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Effects of cognitive rehabilitation on brain grey matter volume in progressive multiple sclerosis: results from the CogEx study

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Introduction:

Cognitive impairment largely affects people with progressive (P) multiple sclerosis (MS). Data on efficacy of cognitive rehabilitation (CR) and aerobic exercise (EX) in PMS are still scanty.

Objectives/Aims:

CogEx is a multi-site, blinded, randomized and sham-controlled trial, aimed at determining if CR and EX are effective in PMS, and if combining CR and EX has synergistic effects. Here, we present the results of CogEx trial on MRI measures of lesions and atrophy.

Methods:

Participants were randomized (1:1:1:1) to following arms: “CR plus EX”, “CR plus sham EX (EX-S)”, “EX plus sham CR (CR-S)”, and “CR-S plus EX-S” and attended 12 weeks of intervention. Physical and cognitive (BICAMS battery) assessments were performed at baseline, immediately after intervention (week 12) and 6 months post-intervention. Participants in the MRI sub-study underwent MRI scans at the same time points. T2 lesion volume was quantified and new T2 lesions vs previous scans were counted. Normalized brain (NBV), grey
matter (NGMV), cortical grey matter (NcGMV) and white matter (NWMV) volumes (FSL SIENAx), normalized thalamic and hippocampal volumes (FSL FIRST) and percentage brain volume change (FSL SIENA) were obtained. Changes of NGMV, NcGMV, NWMV, thalamus and hippocampus were calculated as percentage differences vs previous scans.

Results:

104 PMS people participated to the CogEx MRI sub-study (“CR plus EX”: n=25; “CR plus EX-S”: n=28; “CR-S plus EX”: n=25, “CR-S plus EX-S”: n=26). At week 12, the number of correct responses at Symbol digit modalities test (SDMT) (p=0.64) were not significantly different among groups, nor SDMT (p=0.67), California verbal learning test (CVLT) (p=0.19) and Brief visuospatial memory test (p=0.92) Z-scores. While the time-by-group interaction for changes at week 12 vs baseline of NGMV (p=0.10) and NcGMV (p=0.09) were not statistically significant, the interactions for both NGMV (p=0.04) and NcGMV (p=0.02) were significant when considering groups performing CR vs those performing CR-S. In groups performing CR, increased NGMV (r=0.42, p=0.004) and NcGMV (r=0.36, p=0.01) at week 12 vs baseline correlated with increased CVLT. No significant differences were found for the remaining MRI variables.

Conclusion:

CR modulated cortical GM volumes in PMS patients, and correlated with concomitant improvements of cognitive performances.

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