THE CEREBELLUM WORKS ACROSS TASK-POSITIVE AND TASK-NEGATIVE NETWORKS

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BACKGROUND

The organization of neural activation in anti-correlated networks is a fundamental property of the human brain (Duncan et al. 2001; Fox 2005; Hugdahl et al. 2015; Raichle et al. 2001). However, the distinction between task-positive networks (e.g., the Dorsal Attention Network DAN and the fronto-parietal cortical network FPCN) and task-negative networks (i.e., the Default-Mode Network DMN) as well as the definition of their scope as extending exclusively over cortical structures are unclear.

The effects of cognitive tasks on functional connectivity involving the cerebellum are sparse. Does the cerebellum 'keep going on'?

METHODS

We investigated changes in functional connectivity generated by a working memory task using weak and strong visual Gestalts. We collected resting-state data from 20 right-handed healthy adult volunteers before and after the task using a 3T Siemens Magnetom Prisma scanner. We analysed the data using the CONN toolbox in terms of ROI-to-ROI and seed-based functional connectivity.

CONCLUSION

The cerebellum plays a singular role in post-task processing, for being exclusively upregulated in a whole-brain functional connectivity analysis.

ROI-to-ROI whole-brain functional connectivity for Post vs. Pre-Task Resting State
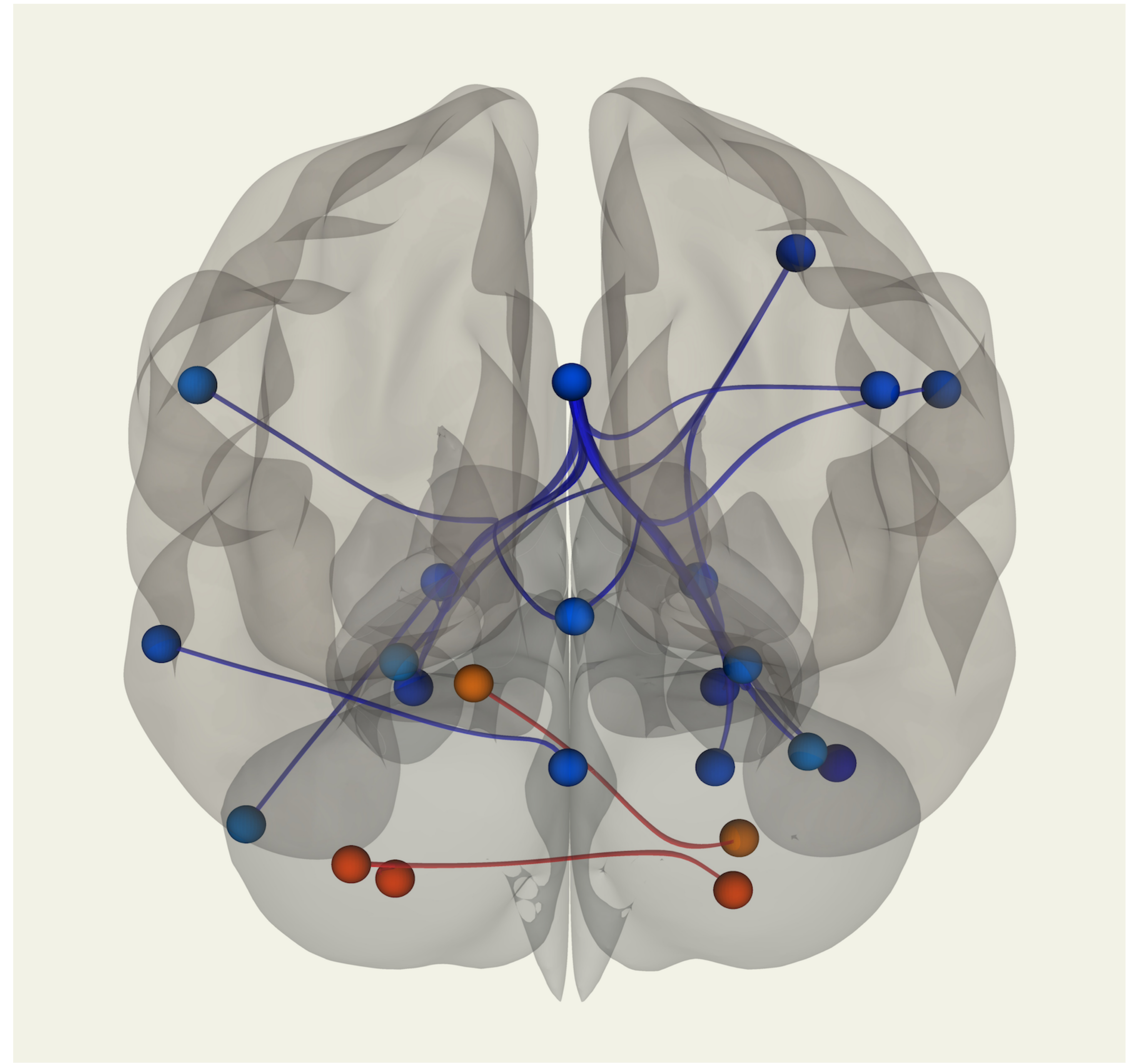
RESULTS

ROI-to-ROI analyses of post- versus pre-task resting-state functional connectivity revealed **deactivation** of cortical networks driven primarily from the posterior cingulate cortex PCC, i.e. from a DMN node, accompanied by **increased connectivity** within the cerebellum.

Seed-based analysis of functional connectivity for the post-task > pre-task contrast revealed downregulation of DMN nodes, up- and downregulation of task-positive nodes, and mostly upregulation of cerebellar nodes, including activity that originates and terminates in cerebellar areas.
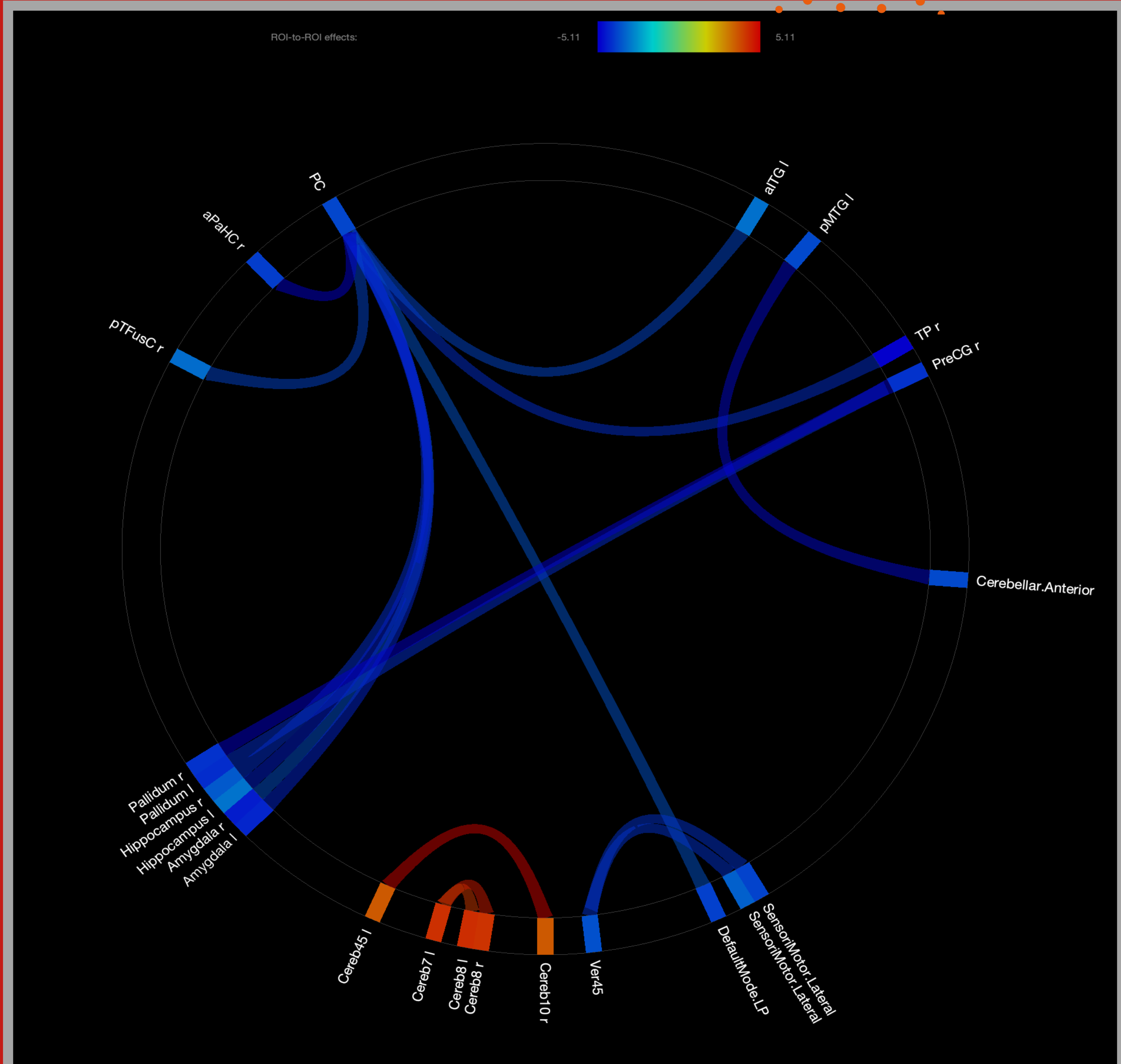
Exclusive upregulation of cerebellar nodes by the anterior cerebellar network seed

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