CROSS-MODAL PLASTICITY AMONG SENSORY NETWORKS IN NEUROMYELITIS OPTICA SPECTRUM DISORDERS

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INTRODUCTION and PURPOSE

The study of large-scale network resting state (RS) functional connectivity (FC) abnormalities may help to define the selectivity of system involvement (e.g., visual and motor network) in Neuromyelitis Optica Spectrum Disorders (NMOSD) patients.

We hypothesized that selective abnormalities of large-scale brain RS networks occur in patients with NMOSD, isolated optic neuritis (ON) and myelitis, according to their clinical symptomatology, and that functionally preserved networks might compensate abnormal RS FC in damaged networks.

METHODS

RS fMRI was acquired from 28 right-handed NMOSD, 11 ON, 12 myelitis patients and 30 healthy controls (HC) (Table1).

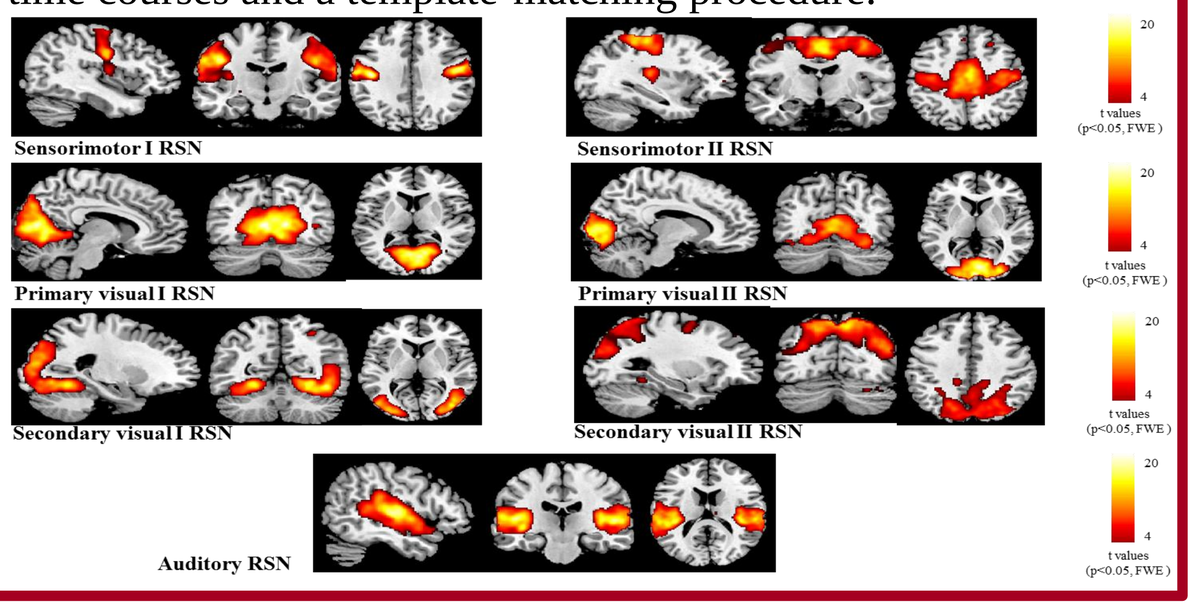
Table 1. Main demographic and clinical measures from all subjects.

	NMOSD patients (N=28)	ON patients (N=11)	Myelitis patients (N=12)	Healthy controls (N=30)	p*
M/F	22/6	6/5	7/5	21/9	0.4
Age (SD) [y]	42.4 (11.9)	38.5 (13.1)	44.9 (13.3)	42.3 (11.1)	0.7
Median EDSS (range)	4.0 (1-7.5)	1.5 (0-4.0)	2.5 (1.0-7.0)	-	0.01
Mean disease duration (SD) [y]	7.2 (7.0)	8.4 (5.6)	4.4 (3.7)	-	0.2

Abbreviations: SD=Standard Deviation; EDSS=Expanded Disability Status Scale. *Kruskall and Wallis test.

Independent component analysis (ICA) identified the main sensory and motor networks (**Figure 1**).

Figure 1. RSNs of interest identified by frequency analysis of IC time courses and a template-matching procedure.



Between-group comparisons and correlations with motor performance (9-hole peg test, 30s finger tapping and 10m-walking test) were assessed using SPM12.

Inter-network connectivity modifications were estimated with a functional network connectivity (FNC) analysis.

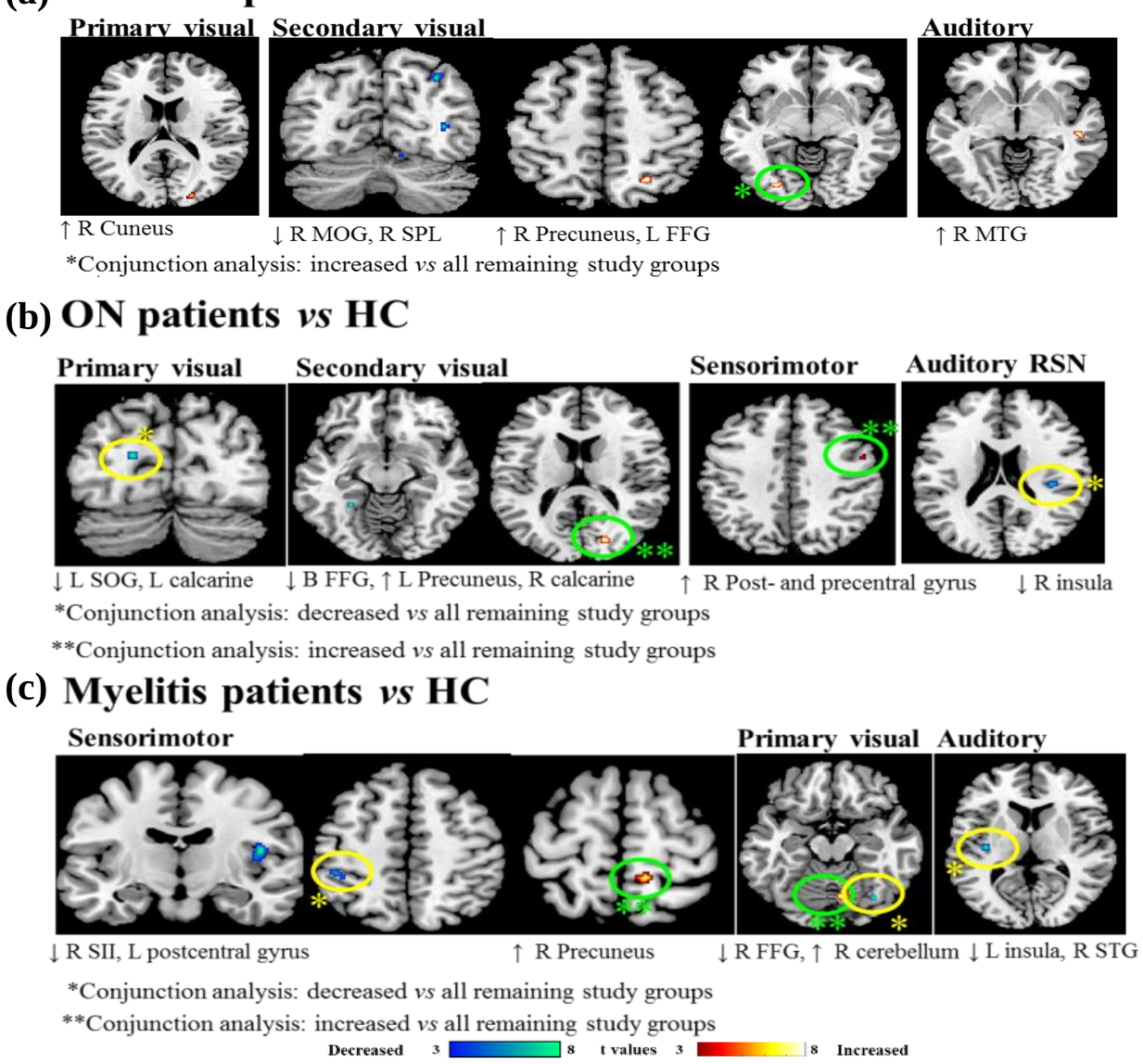
RESULTS

- NMOSD patients showed clusters of decreased RS FC in the secondary visual network and increased RS FC in the visual and auditory networks (**Figure 2a**).

- ON patients showed decreased RS FC of visual and auditory networks and increased RS FC of secondary visual and sensorimotor regions (**Figure 2b**).

- Myelitis patients had reduced RS FC of sensorimotor, visual and auditory networks and increased RS FC in the precuneus and cerebellum (**Figure 2c**).

Figure 2. Clusters of increased/decreased RS FC at the between groups comparisons.



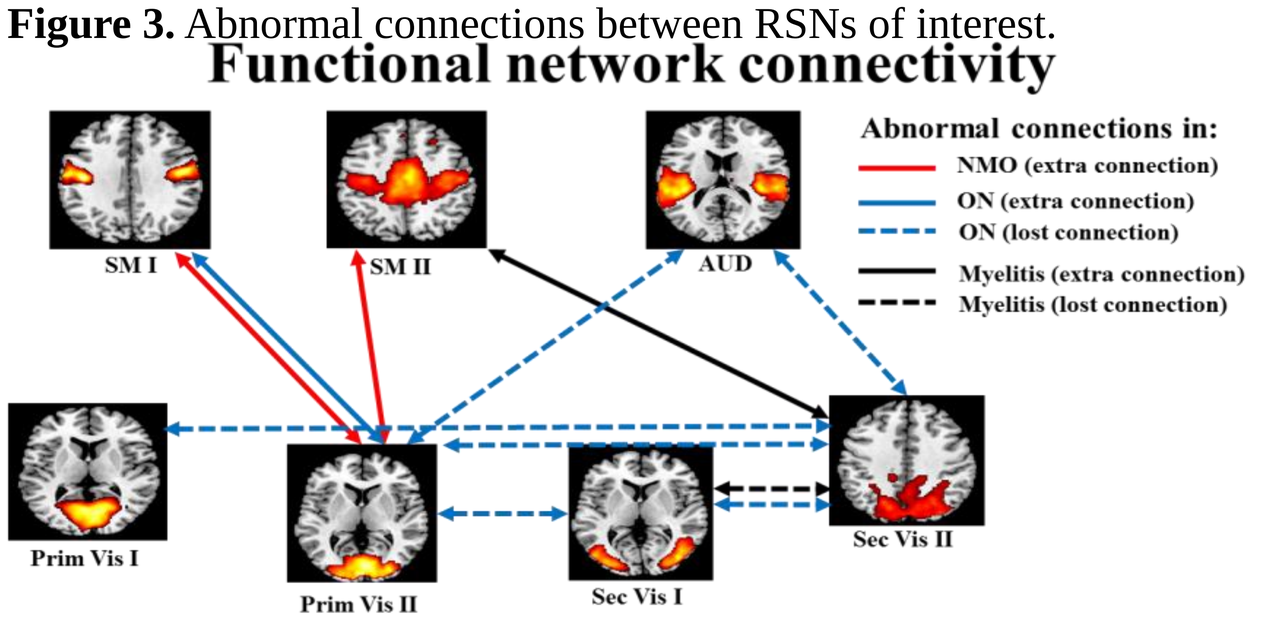
Abbreviations: MOG=Middle Occipital Gyrus; SPL=Superior Parietal Lobule; FFG=Fusiform Gyrus; MTG=Middle Temporal Gyrus; SOG=Superior Occipital Gyrus; SII=Secondary Somatosensory Cortex; STG=Superior Temporal Gyrus.

In all groups, decreased RS FC correlated with poor motor performance.

In myelitis patients, increased precuneus RS FC correlated with a better motor performance.

FNC was increased between motor and visual RSNs in NMOSD, ON and myelitis, while FNC was markedly decreased between primary and secondary visual RSNs in ON (**Figure 3**).

Figure 3. Abnormal connections between RSNs of interest.



Abbreviations: SM=Sensorimotor Network; AUD=Auditory Network; Vis=Visual Network; Prim=Primary; Sec=Secondary.

CONCLUSIONS

Cross-modal plasticity occurs in NMOSD, ON and myelitis patients. Damage to disease-target sensory network is likely to elicit compensatory plasticity across brain regions, with a reorganization of sensory cortices of the spared senses to allow for better processing.

DISCLOSURES

A. d'Ambrosio, F. Savoldi, P. Valsasina, M. Radaelli, P. Preziosa and A. Falini have nothing to disclose.

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