

Background

Interhemispheric balance is kept via reciprocal interhemispheric inhibition¹, exemplified in the communication between the two posterior parietal cortices (PPCs)².

A lesion to the right hemisphere can cause neglect syndrome along with hyperexcited PPC-M1 functional connectivity in the spared left hemisphere³.

Inhibitory rTMS over neglect patients' left PPC reduces their leftward visuospatial bias and normalizes their left PPC-M1 functional connectivity³, presumably by restoring the inter-hemispheric balance.

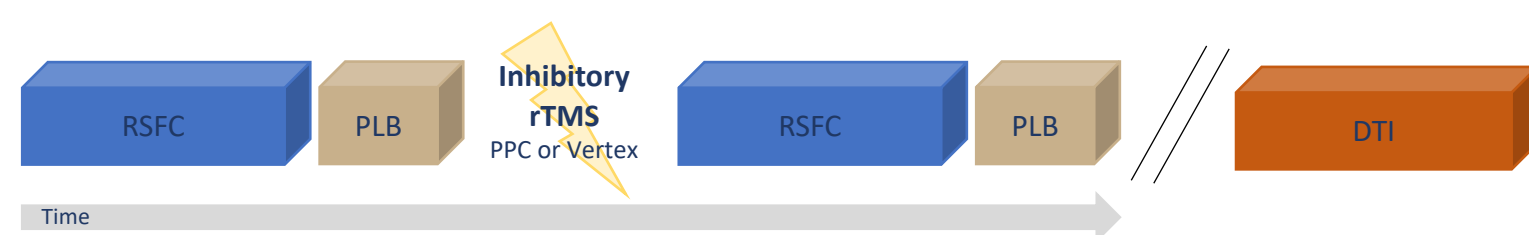
On the other hand, inhibitory rTMS over the right PPC of healthy individuals induces a rightward (neglect-like) visuospatial bias⁴, presumably by offsetting interhemispheric balance.

We directly measure resting state functional connectivity (RSFC) before and after inhibitory rTMS over the right PPC in healthy individuals.

Predictions:

- Inhibitory rTMS over right PPC induces a rightward visuospatial bias;
- Inhibitory rTMS over right PPC modulates intra/interhemispheric RSFC;
- Integrity of the PPC-to-PPC white matter tracts predicts the rTMS-induced changes in RSFC.

Procedure



Within-subjects design

17 right-handed and right-eyed adults (11 female; age = 25.94 ± 1.01 SEM).

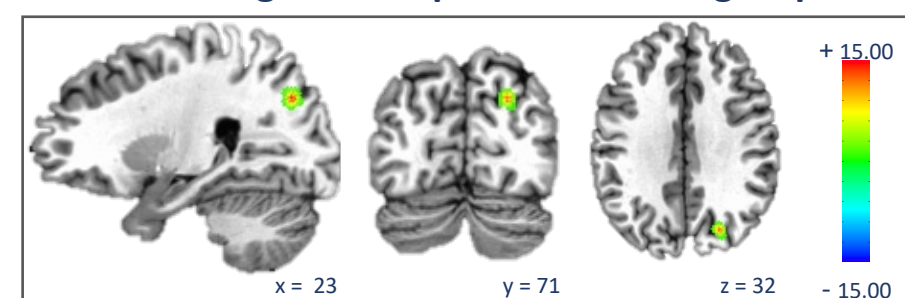
Resting State fMRI (RS): 1 run of 10 minutes each. Participants were asked to "relax, look at the central cross while thinking about nothing".

Perceptual line bisection task 66 pre-bisected lines, the mark was placed at: 0, ± 2, ± 4, ± 6, ± 8, ± 10 mm from the true center (0 mm). Answers were recorded from pedals. Data were fitted to a sigmoid function to calculate the perceived midline.

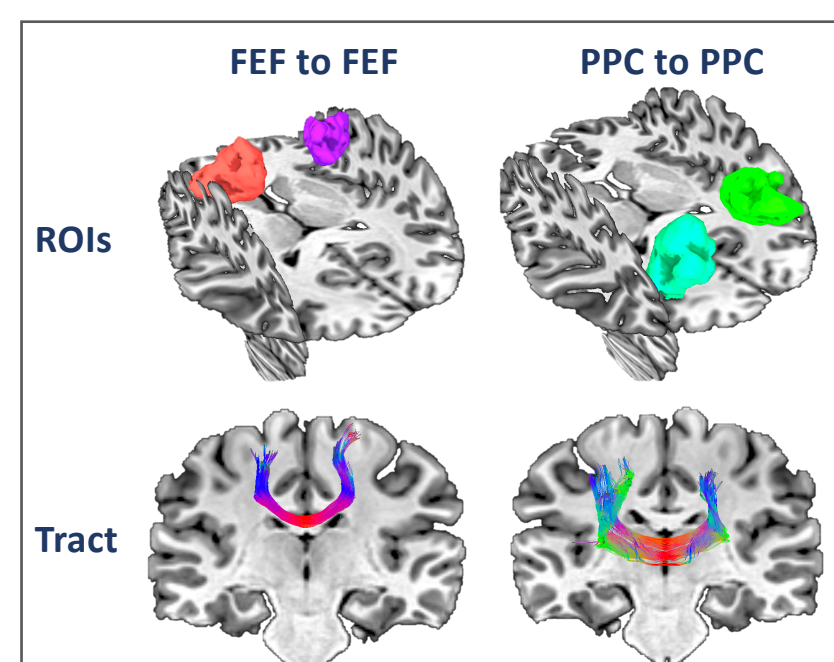
Inhibitory rTMS: Continuous Theta Burst Stimulation (600 pulses in 40s) at 80% of active motor threshold to either the right PPC or Vertex (counterbalanced) in 2 different sessions at least 5 days apart.

rTMS Target: right PPC was area 1 of the intraparietal sulcus (IPS1)⁵ derived from probabilistic atlas⁶ and mapped onto subject's brain for neuronavigation (Brainsight).

rTMS target overlap for the whole group

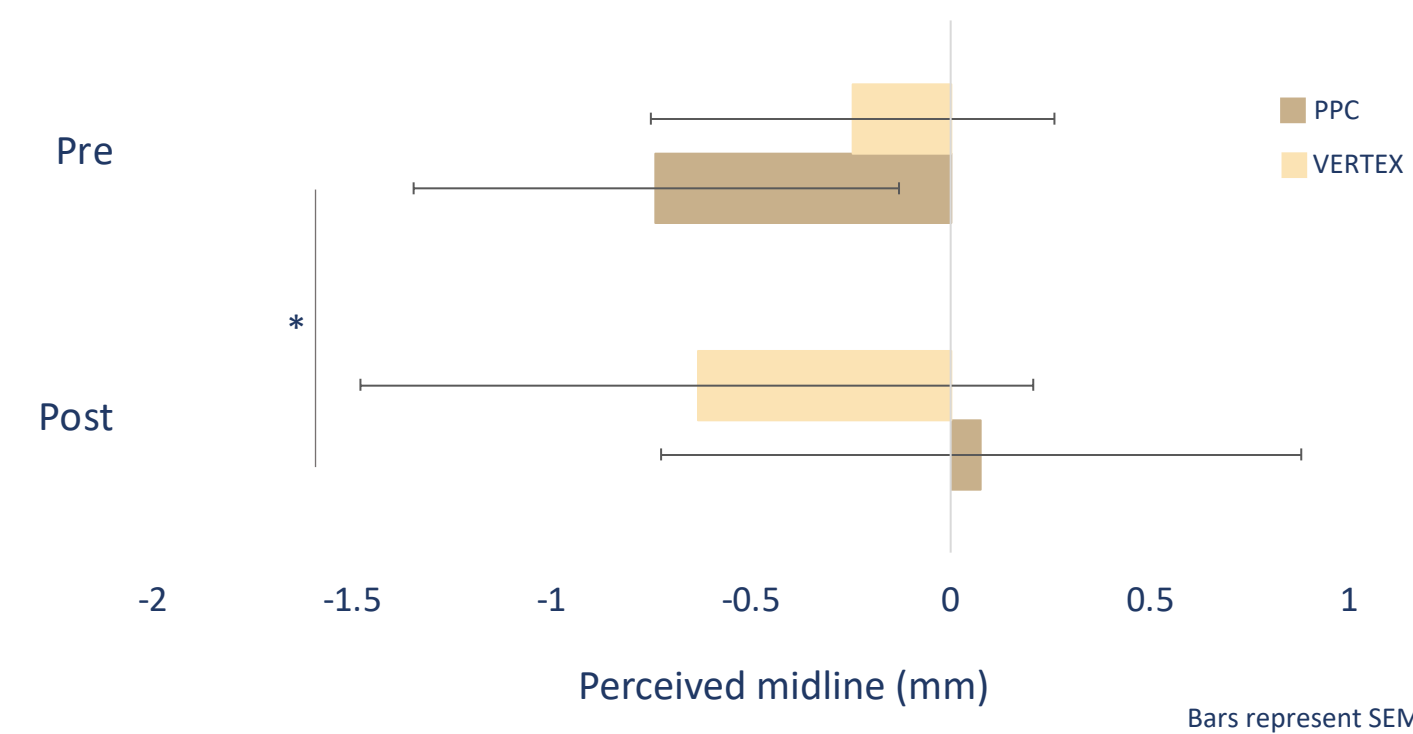


DTI - Fiber Tacking: PPC-to-PPC and FEF-to-FEF tracts were reconstructed for each participant using mini-probabilistic tractography in 3dTrackID (FATCAT toolbox).

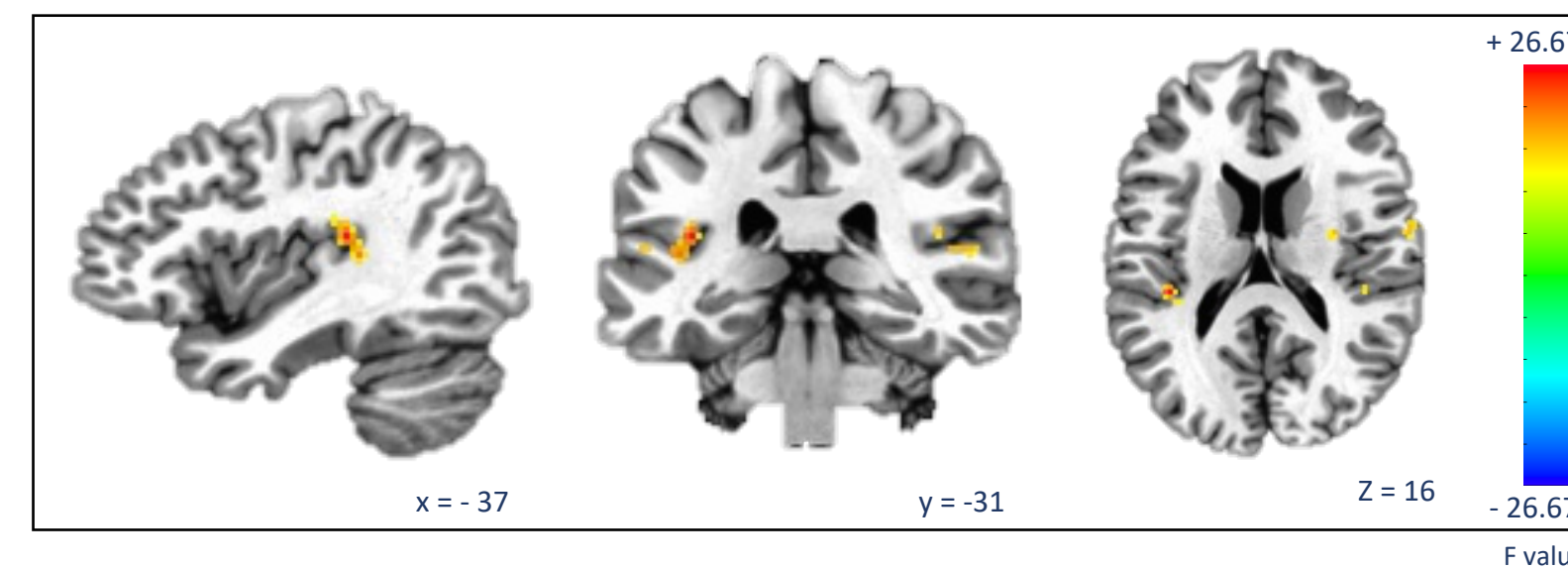


Results

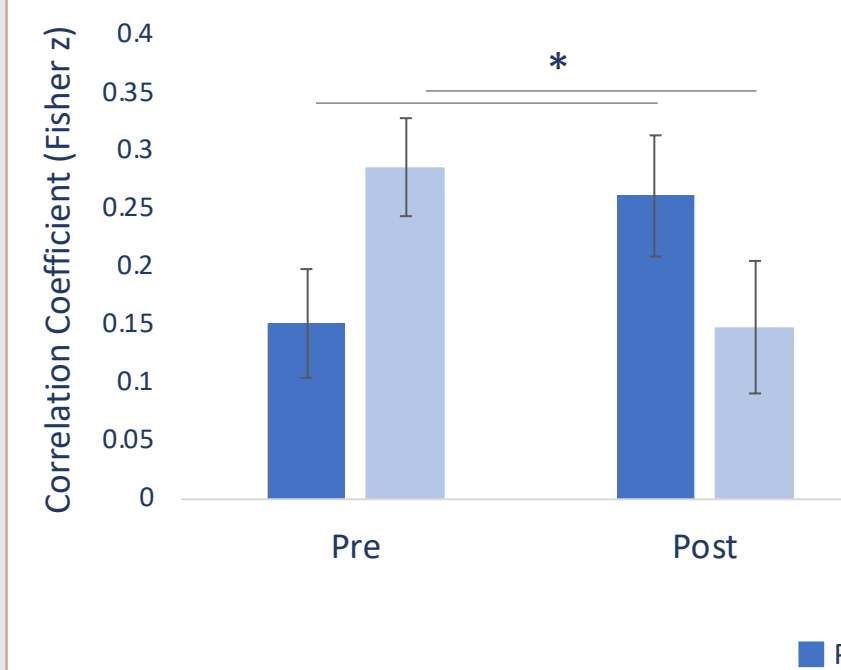
rTMS over right PPC produces a rightward visuospatial bias



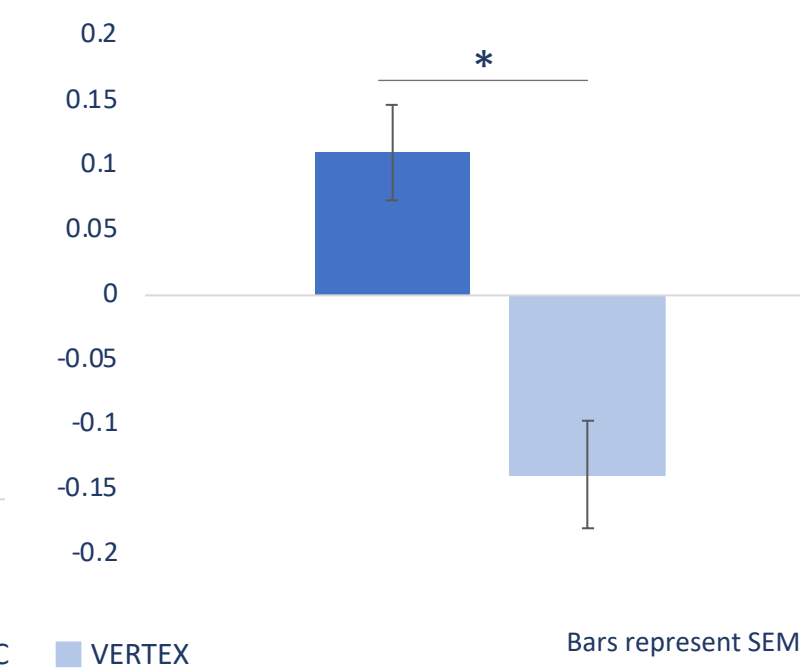
PPC versus Vertex rTMS differentially modulates RSFC between right PPC and left STG



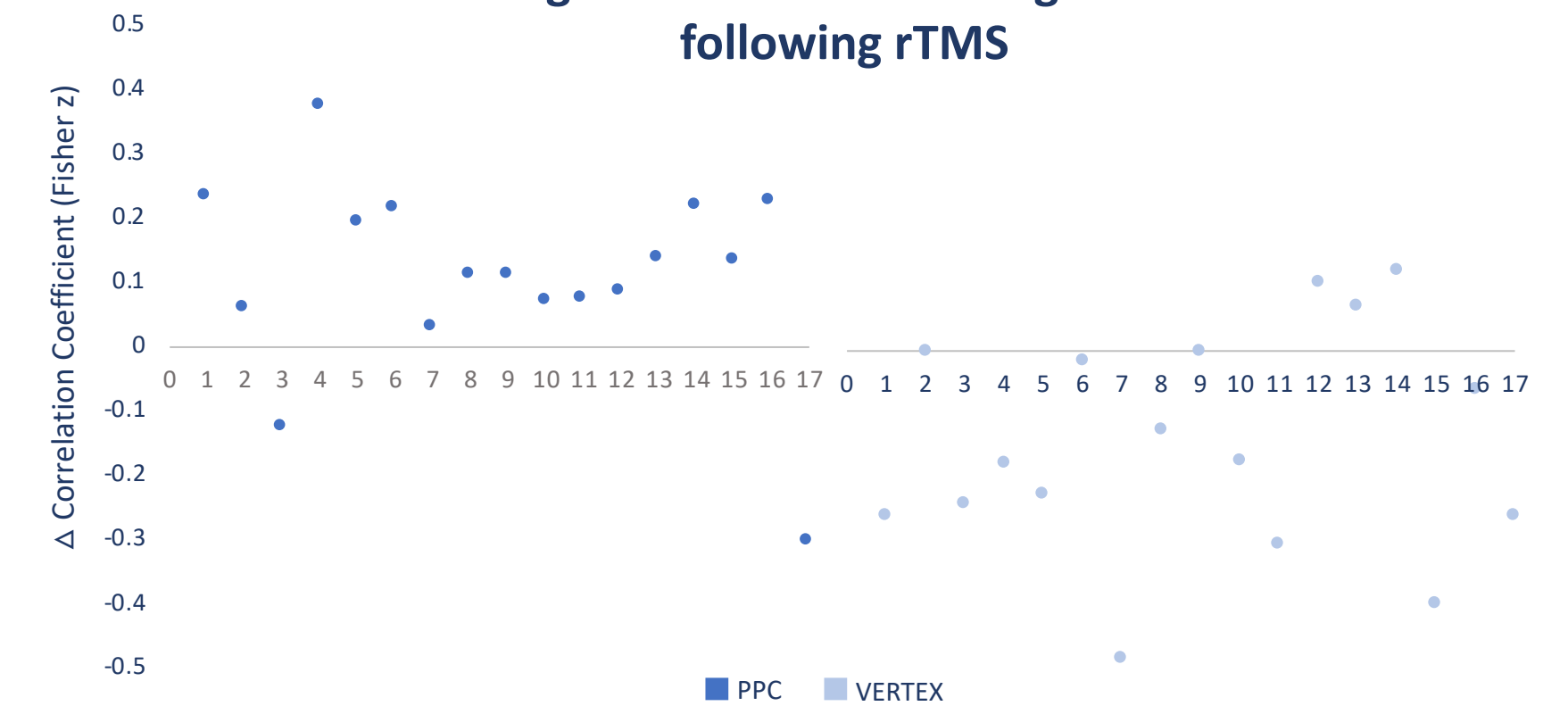
rTMS over the right PPC increases RSFC with left STG



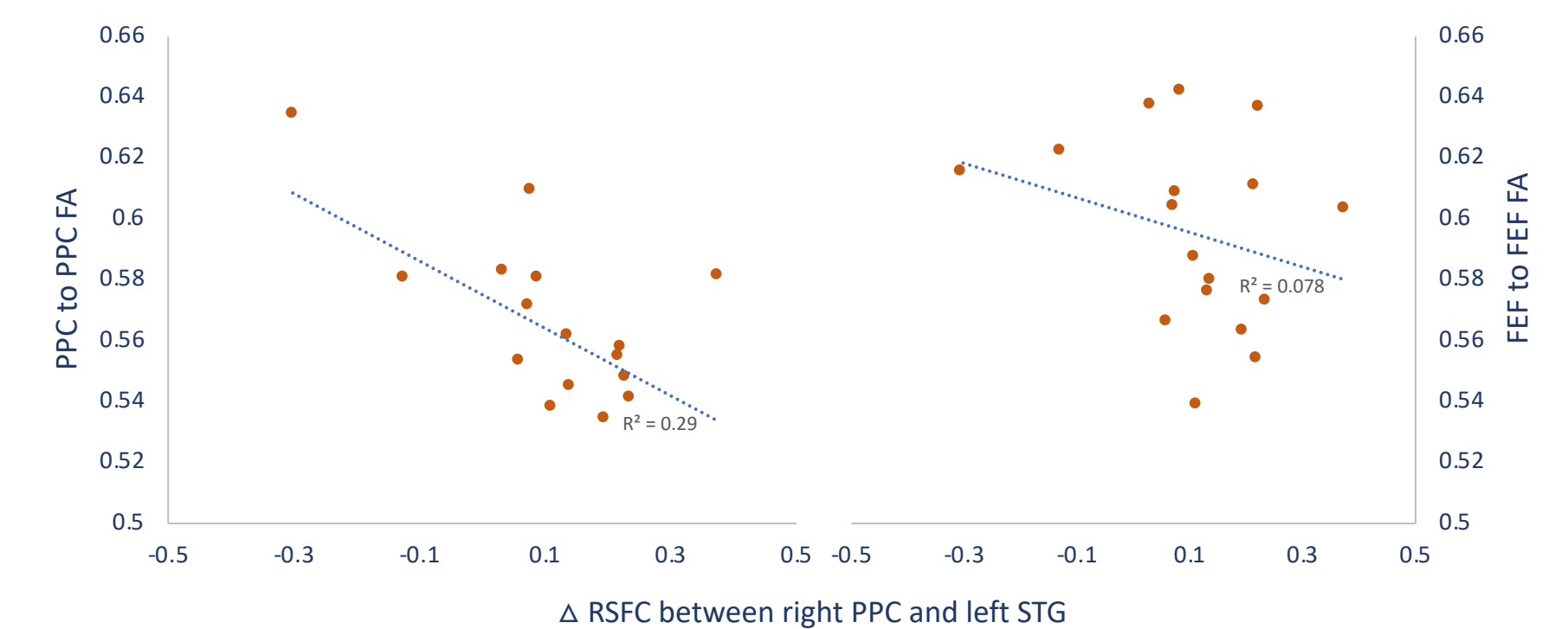
The amount of change in RSFC differs between rTMS over right PPC and Vertex



Individual changes in RSFC between right PPC and left STG following rTMS



White matter integrity (FA) between the two PPCs predicts RSFC change after rTMS over the right PPC



Conclusion

Local inhibition of the right PPC reshapes the attentional network by recruiting a vicarious region in the contralateral hemisphere.

PPC to PPC white matter integrity predicts the change in RSFC induced by inhibitory rTMS over the right PPC.

REFERENCES

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