



Resting-state Functional Connectivity Between the Cerebellum and Cortical Networks: Individual Differences in Verbal Working Memory

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BACKGROUND

- The cerebellum is not only involved in motor control, but also in higher-level cognition.
- Verbal working memory is supported by the reciprocal cortical-cerebellar circuits (Chen & Desmond, 2005).
- The correlation between resting-state cortical-cerebellar functional connectivity and individual differences in VWM capacity for both younger adults and older adults needs further investigation.

METHODS

- 9 younger adults (mean age=24.33) and 12 older adults (mean age=65.58) were recruited after passing HK-MoCA.
- A reading span task was used to measure the VWM capacity.
- Resting-state scans were acquired with eyes open.
- Cerebellar Crus I, Crus II, lobules VI and VIIb were chosen as Regions of Interest.

RESULTS

- Significantly higher reading span task scores in younger adults than older adults (see Fig.1).
- Decreased intrinsic connectivity between the cerebellum and the visual network, the sensorimotor network, the auditory network, and the default mode network in older adults (see Fig.2 for visual network).
- The individual differences in VWM capacity was correlated with the connectivity strength between the cerebellum and superior parietal lobule, middle frontal gyrus, and superior frontal gyrus (see Fig.3).

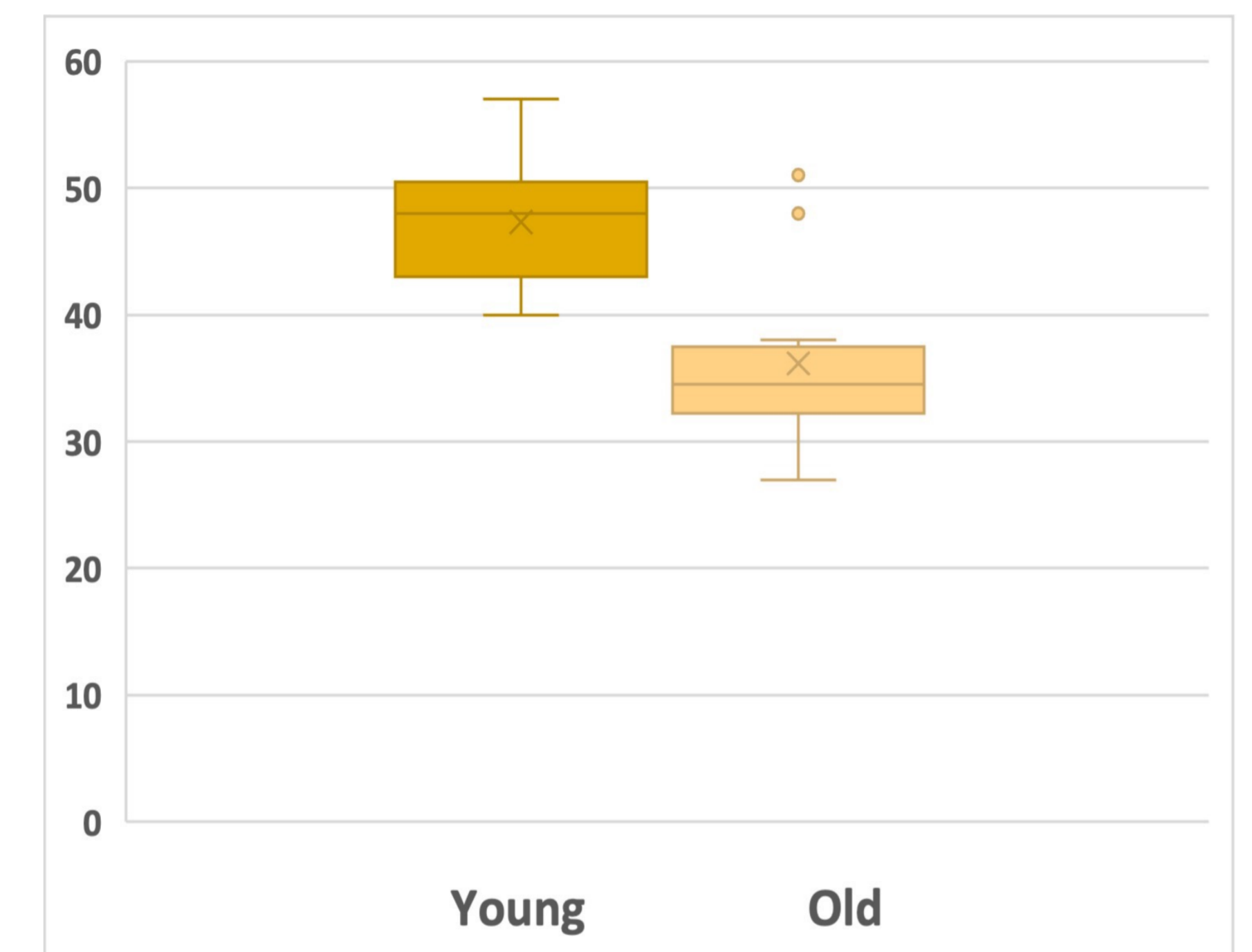


Fig.1. Behavioral results

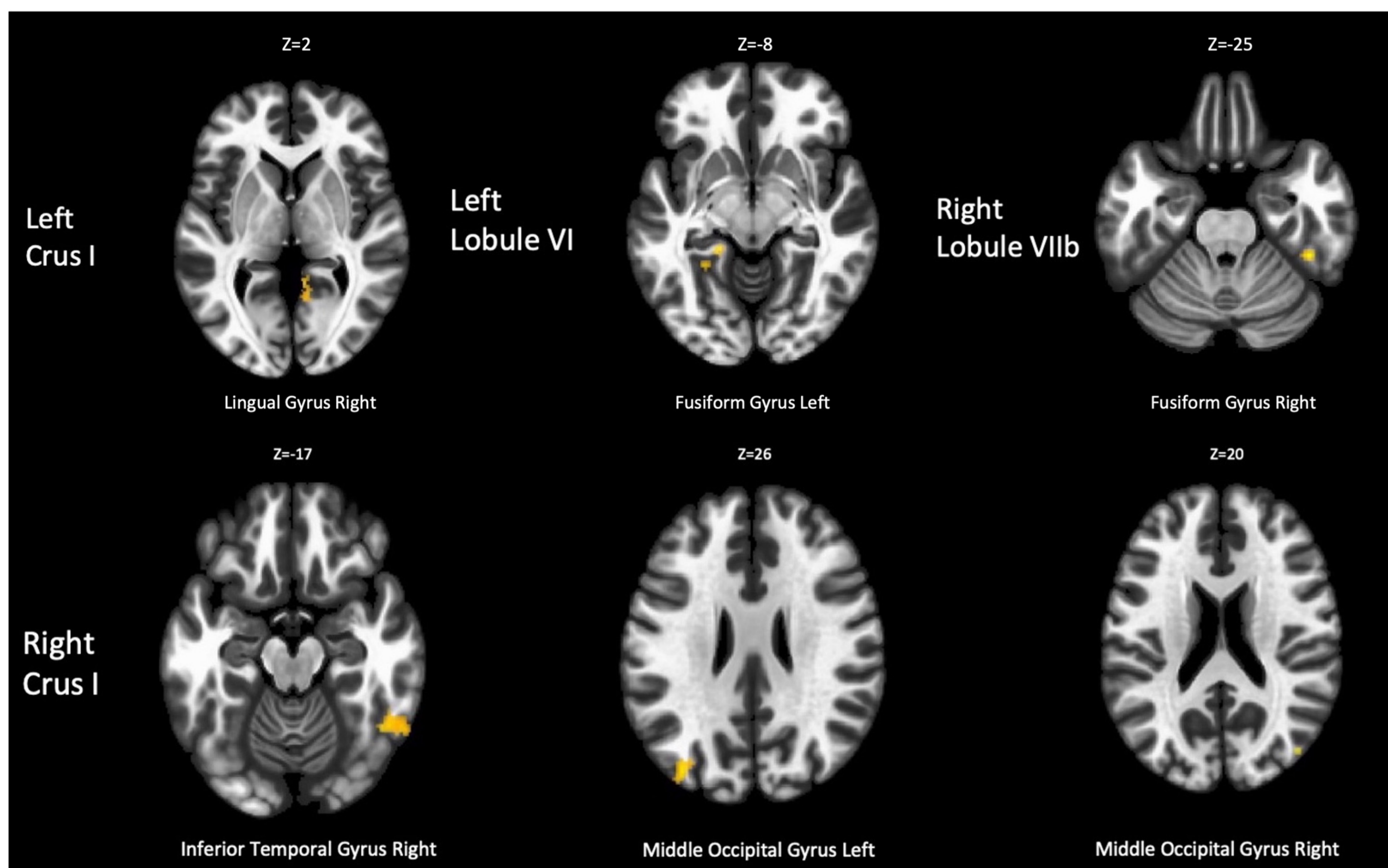


Fig.2. Significant clusters in YA>OA contrasts (Visual network)

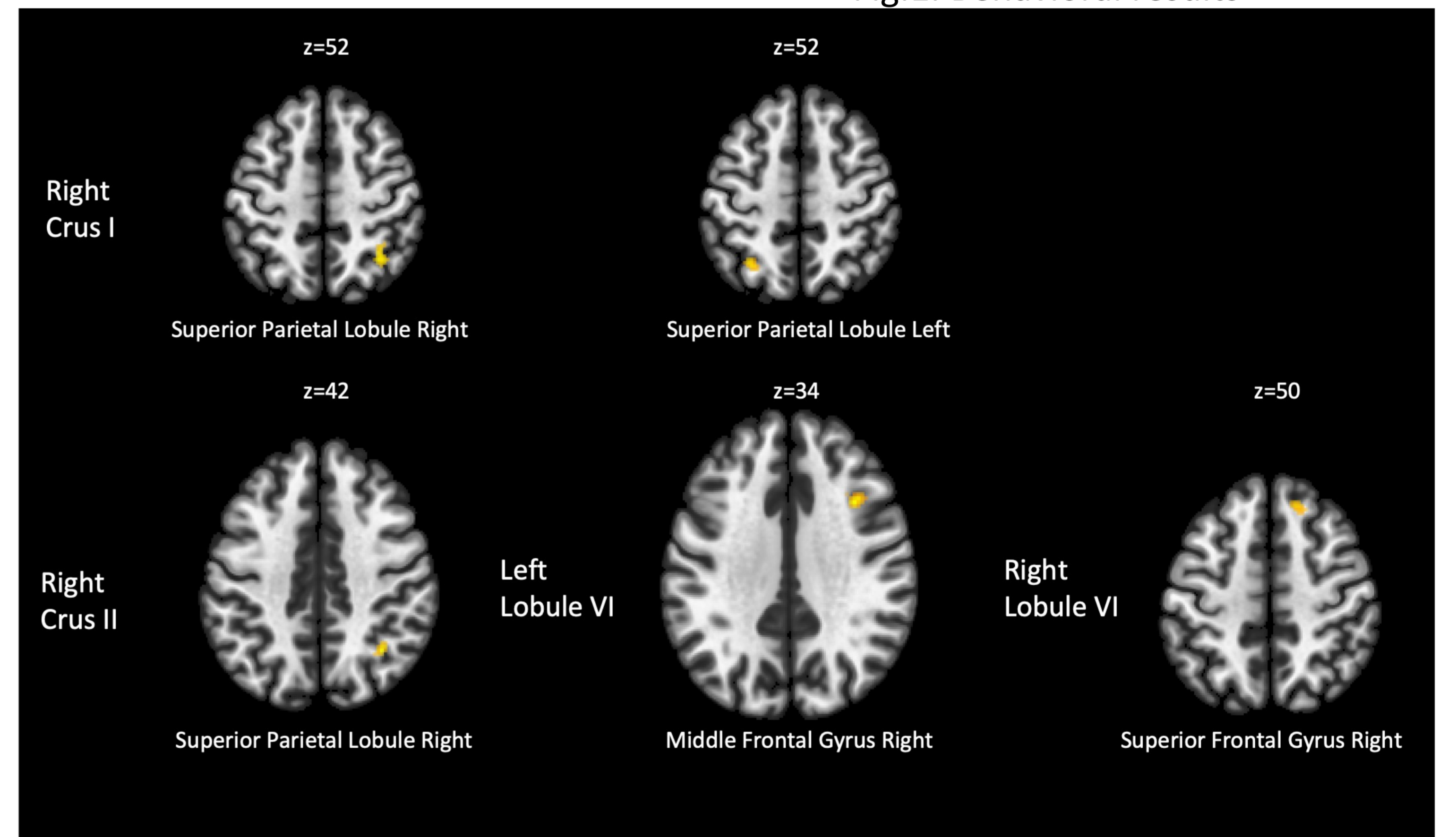


Fig.3. The correlation between connectivity strength and individual differences in VWM performance (for all participants)

DISCUSSION

- The cerebellum is involved in processing and integrating multi-modal (auditory, visual and somatosensory) sensory information (Gentile et al., 2011). This sensory integration is especially important for maintaining posture and alertness during resting-state (Sang et al., 2012; Magalhães et al., 2021). The reduced intrinsic connectivity in older adults might indicate their altered abilities to integrate multisensory information.
- Our results are consistent with previous task-based fMRI studies that suggest VWM is supported by the functional connectivity between frontal-superior cerebellum and parietal-inferior cerebellum (Chen & Desmond, 2005).

SELECTED REFERENCES

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- Sang, L., Qin, W., Liu, Y., Han, W., Zhang, Y., Jiang, T., & Yu, C. (2012). Resting-state functional connectivity of the vermal and hemispheric subregions of the cerebellum with both the cerebral cortical networks and subcortical structures. *Neuroimage*, 61(4), 1213-1225.

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