Although the tested models showed a classification performance just above the chance level, verbal fluency was predicted with good accuracy, and importantly it was based on meaningful information. Thus, although structural neuroimaging alterations have been previously associated with cognitive deficits, our results suggest that these features can only partially predict cognitive impairment in mood disorders at the single-subject level on out-of-sample observations. Nevertheless, the combination of these measures with other neuroimaging modalities and biological data might enhance the predictive power, elevating the ML approach as a promising framework for individual cognitive assessment, hence allowing tailored interventions to reduce the burden of these disorders.

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Conflict of interest

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Identifying suicide attempters among bipolar depressed patients using structural neuroimaging: a machine learning study

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Background: Among psychiatric disorders, bipolar disorder (BD) is shown to be associated with the highest rate of suicide risk [1]. Indeed, 30-50% of adults with BD attempt suicide at least once during their lifetime, and 15-20% of BD patients commit suicide [2]. However, no objective and biological markers of suicidality are currently available, leaving clinical assessment based solely on subjective information. Thus, the identification of reliable biomarkers for suicidality in BD patients is crucial to improve suicide prevention in clinical practice and to move towards a precision medicine framework. The application of the machine learning (ML) approaches combined with neuroimaging techniques has been previously demonstrated successful in differentiating bipolar suicide attempters (SA) from non-attempters (nSA), achieving 84% of accuracy on functional connectivity data [3]. However, no studies used structural neuroimaging to discriminate SA from nSA BD patients.

Aims: Given the ability of ML to manage high-dimensional data and to make predictions at the single-subject level [4], the present study aimed at applying ML on both white matter (WM) and grey matter (GM) voxel-wise data to assess their predictive power in differentiating bipolar SA from nSA.

Methods: 178 currently depressed BD patients (27 SA, 151 nSA) underwent an MRI session for T1-weighted and diffusion tensor images (DTI) acquisition. For GM volumes, T1-weighted sequences were pre-processed using Computational Atlas Toolbox 12 (CAT12) to obtain voxel-based morphometry (VBM) measures, whereas for WM measures, fractional anisotropy (FA) was computed through tract-based spatial statistics (TBSS) on FSL. Whole-brain VBM and FA measures were entered both separately and combined as input features into a Support Vector Machine (SVM), as implemented in the Pattern Recognition for Neuroimaging Toolbox (PRoNTo) [5]. All SVM models were trained to classify nSA vs. SA through a 5-fold nested cross-validation with subsampling, which allowed to calculate balanced accuracy (BA), specificity, sensitivity, and area under the receiver operator curve (AUC).

Results: The SVM model based on both GM and WM correctly classified SA and nSA with 59% of BA (47.33% nSA specificity, 70.67% SA sensitivity, 64% AUC). Conversely, the SVM model on GM reached a BA of 52% (36.67% nSA specificity, 67.33% SA sensitivity, 62% AUC), whereas the BA of the SVM model on WM was 55.33% (66% nSA specificity, 44.67% SA sensitivity, 60% AUC).

Conclusions: Although being above the chance level (i.e., 50%), the classification models achieved quite low accuracies in discriminating SA and nSA BD patients, which might be due to the imbalanced numerosity of the classes. However, despite these limits, our results highlight the importance of combining different kinds of information, since the model on both GM and WM was the most sensitive (70.67%) in identifying bipolar SA. Thus, future studies may consider including both structural and functional neuroimaging data to develop an objective and reliable predictive model to assess and hence prevent suicide risk among BD patients.

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The use of a socially assistive robot in individuals with depression during acute psychiatric inpatient treatment – preliminary RCT results

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Background: Depression is one of the most common mental illnesses worldwide [1] affecting around 322 million people, with a rising tendency [2]. In Europe, the resulting costs amount to 170 billion euros per year, with 50% of depressions being untreated [2]. The lack of motivation is an essential problem in the treatment of depression, which is associated with a lack of adherence to therapy and exercise. This makes it difficult for sufferers to achieve lifestyle changes [3].