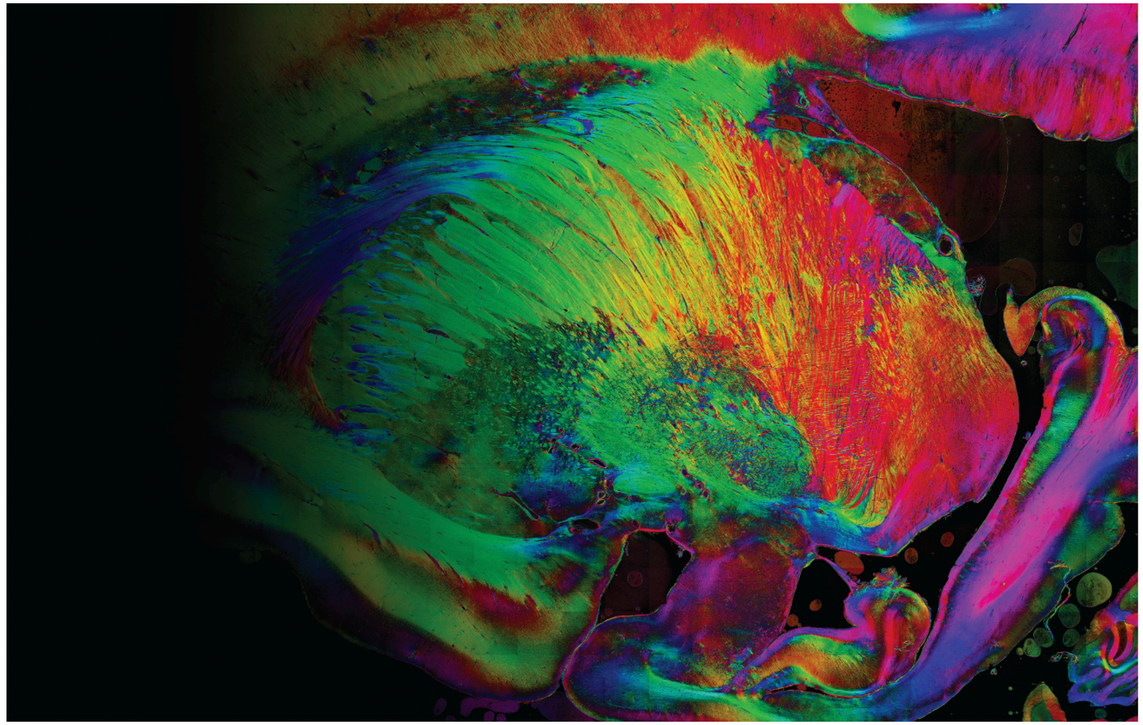
Historical reappraisals: Wernicke (Yeatman et al., 2014), Sachs (Vergani et al. 2014; Forkel et al. 2015) and the Dejerines (Bugain et al. 2021)
Tractography: Briggs et al. 2018; Keser et al. 2016; Panesar et al. 2019; Schurr et al. 2019; Yeatman et al. 2014
Post mortem: Güngör et al. 2017; Palejwala et al. 2020; Vergani et al. 2014
Comparative studies: Takemura et al. 2017

‘No neuron is an island’

‘The brain is so much more than its constituent cells.

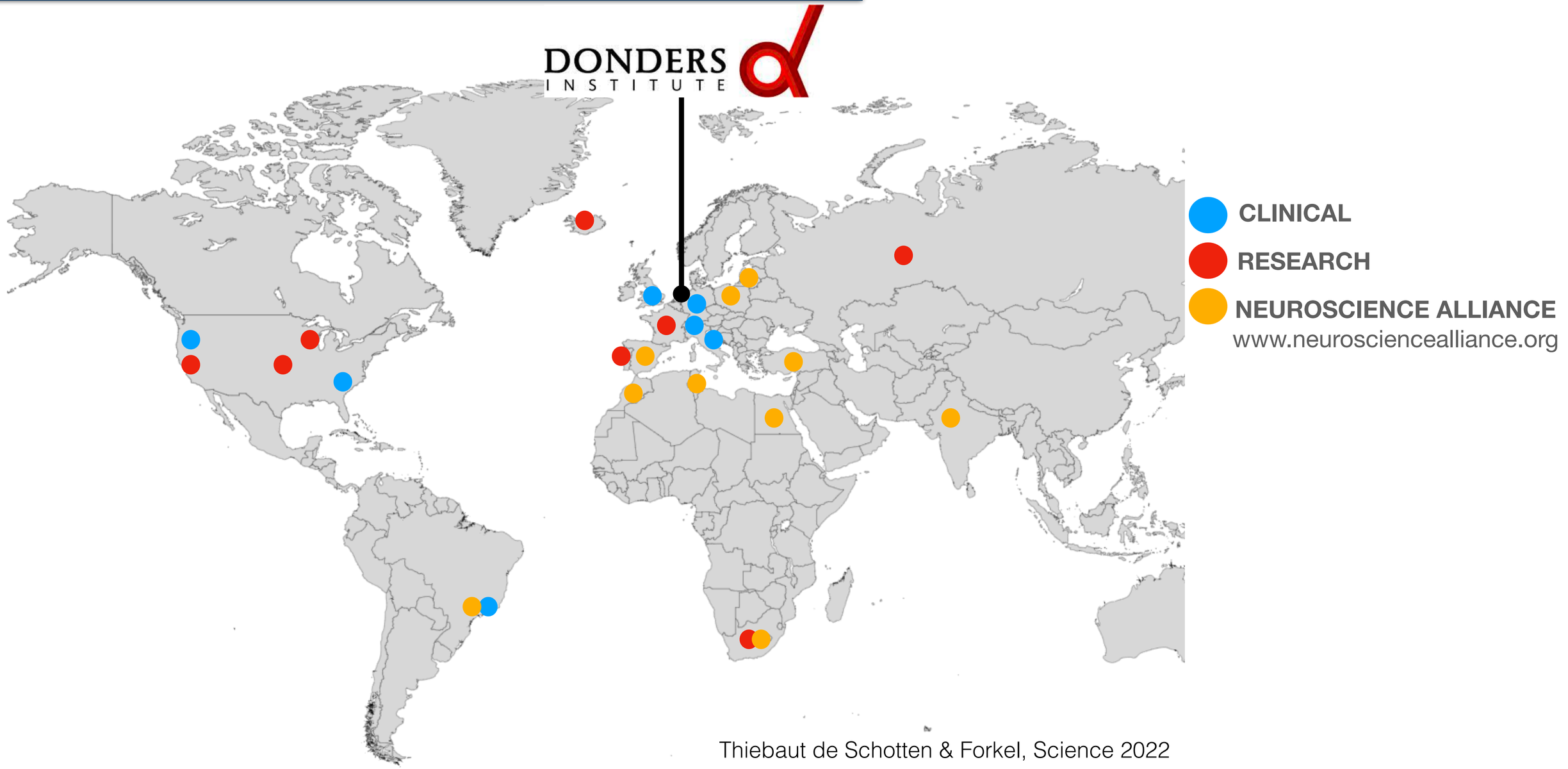
Each neuron in the brain connects with thousands of other neurons—but instead of a cacophony of connections, we have a synchronized symphony.’

Peter Stern, Science 2022



3D PLI. The colors represent 3D fiber orientations and highlight pathways of individual fibers and tracts

Be like a neuron and connect



Thiebaut de Schotten & Forkel, Science 2022

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Thank you for your attention

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