Preserved Brain Functional Plasticity After Upper Limb Task-Oriented Rehabilitation in Progressive Multiple Sclerosis

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**Objective:** To investigate the effect of task-oriented upper limb (UL) rehabilitation in progressive multiple sclerosis (PMS) and to assess the MRI correlates of changes in motor performance.

**Background:** Despite clinical relevance of UL dysfunction, limited research has been dedicated to UL rehabilitation in PMS, leading to lack of evidence-based guidelines. It’s therefore still unknown whether more disabled patients with advanced PMS could still benefit from motor rehabilitation.

**Design/Methods:** Thirty-five PMS patients were prospectively enrolled and randomized into 3 groups: active treatment group (ATG, n=13), passive treatment group (PTG, n=13) and control group (CG, n=9). At baseline and after training, patients underwent MRI scans and were evaluated with the action research arm test (ARAT), nine hole peg test (9-HPT), ABILHAND scale, modified fatigue impact scale (MFIS). Measures of motor finger performance were also obtained by engineered glove measuring.

**Results:** After rehabilitation, ATG improved in several UL motor tasks (0.02≤p≤0.03) and showed increased ABILHAND scores compared to PTG (p<0.01). ATG showed increased functional connectivity of the sensorimotor and thalamic resting state networks compared to CG and PTG (p<0.05 cluster-wise-FDR-corrected). Correlations were found between motor improvement and thalamic, sensorimotor and basal ganglia networks (0.70≤r≤0.79, 0.008≤p≤0.04). No structural MRI changes were detected as measured by DTI.

**Conclusions:** PMS patients could benefit from task-oriented UL rehabilitation, which seems to be more efficient than passive mobilization. Despite extensive brain damage, functional neuroplasticity seems to be preserved in PMS, thus providing a rationale for the use of rehabilitative treatments in late PMS.