Article: 0054
Topic: S19 - Symposium 22: The use of computational techniques to automatically classify diagnosis and outcome of psychiatric disorders using neuroimaging data

Using Multimodal MRI Data to Classify Patients with First Episode Psychosis

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Introduction: currently, most of the classification studies of psychosis focused on chronic patients and employed single machine learning approaches. To overcome these limitations, we here compare, to our best knowledge for the first time, different classification methods of First Episode Psychosis (FEP) using multimodal imaging data exploited on several cortical and subcortical structures and white matter fiber bundles.

Methods: 23 FEP patients and 23 age-, gender-, and race-matched healthy participants were included in the study. An innovative multivariate approach based on Multiple Kernel Learning (MKL) methods was implemented on structural MRI (sMRI) and diffusion tensor imaging (DTI).

Results: MKL provides the best classification performances in comparison with the more widely used Support Vector Machine, enabling the definition of a reliable automatic decisional system based on the integration of multimodal imaging information. Our results show a discrimination accuracy greater than 90% between healthy subjects and patients with FEP. Regions with an accuracy greater than 70% on different imaging sources and measures were middle and superior frontal gyrus, parahippocampal gyrus, uncinate fascicles and cingulum.

Conclusions: this study shows that multivariate machine learning approaches integrating multimodal and multisource imaging data can classify FEP patients with high accuracy. Interestingly, specific grey matter structures and white matter bundles reach high classification reliability when using different imaging modalities and indices, potentially outlining a prefronto-limbic network impaired in FEP with particular regard to the right hemisphere.

https://doi.org/10.1016/S0924-9338(15)30044-4 Published online by Cambridge University Press