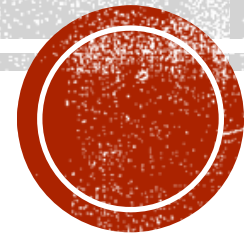# Investigating resting-state functional connectivity of the ventral anterior intraparietal area:

an offline TMS-fMRI study

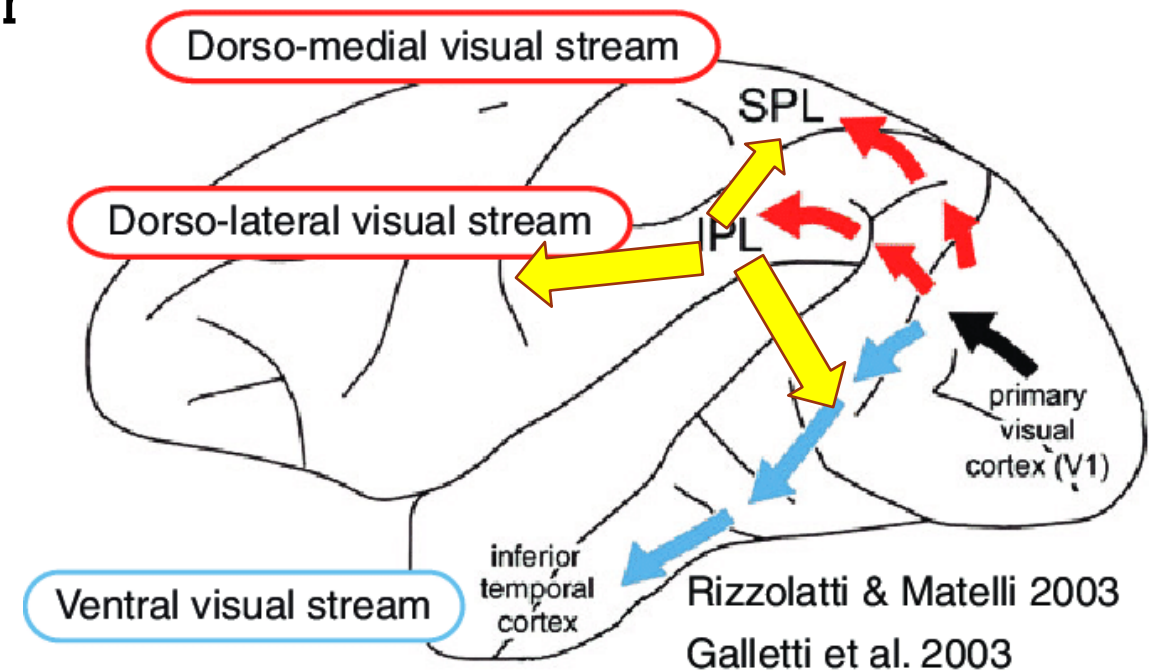**Pierotti, E., Speranza, C., Cattaneo, L. & Turella, L.**

University of Trento
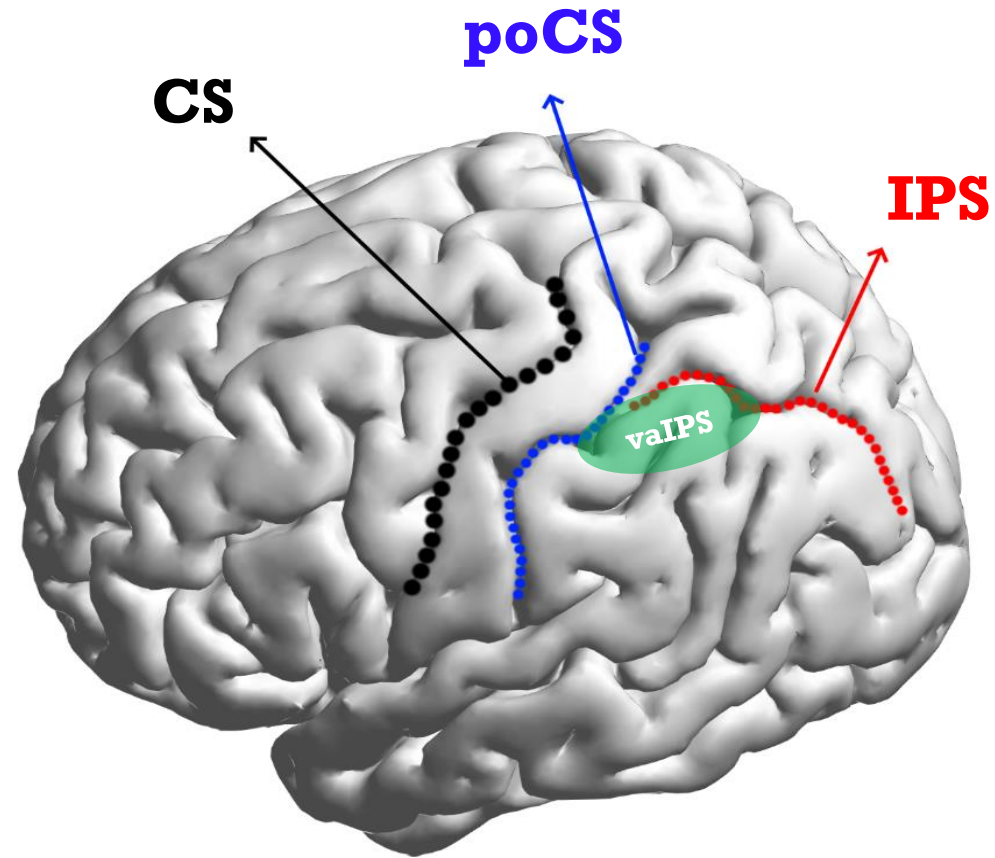
XXXI Congresso Nazionale SIPF

Siena, 10/11/2023

Background

✓ Parietal complex: crucial hub for upper limb control in monkeys

✓ Hub of the Dorsolateral pathway involved in visuo-motor transformations for grasping/object manipulation

✓ Widespread connectivity with the:

    ✓ Dorsolateral pathway

    ✓ Dorsomedial pathway

    ✓ Ventral pathway

Dorso-medial visual stream

Dorso-lateral visual stream

Ventral visual stream

SPL

IPL

primary visual cortex (V1)

inferior temporal cortex

Rizzolatti & Matelli 2003
Galletti et al. 2003
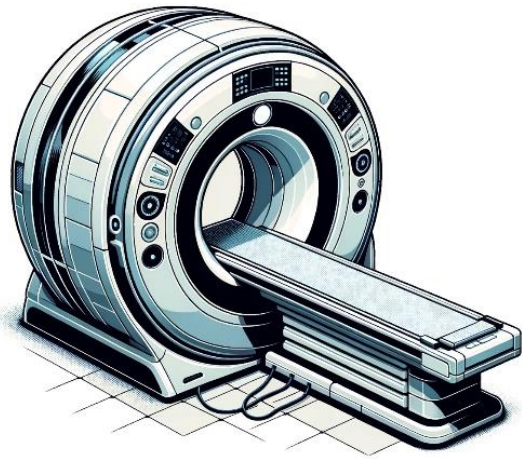
Background

Research question:

Is the connectivity of the human vaIPS similar to the connectivity of the monkey parietal complex?
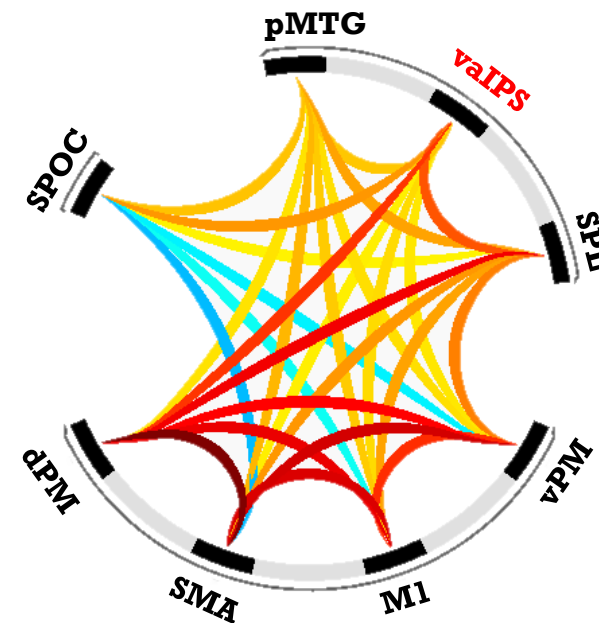
Aim:

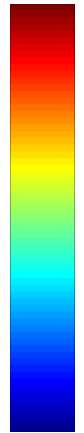Is the connectivity of the human vaIPS similar to the connectivity of the monkey parietal complex?

How?

Testing the modifications in resting-state functional connectivity after TMS stimulation
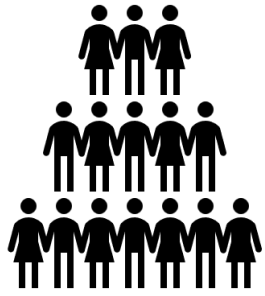
Resting State Functional connectivity (FC)
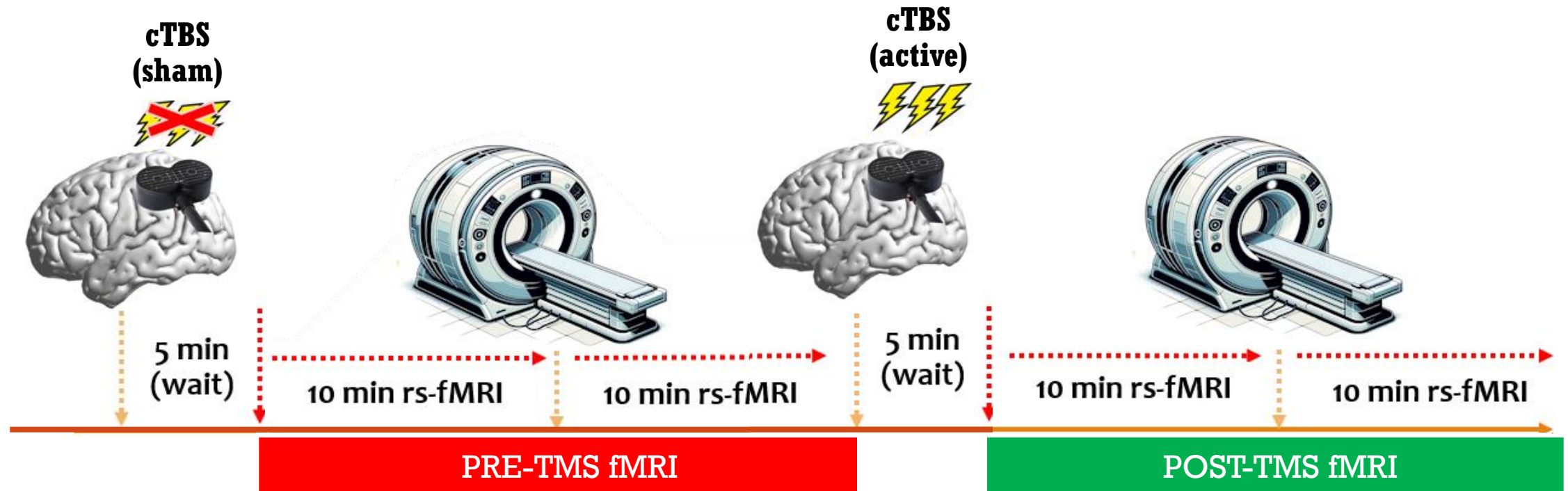
Positive FC

Negative FC

pMTG · vaIPS · SPOC · SPL · dPM · vPM · SMA · M1

Methods

32 participants
(6 excluded)
Right-handed

MRI-guided neuronavigation
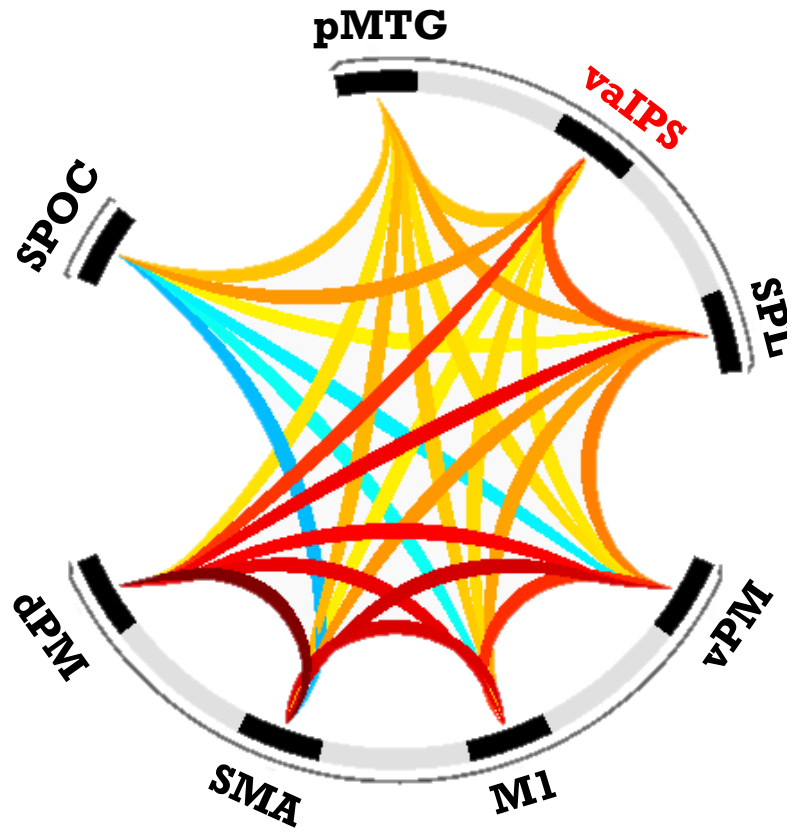**Continuous theta-burst stimulation (cTBS)**
Huang et al., 2005

cTBS
(sham)

cTBS
(active)

5 min
(wait)

10 min rs-fMRI

10 min rs-fMRI

5 min
(wait)

10 min rs-fMRI

10 min rs-fMRI

PRE-TMS fMRI

POST-TMS fMRI

Analysis

1. ROI-to-ROI connectivity analysis

Results

PRE-TMS

POST-TMS **DIFFERENCE**

pMTG vaIPS SPOC SPL dPM vPM SMA M1

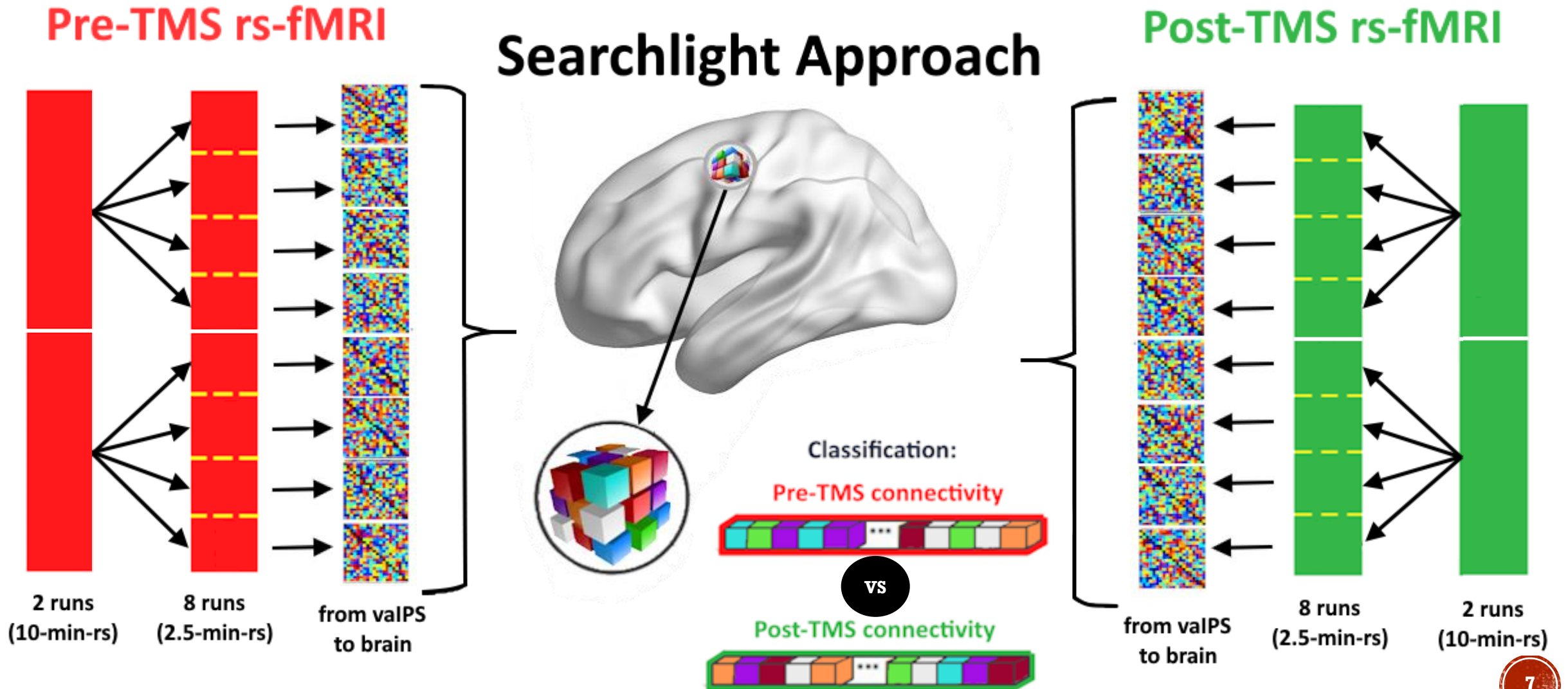-11.86 11.86

-3.65 3.65
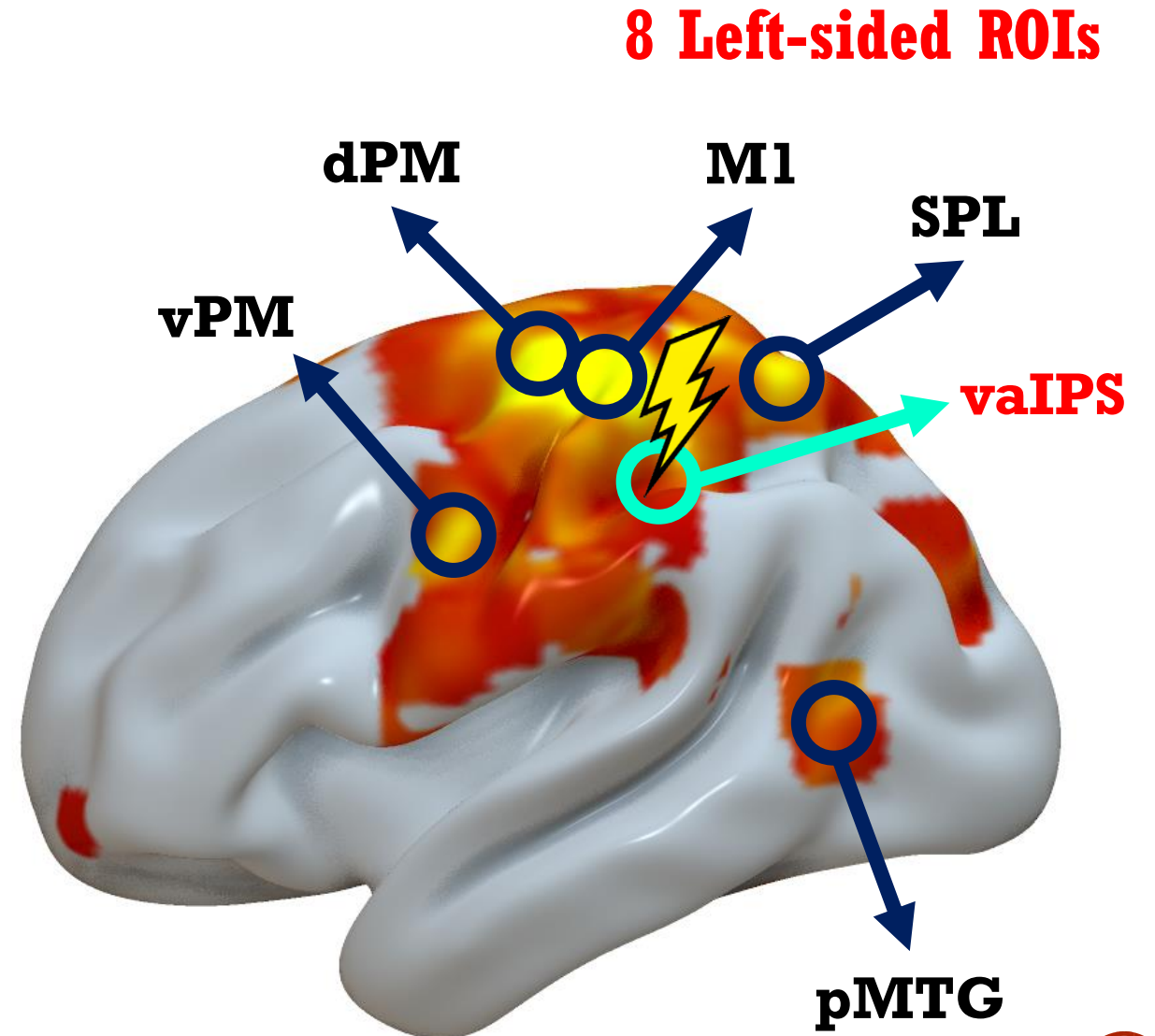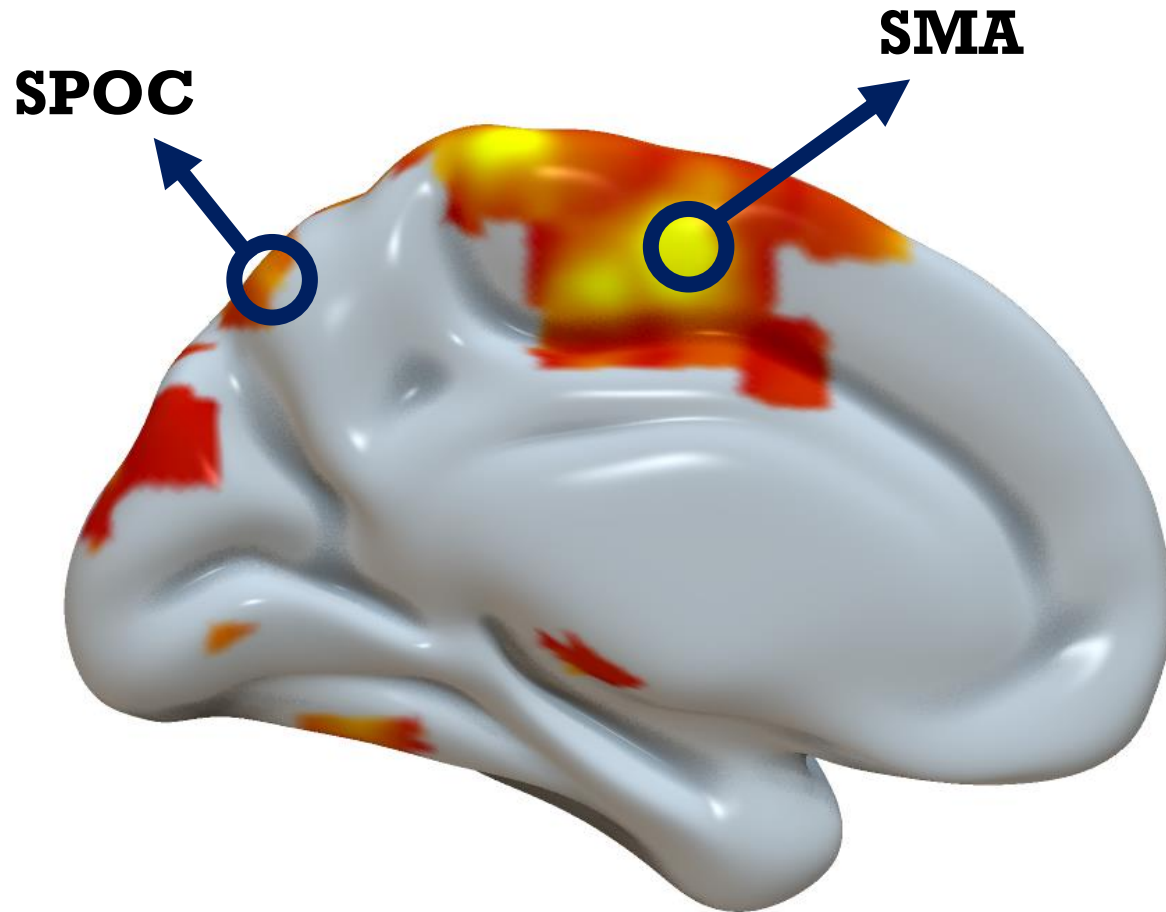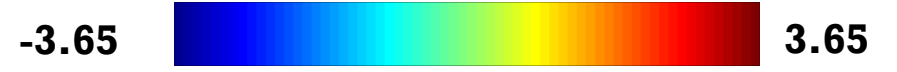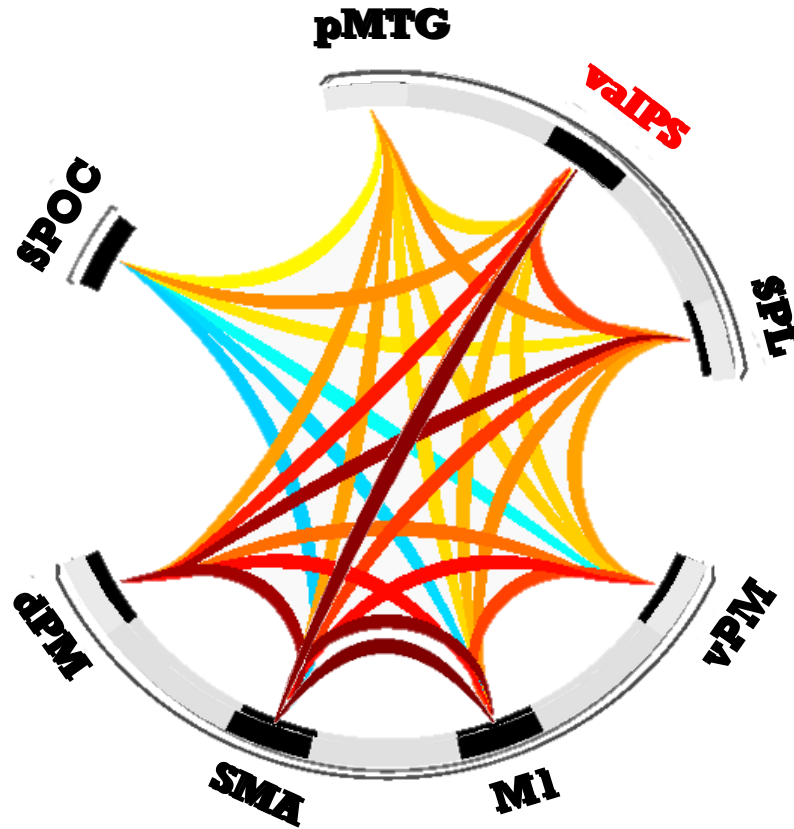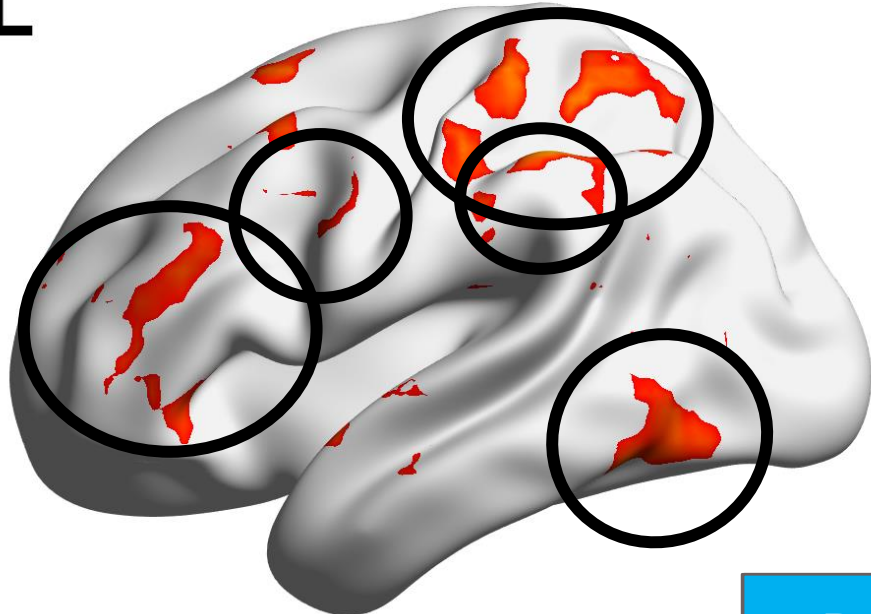
q< 0.05 (FDR-corrected, two-tailed)

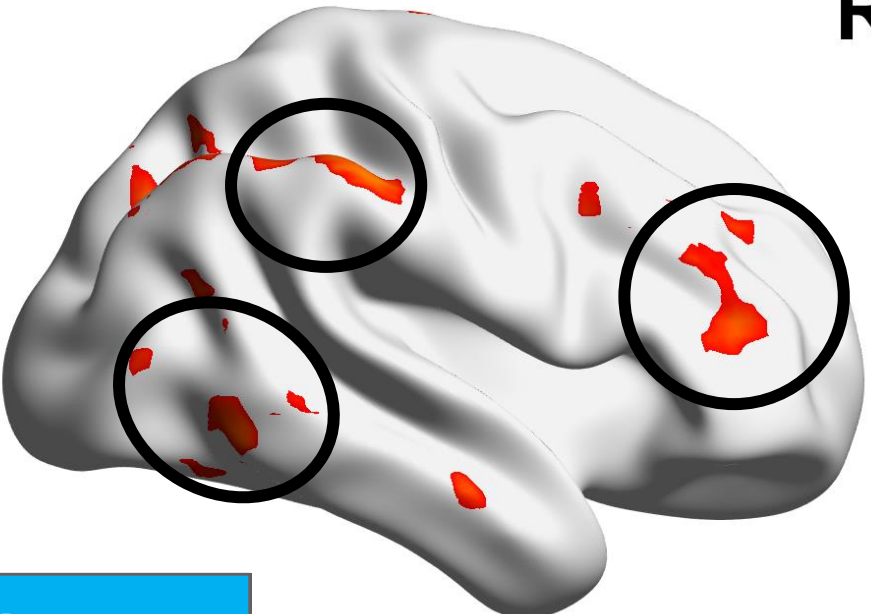# 2. Multivariate approach based on vaIPS Seed-Based Connectivity
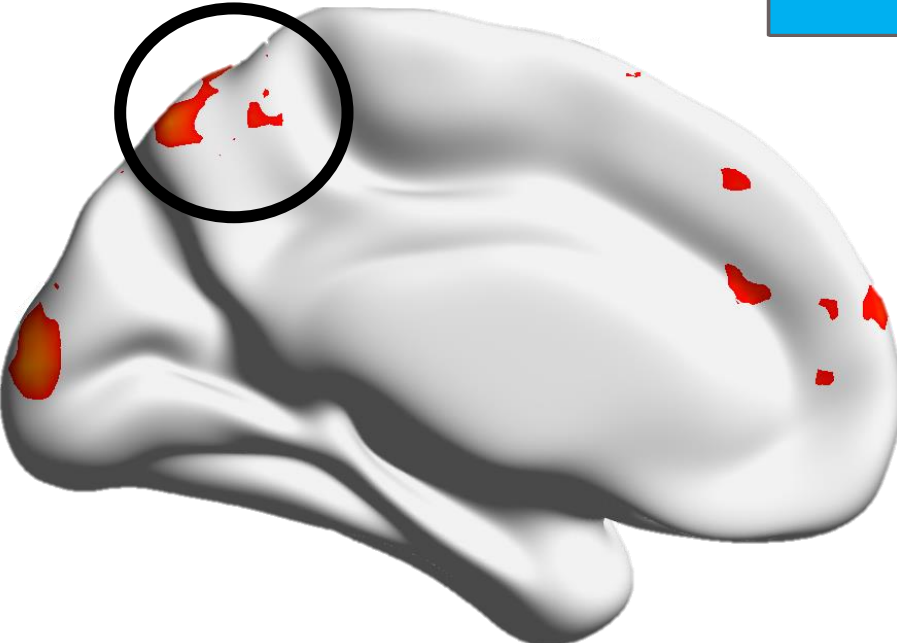
2. Searchlight results

L R

Prefrontal cortex

9.85

t-values

3.45

Cluster p < 0.05
FDR corrected

8

Conclusions

Research question:

Is the connectivity of the human vaIPS similar to the connectivity of the monkey parietal complex?

1. ROI-to-ROI univariate analysis showed an unexpected pattern of connectivity:

TMS over vaIPS increased the connectivity between vaIPS and SMA and between SMA and M1

2. Multivariate analysis showed a pattern of connectivity in line with monkey:

Widespread change in connectivity in the dorsolateral, dorsomedial and ventral pathways together with modifications in the prefrontal cortex

Thank you!

Luca Turella
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Professore Associato - CiMeC

Luigi Cattaneo
luigi.catteno@unitn.it
Professore Associato – CiMeC
Professore Associato - CISMED

Chiara Speranza
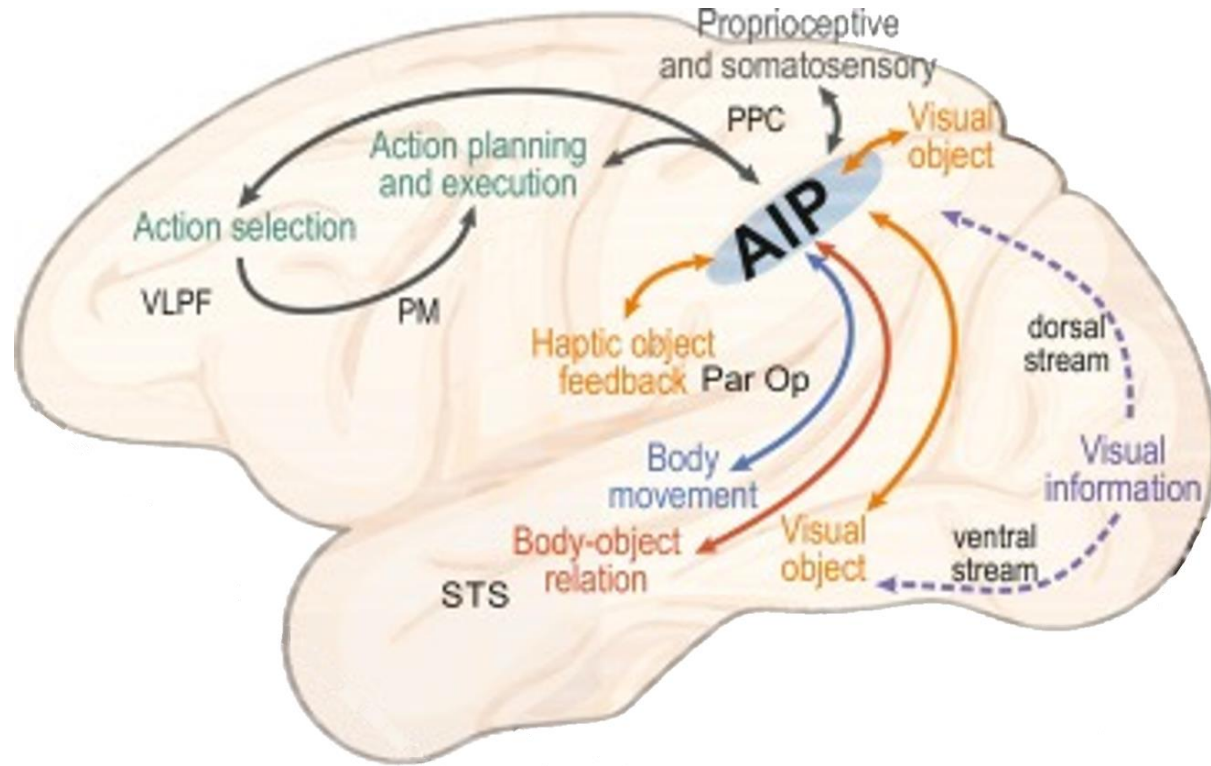Chiara.speranza@unitn.it
Research Assistant – CiMeC

We are hiring!!
Post-lauream & Post-doc
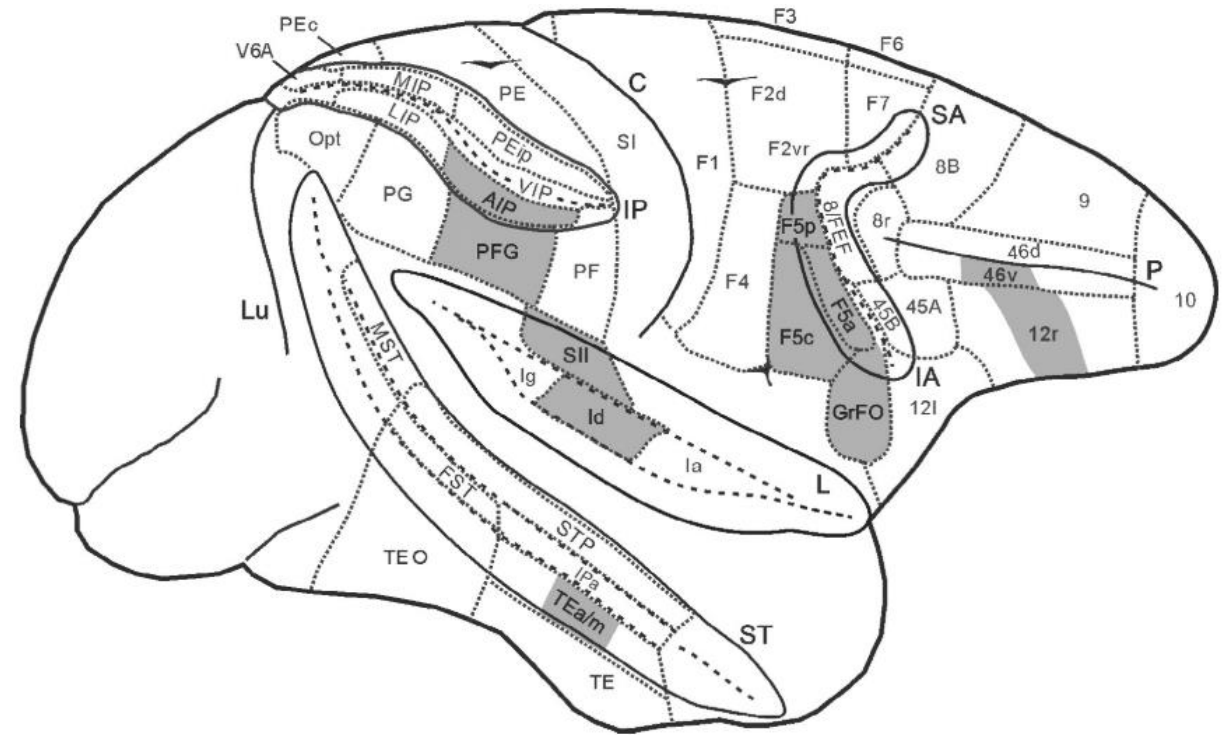**positions are available!**
For info:
luca.turella@unitn.it
luigi.cattaneo@unitn.it

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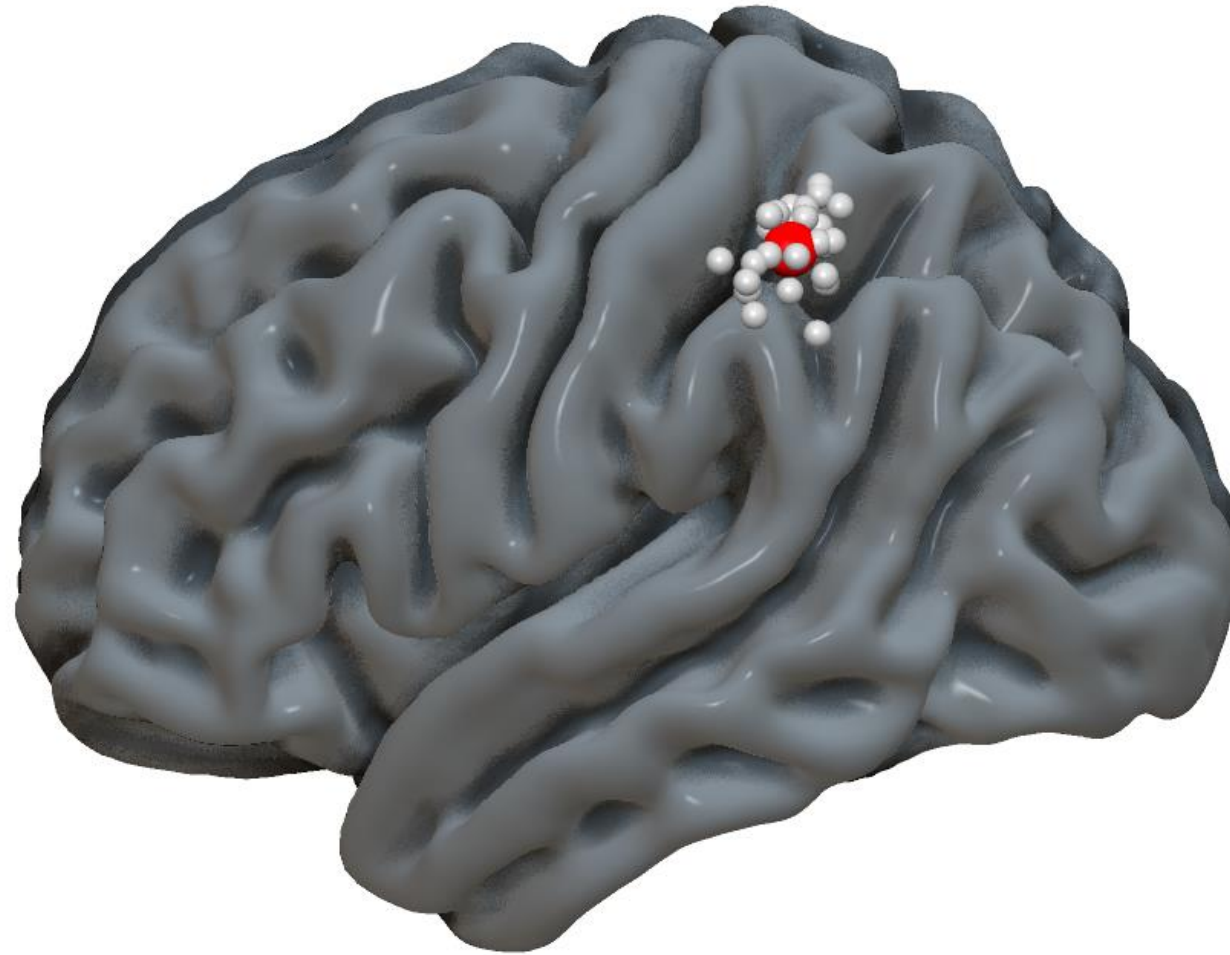# Supplementary – __background__

Adapted from Orban et al, 2021

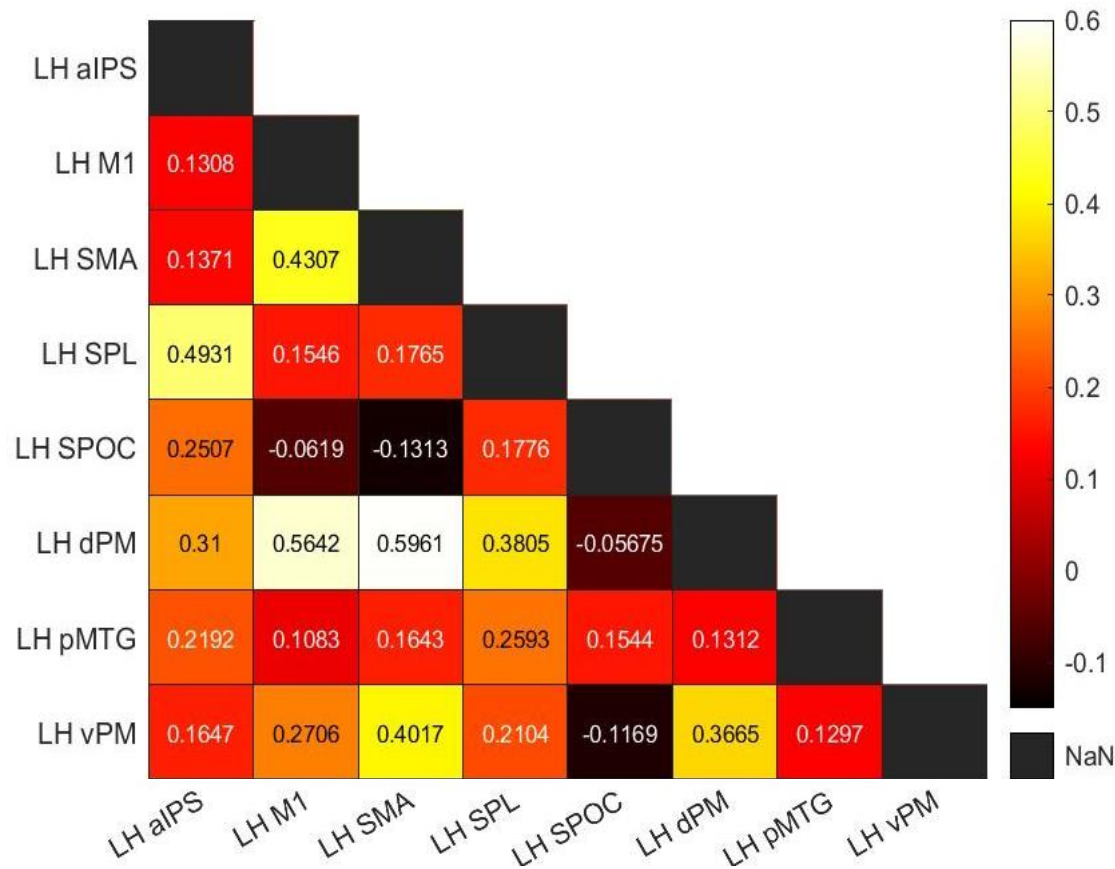Adapted from Borra et al, 2017
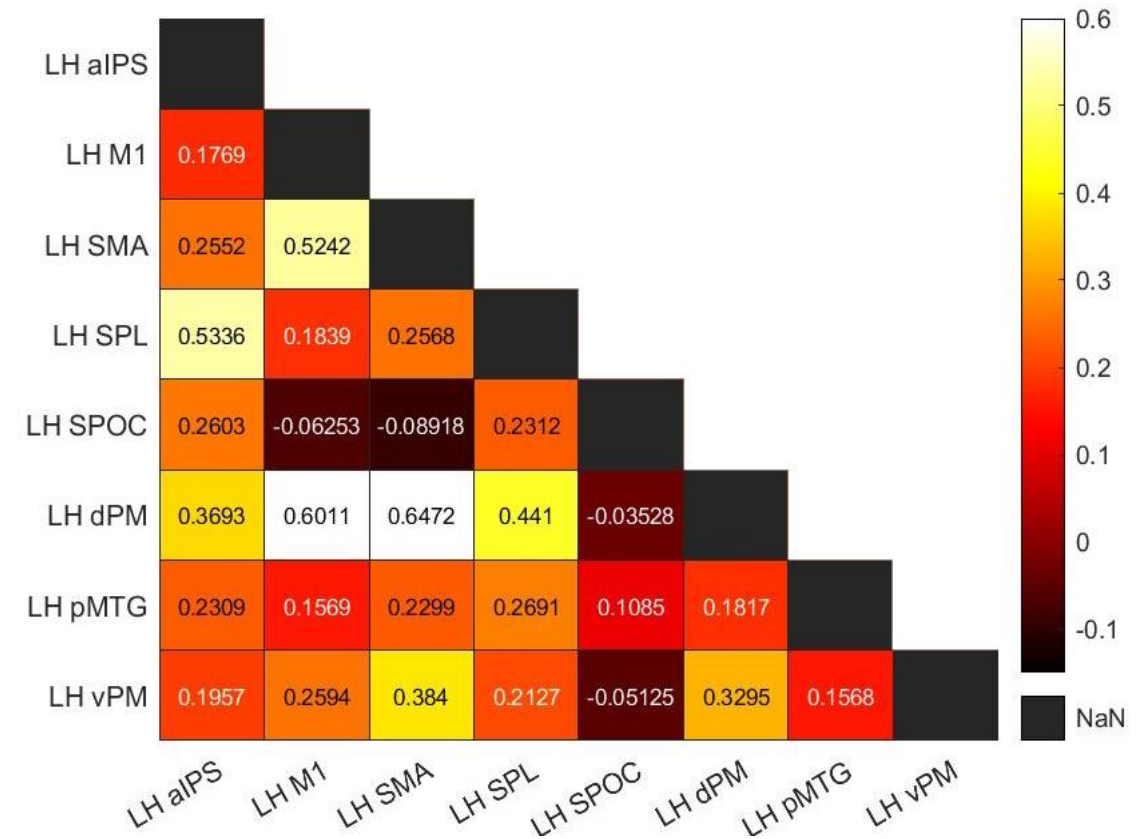
Supplementary – <u>Methods</u>

vaIPS distribution

Supplementary – <u>Results</u>

1. Univariate Results
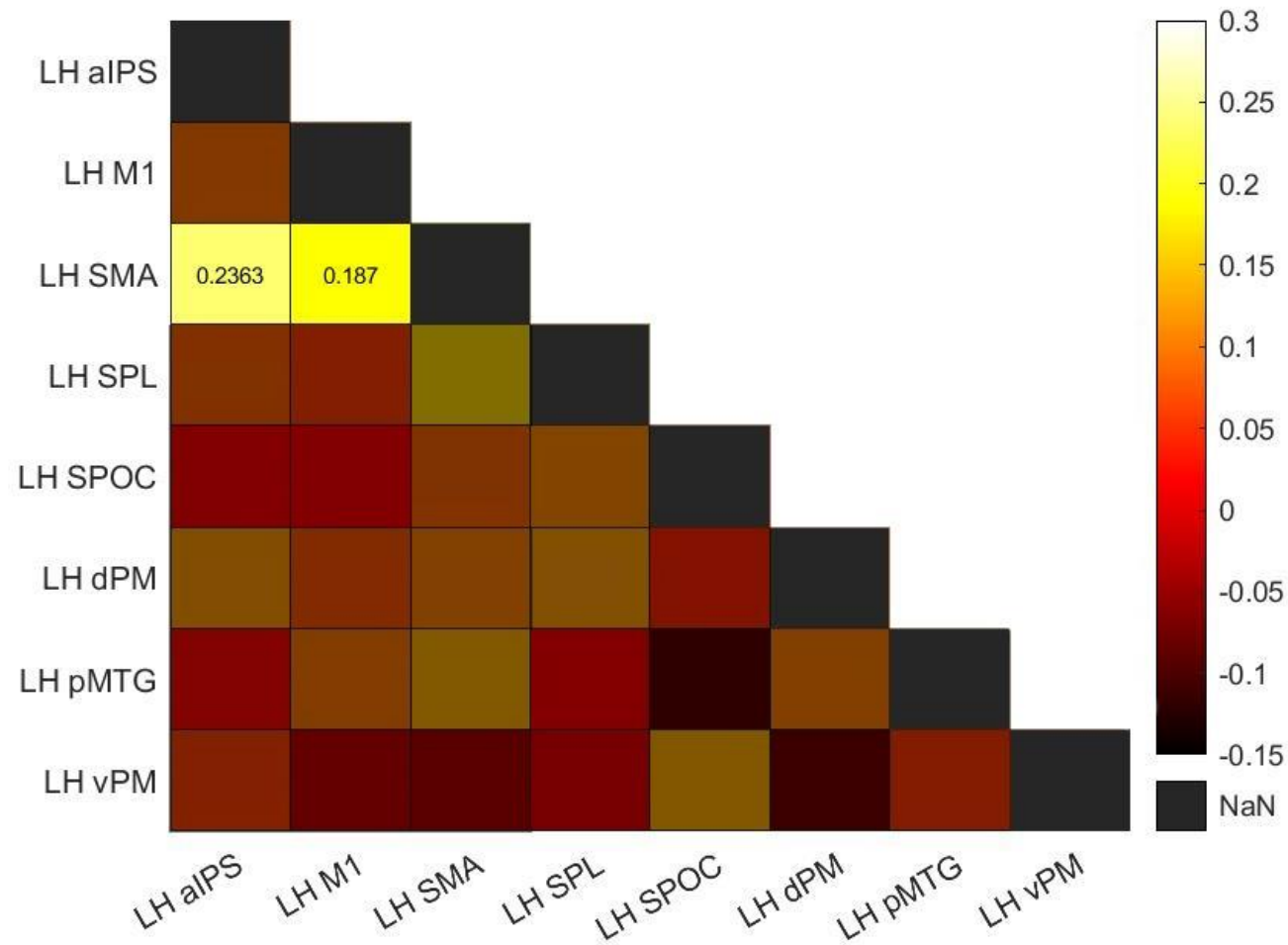### ROI-to-ROI

PRE-TMS functional connectivity

POST-TMS functional connectivity

Supplementary – <u>Results</u>

1. Univariate Results
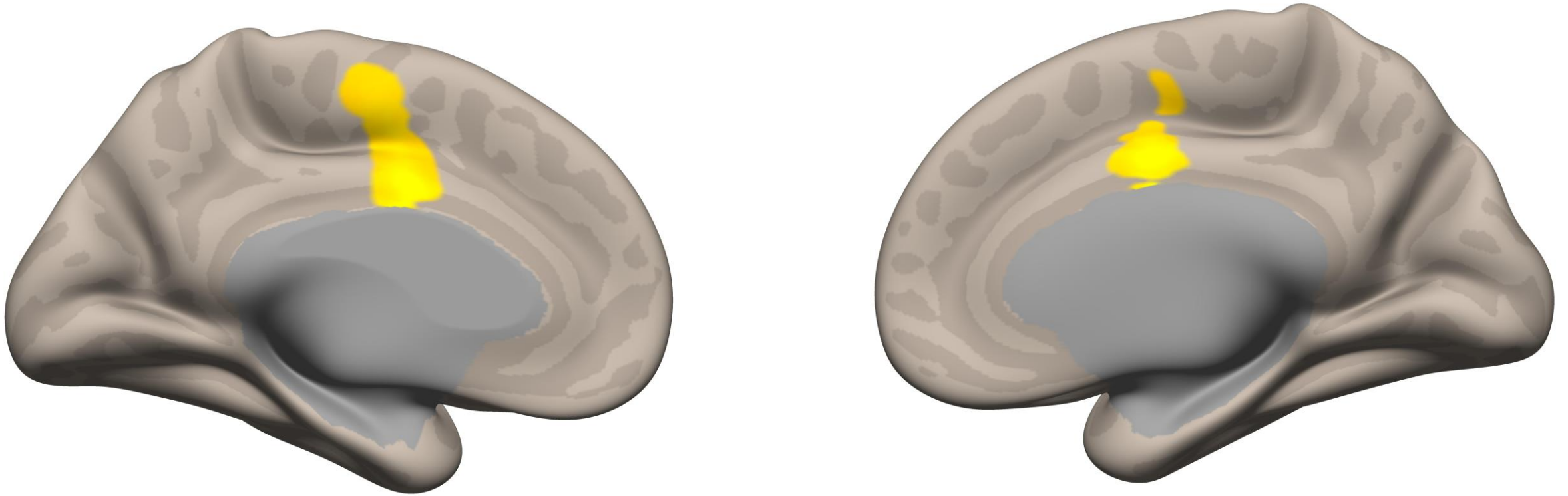### ROI-to-ROI

Difference between

PRE-TMS and POST-TMS

functional connectivity

Supplementary – <u>Results</u>
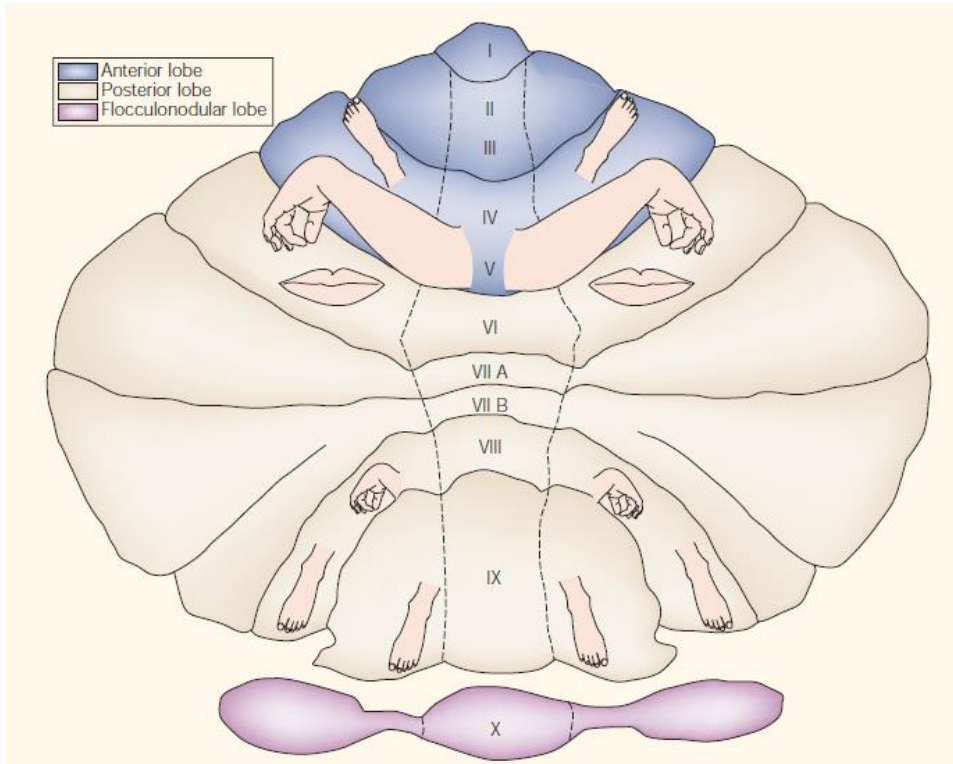
1. Univariate Results
vaIPS to whole brain connectivity
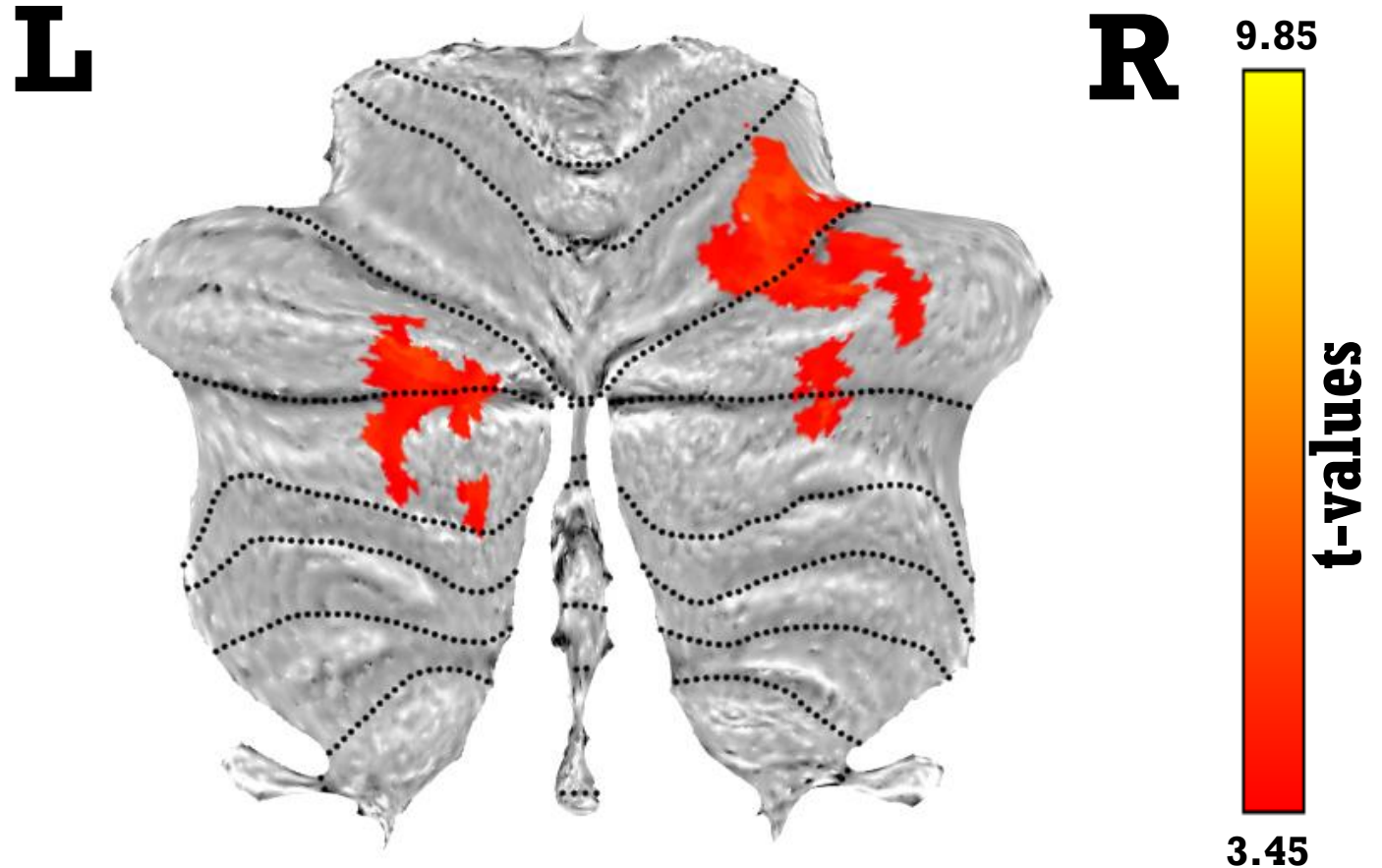

Voxel p < 0.01 uncorrected

Cluster-size uncorrected

Supplementary – <u>Results</u>

2. Searchlight results - cerebellum

L

R

9.85

t-values

3.45

Manni & Petrosini, 2004

Cluster p < 0.05
FDR corrected