

J. Kambeitz<sup>1</sup>, L. Kambeitz-Illankovic<sup>1</sup>, S. Leucht<sup>2</sup>, S. Wood<sup>3</sup>, C. Davatzikos<sup>4</sup>, B. Malchow<sup>5</sup>, P. Falkai<sup>5</sup>, N. Koutsouleris<sup>5</sup>

<sup>1</sup>Department of Psychiatry, Ludwig-Maximilians-University, München, Germany ; <sup>2</sup>Department of Psychiatry, Technical University Munich, München, Germany ; <sup>3</sup>School of Psychology, University of Birmingham, Birmingham, United Kingdom ; <sup>4</sup>University of Pennsylvania, Section of Biomedical Image Analysis Department of Radiology, Pennsylvania, USA ; <sup>5</sup>Ludwig-Maximilians-University, Department of Psychiatry, Munich, Germany

### Background

Numerous studies have applied novel multivariate statistical approaches to the analysis of brain alterations in patients with schizophrenia. However the diagnostic accuracy of the reported predictive models differs largely, making it difficult to evaluate the overall potential of these studies to inform clinical diagnosis.

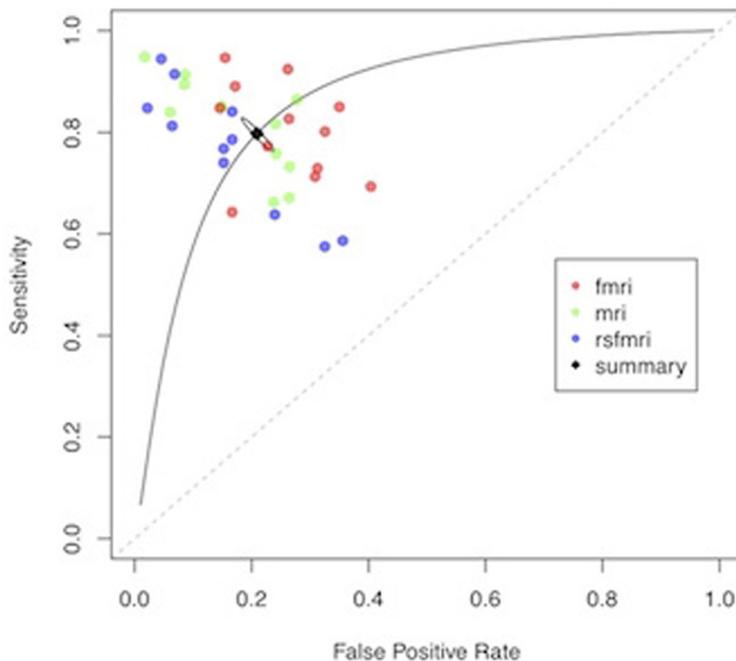
### Methods

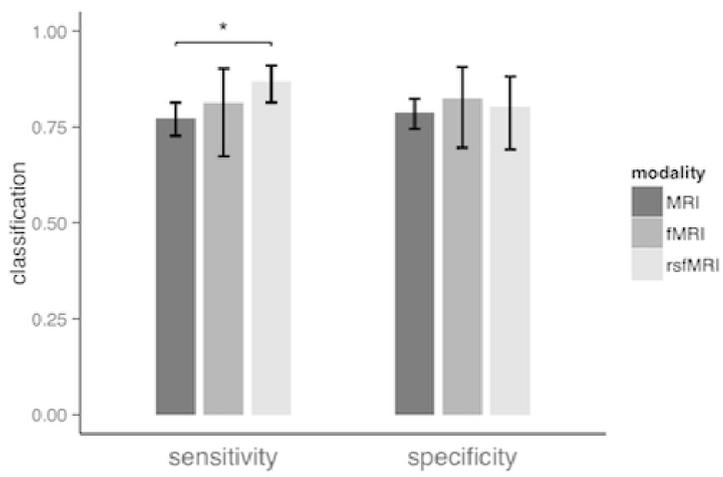
We conducted a comprehensive literature search to identify all studies reporting performance of neuroimaging-based multivariate predictive models for the differentiation of patients with schizophrenia from healthy control subjects. The robustness of the results as well as the effect of potentially confounding continuous variables (e.g. age, gender ratio, year of publication) was investigated.

### Results

The final sample consisted of n=37 studies including n=1491 patients with schizophrenia and n=1488 healthy controls. Meta-analysis of the complete sample showed a sensitivity of 80.7% (95%-CI: 77.0 to 83.9%) and a specificity of 80.2% (95%-CI: 83.3 to 76.7%). Separate analysis for the different imaging modalities showed similar diagnostic accuracy for the structural MRI studies (sensitivity 77.3%, specificity 78.7%), the fMRI studies (sensitivity 81.4%, specificity 82.4%) and resting-state fMRI studies (sensitivity 86.9%, specificity 80.3%). Moderator analysis showed significant effects of age of patients on sensitivity (p=0.021) and of positive-to-negative symptom ratio on specificity (p=0.028) indicating better diagnostic accuracy in older patients and patients with positive symptoms.

SROC curve (bivariate model) for multivariate classification of schizophrenia via neuroimaging data





### Discussion

Our analysis indicate an overall sensitivity and overall specificity of around 80 % of neuroimaging-based predictive models for differentiating schizophrenic patients from healthy controls. The results underline the potential applicability of neuroimaging-based predictive models for the diagnosis of schizophrenia.