ABSTRACT

Cognitive impairment (CI) is now considered a clinical marker in multiple sclerosis (MS). The most common CI and neuropsychological features of the disease. This pattern appears to be dependent on task demands. Ongoing analyses aim to determine if there are quantitative differences in the extent and distribution of correlated activated voxels that might scale with the degree of CI in MS patients. The network shows no statistically significant difference between patients and controls. Changes that occur in multiple sclerosis result in altered connectivity patterns in affected neural areas. Such alterations may underlie overt dysfunction. During the fMRI scan, subjects performed a WCS task on the computer display. The participant was asked to put each card under one of four stimulus cards and to figure out the sorting rules during the task. The steps in the computational procedure for functional network analysis are as follows: 1. Low-pass filter at 0.1 Hz 2. Calculate mean time series for each voxel, 3. Determine the functional connectivity matrix 4. Calculate the number of functionally correlated voxels using the nearest neighbor clustering method 5. Plot a 3D representation of the functional brain networks using a color coding scheme reflecting the functional correlation within and between networks (see Figure 1A, B, and C). Functional Correlation Of Brain Loci During Cognitive Tasks In Multiple Sclerosis

RESULTS

Figure 4

No Difference in Negative Latency and Error Rates Between MS Patients and Controls

Figure 5

Change to the Size of Networks in Multiple Sclerosis

Figure 6

Change to the Spatial Extent of Networks in Multiple Sclerosis

Figure 7

Number and Connection Strengths of Networks in Multiple Sclerosis

Figure 8

Variability in the Brain Area Composition of Networks

CONCLUSIONS AND DISCUSSION

Global functional network analysis in patients with relapsing remitting type of multiple sclerosis with no overt deficit in the performance of Wisconsin card sorting task shows significant increase in the size of medium to large sized networks compared to age-matched controls. There is also a concomitant increase in the spatial extent of the largest networks, as measured by the mean distance between pairs of functionally correlated voxel time series.

These findings are consistent with previous observations of alterations in the functional connectivity of specific networks such as the primary sensorimotor (Rocca et al., 2009; Lowe et al., 2008), working memory (An Duong et al., 2005), and cerebellar (Saini et al., 2004) networks. While it is possible that the present results reflect changes due to primary white matter lesions, the lack of deficit in the performance of the cognitive task indicates that they are at least in part due to compensatory neuroplastic changes.