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Functional connectivity adaptation to neurological disease progression: fMRI study

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The severity of disability and disease burden in Multiple Sclerosis (MS) patients may not coincide. In patients with no-to-moderate disability an increment in the recruitment of crucial cortical areas has been hypothesized to attenuate the negative effects of structural damage accumulation. Functional Connectivity (FC) changes may be associated with relatively preserved neurological functions in the early phases of the disease. We studied FC in 119 patients (28 males, age 39.9±10.1) with diagnosed MS at different stages, no treatments or medication change in the three months prior to enrollment, no uncertain diagnosis, concomitant relevant diseases or contraindications to Magnetic Resonance Imaging (MRI). Patients underwent a neurological evaluation (median Expanded Disability Status Scale, EDSS, 2) and MRI. 41 age and gender matched healthy subjects with no previous history of neurological diseases were enrolled as control group. Functional MRI was acquired at 3.0T and included single-shot echo-planar resting state (140TR, TR=3 seconds), high resolution 3D-T1-weighted and dual-echo T2-weighted images. Images were processed through FSL and homemade MATLAB tools. We found that FC changes strongly depend on brain topology, being disability and FC positively correlated in frontal regions and negatively correlated across cerebellar and temporal/frontal regions. The model that better predicts the FC-EDSS relation between frontal regions increases linearly, as example of maladaptive plasticity. Conversely, FC of the cerebellum with temporal and frontal regions shows an initial upraises, as possible compensatory adaptive plasticity and could be addressed as therapeutic targets.

Biography

Silvia Tommasin has completed her PhD studies at the Physics Department of Sapienza University of Rome in 2010 and since then she has worked as Post-Doctoral Fellow in Italy and Israel focusing on topic of neuro-scientific and astronomical interest. Her main abilities include analysis of data, signals and images and estimation of semi-analytical models. Presently she works with the neuroradiology group of Sapienza University and investigates the role of neuroplasticity in disability progression of neurodegenerative disorders, such as multiple sclerosis.

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