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'?
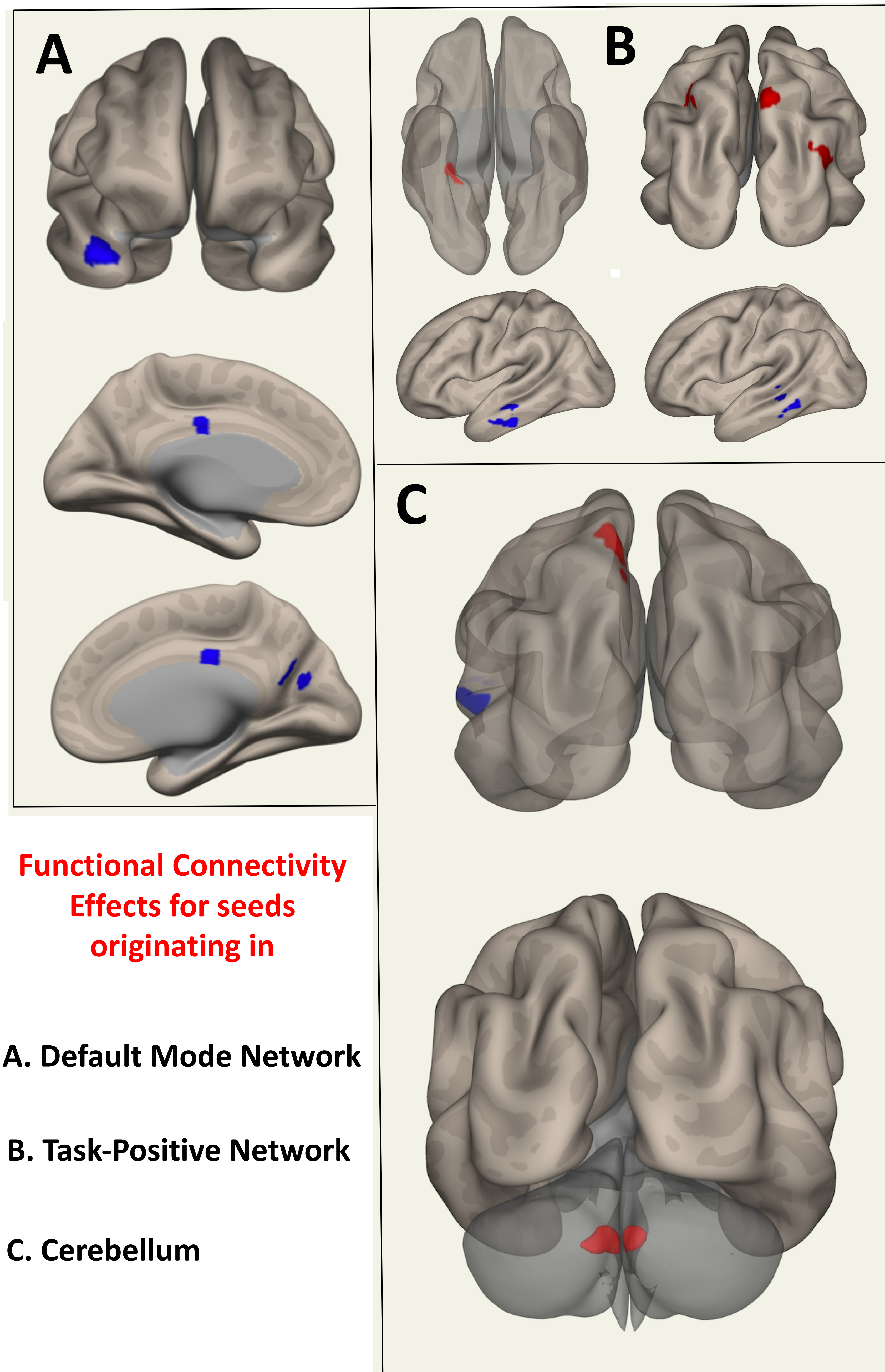
METHODS

We used resting-state fMRI to investigate the dynamics of neural networks before, during, and after a working memory task involving weak and strong visual Gestalts.

Volunteers: 20 right-handed adults Scanner: 3T Siemens Magnetom Prisma

CONCLUSION

The cerebellum plays a singular role in post-task processing.
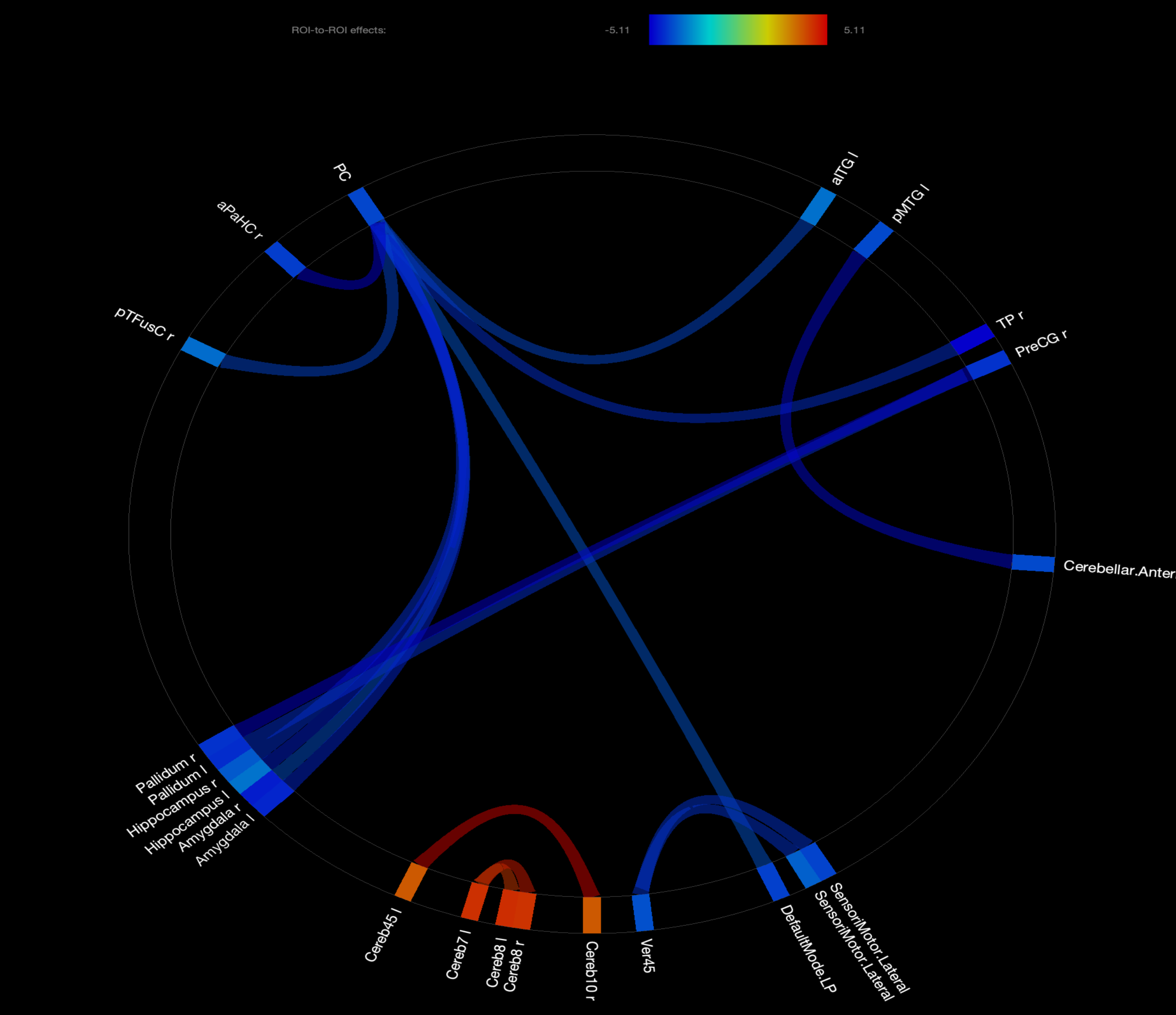
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Functional Connectivity Effects for seeds originating in

A. Default Mode Network

B. Task-Positive Network

C. Cerebellum

Whole-brain functional connectivity for the Post vs. Pre-Task contrast

RESULTS

Whole-brain functional connectivity analysis of post- versus pre-task resting-state sessions 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 functional connectivity analysis of the contrast between post-task and pre-task revealed post-task downregulation of DMN seeds, both up- and downregulation of Task-Positive seeds, and upregulation of cerebellar networks, including activity that originates and terminates in cerebellar areas.