Characterization of minimally conscious state *minus* and *plus* according to resting functional connectivity

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Objectives

Patients in a MCS have been subcategorized in MCS *plus* and MCS *minus*, that is, with or without command following capacity respectively (**Fig. 1**). We aim to characterize this residual capacity in both patient groups by means of resting state fMRI. We hypothesize a higher connectivity in MCS *plus* as compared with MCS *minus* in language-related networks, that is the left fronto-parietal network (FPN).

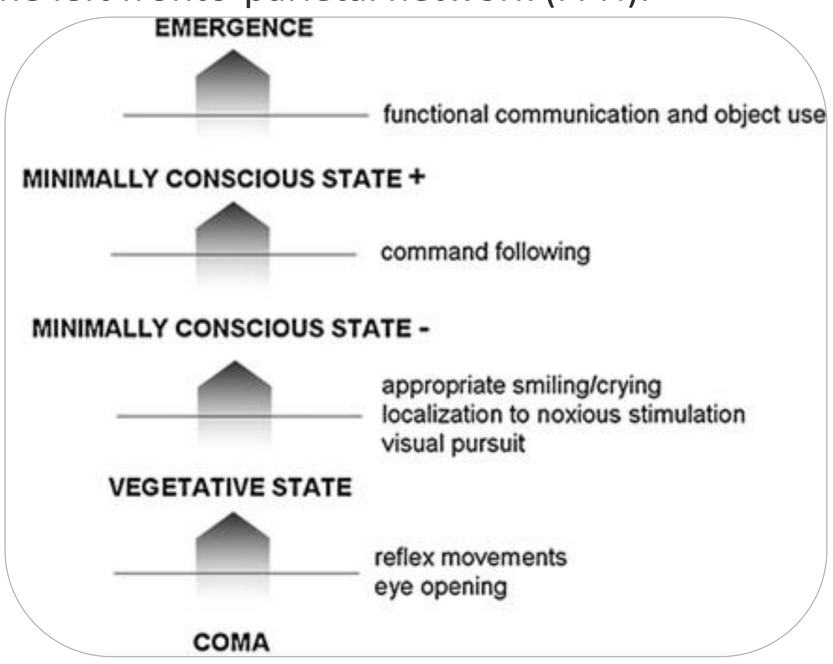

Fig. 1: The minimally conscious state as a disorder of consciousness[1]

Methods

Our sample includes 10 MCS *plus* and 9 MCS *minus* who match for age, gender, etiology and disease duration, as well as 35 healthy controls. We performed a seed-based resting state analysis using CONN toolbox[2]. Results were considered significant at $p<0.05$ FDR corrected. We investigated the left FPN, and also the right FPN, the auditory network and the default mode network (DMN) in order to exclude the influence of perception of surrounding, auditory capacity, or internal thoughts (**Table 1**).

Networks	Seeds
Left FPN	Left dorso-lateral prefrontal cortex (DLPFC) and inferior parietal lobule (IPL)
Right FPN	Right DLPFC and IPL
Auditory network	Right and left superior temporal gyrus
DMN	Anterior and posterior cingulate cortices

Table 1: Investigated networks and their main nodes

We employed a ROI-to-ROI analysis to investigate the inter-hemispheric connectivity and we investigated inter-group differences in grey and white matter volume by means of voxel-based morphometry (VBM).

Results

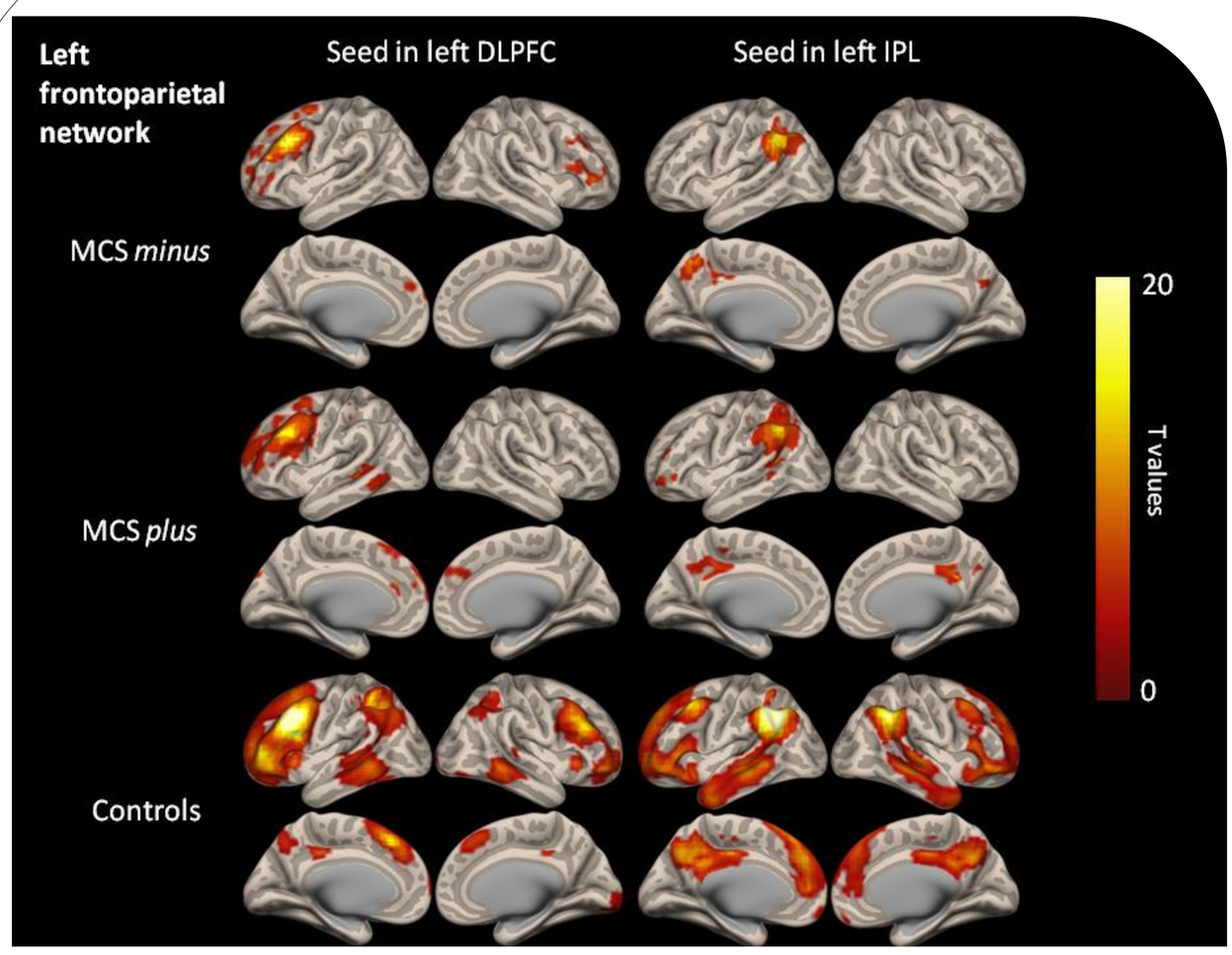

Fig. 2: Correlation between the left DLPFC, left IPL and the time series from all other brain voxels in MCS *minus*, MCS *plus* and healthy controls.

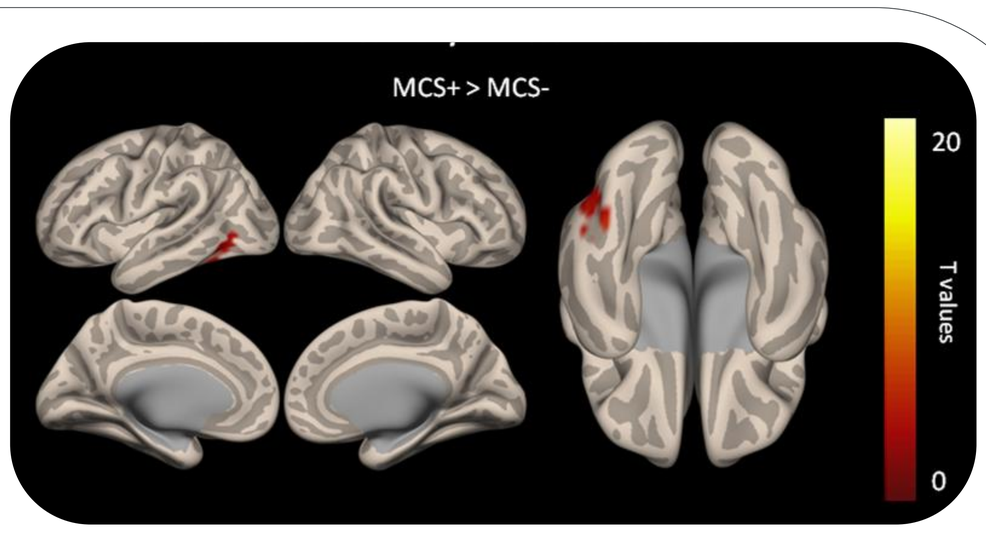

Fig. 3: Difference between MCS *minus* and *plus* according to the correlation between the left DLPFC and the time series from all other brain voxels.

We observe a higher functional connectivity in controls than in patients, as well as in MCS *plus* as compared to MCS *minus* patients (**Fig. 2**). Specifically, with DLPFC as seed, the left FPN was more connected in MCS *plus* patients to the left temporo-occipital fusiform cortex (**Fig. 3**). No significant differences were found between both patient groups in the right FPN, the auditory network and the DMN, or using the ROI-to-ROI analyses and the VBM.

Conclusion

Our results suggest that the clinical sub-categorization of MCS is sustained by functional connectivity differences in a language-related executive control network. MCS *plus* and MCS *minus* patients are not differentiated by networks involved in auditory processing, perception of surroundings and internal thoughts, nor by inter-hemispheric connectivity and morphology.

REFERENCES
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2 Whitfield-Gabrieli S, Nieto-Castanon A (2012): Conn: A Functional Connectivity Toolbox for Correlated and Anticorrelated Brain Networks. Brain Connect 2:125–141