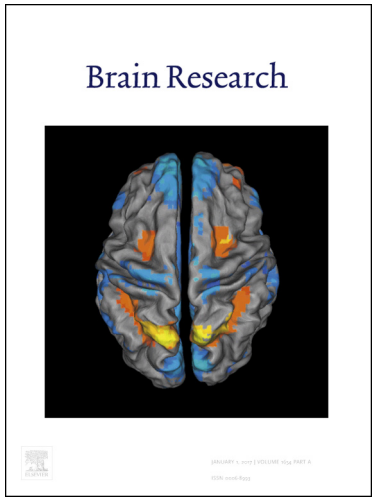

Research report

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PII: S0006-8993(18)30244-0
DOI: https://doi.org/10.1016/j.brainres.2018.04.042
Reference: BRES 45782

To appear in: *Brain Research*

Received Date: 21 January 2018
Revised Date: 28 April 2018
Accepted Date: 30 April 2018

Please cite this article as: Z. Zhuo, X. Mo, X. Ma, Y. Han, H. Li, Identifying aMCI with Functional Connectivity Network Characteristics based on Subtle AAL Atlas, *Brain Research* (2018), doi: https://doi.org/10.1016/j.brainres.2018.04.042

Identifying aMCI with Functional Connectivity Network Characteristics based on Subtle AAL Atlas

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Abstract

Purpose:

To investigate the subtle functional connectivity alterations of aMCI based on AAL atlas with 1024 regions (AAL_1024 atlas).

Materials and methods:

Functional MRI images of 32 aMCI patients (Male/Female:15/17, Ages:66.8±8.36y) and 35 normal controls (Male/Female:13/22, Ages: 62.4±8.14y) were obtained in this study. Firstly, functional connectivity networks were constructed by Pearson's Correlation based on the subtle AAL_1024 atlas. Then, local and global network parameters were calculated from the thresholding functional connectivity matrices. Finally, multiple-comparison analysis was performed on these parameters to find the functional network alterations of aMCI. And furtherly, a couple of classifiers were adopted to identify the aMCI by using the network parameters.

Results:

More subtle local brain functional alterations were detected by using AAL_1024 atlas. And the predominate nodes including hippocampus, inferior temporal gyrus, inferior parietal gyrus were identified which was not detected by AAL_90 atlas. The identification of aMCI from normal controls were significantly improved with the highest accuracy (98.51%), sensitivity (100%) and specificity (97.14%) compared to those (88.06%, 84.38% and 91.43% for the highest accuracy, sensitivity and specificity respectively) obtained by using AAL_90 atlas.

Conclusion：

More subtle functional connectivity alterations of aMCI could be found based on AAL_1024 atlas than those based on AAL_90 atlas. Besides, the identification of aMCI could also be improved.

Keywords: amnesic Mild Cognitive Impairment; functional connectivity; network parameters; multi-variates pattern analysis

Abbreviations: aMCI, amnesic Mild Cognitive Impairment; AD, Alzheimer's Disease; NC, Normal Controls; AAL, Automated Anatomical Labeling; ANIMAL, Automatic Nonlinear Imaging Matching and Anatomical Labeling; CDR, Clinical Dementia Rating Scale; MMSE, Mini-Mental State Examination; MoCA, Montreal Cognitive Assessment; AVLT, Auditory Verbal Learning Test; PSW, Proportion of the Strong Weights; GCE, Global Cost Efficiency; SVM, Support Vector Machine; ANN, Artificial Neural Network; NB, Naïve Bayes; RF, Random Forest; LDA, Linear Discriminate Analysis