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Social dysfunction is associated with altered facial emotion neural processing across diverse neuropsychiatric disorders

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Introduction

- Social dysfunction is common across diverse neuropsychiatric disorders.
- Altered neural processing of negative and positive emotions has been reported in these disorders.
- Therefore, perturbed socioaffective neural processing might be a shared neurobiological correlate for social dysfunction (Figure 1).
- **This study examined whether alterations in neural processing of negative and positive valence is coupled to social dysfunction across schizophrenia (SZ) and Alzheimer's disease (AD) patients and whether these results can be generalized to depressive (DEP) and anxiety (ANX) disorders.**

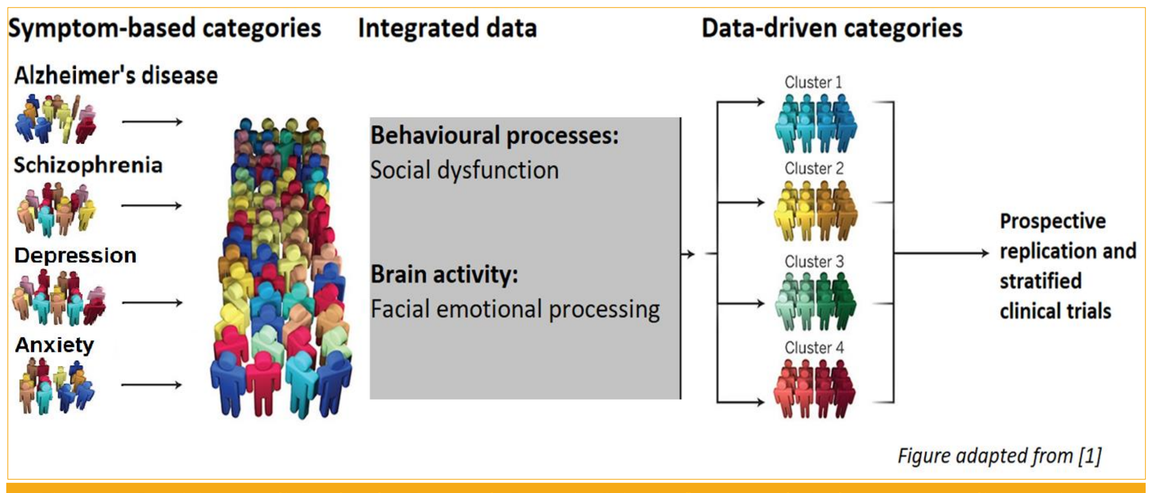


Figure 1. Precision medicine by the Research Domain Criteria framework. It deconstructs diagnostic classifications into data-driven categories using integrated data.

Methods

Participants:
- Data from the PRISM [2] and NESDA [3] studies were used.
- PRISM included patients with SZ (N=46), probable AD (N=40), and two age-matched healthy control (HC) groups (SZcontrols: N=26, ADcontrols: N=27).
- NESDA included patients with DEP (N=46), ANX (N=45), comorbid DEP and ANX (COM) (N=57) and HC (N=52).

Assessments:
Social function
- Social Functioning Scale (SFS) (PRISM)

(measures behavioural aspects of social dysfunction)
- World Health Organization Disability Assessment Schedule 2.0 (WHODAS) (NESDA)

(measures perceived social disability)
- De Jong-Gierveld Loneliness Scale (LON) (PRISM & NESDA)

(measures subjective experiences of social dysfunction)

Facial emotion processing fMRI task paradigm
- All participants performed an implicit facial emotion processing fMRI task (Figure 2).

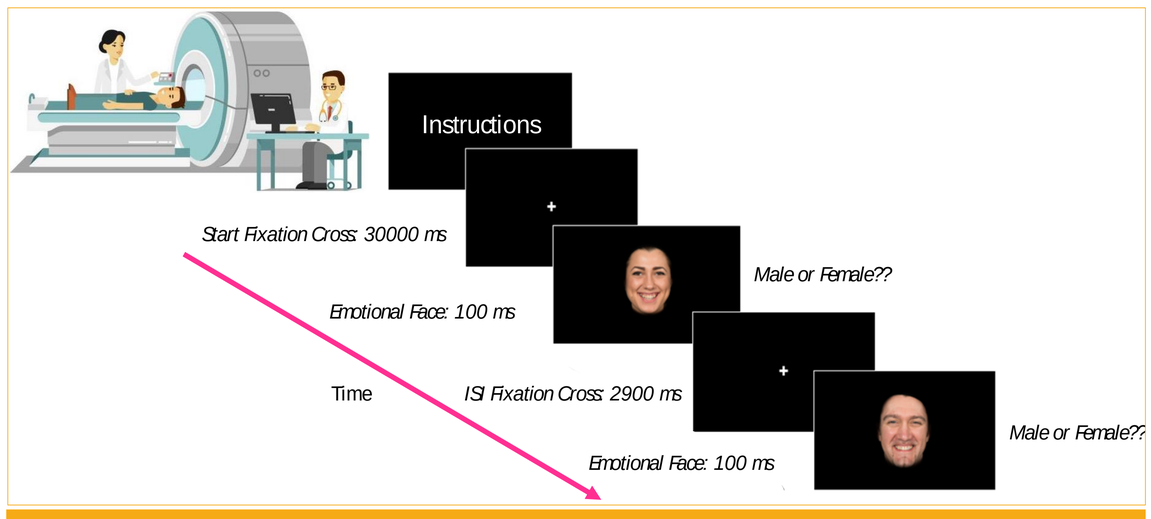


Figure 2. Time course of stimulus presentation for the implicit facial emotional processing task during the scanning session. An example of the PRISM study.

Analysis:
Subject-level statistical maps were created for each emotion. Group-level general linear model analyses (whole-brain) were performed that included social functioning measures while correcting for clinical and demographic variables. Statistical thresholding was set at z=3.1, $p < 0.05$ corrected for multiple comparisons.

Results

- **PRISM:** Data revealed an association across SZ/AD/HC participants wherein higher SFS social dysfunction scores were coupled to greater activation within fronto-parieto-limbic brain regions in response to sad emotions (Figure 3); but less activation in these brain regions in response to happy emotions. Many of these brain regions are involved in the default mode network and include the medial prefrontal cortex, precuneus and angular gyrus.
- **In NESDA**- and consistent with PRISM results, higher WHODAS social dysfunction scores across DEP/ANX/COM/HC participants were associated with greater activation within the left angular gyrus in response to sad emotions (Figure 4). The angular gyrus has been implicated in social cognition and attention [4].
- No diagnosis by social dysfunction interaction effects were observed for the findings in either dataset.
- No relationship was found for total LON scores in either dataset.

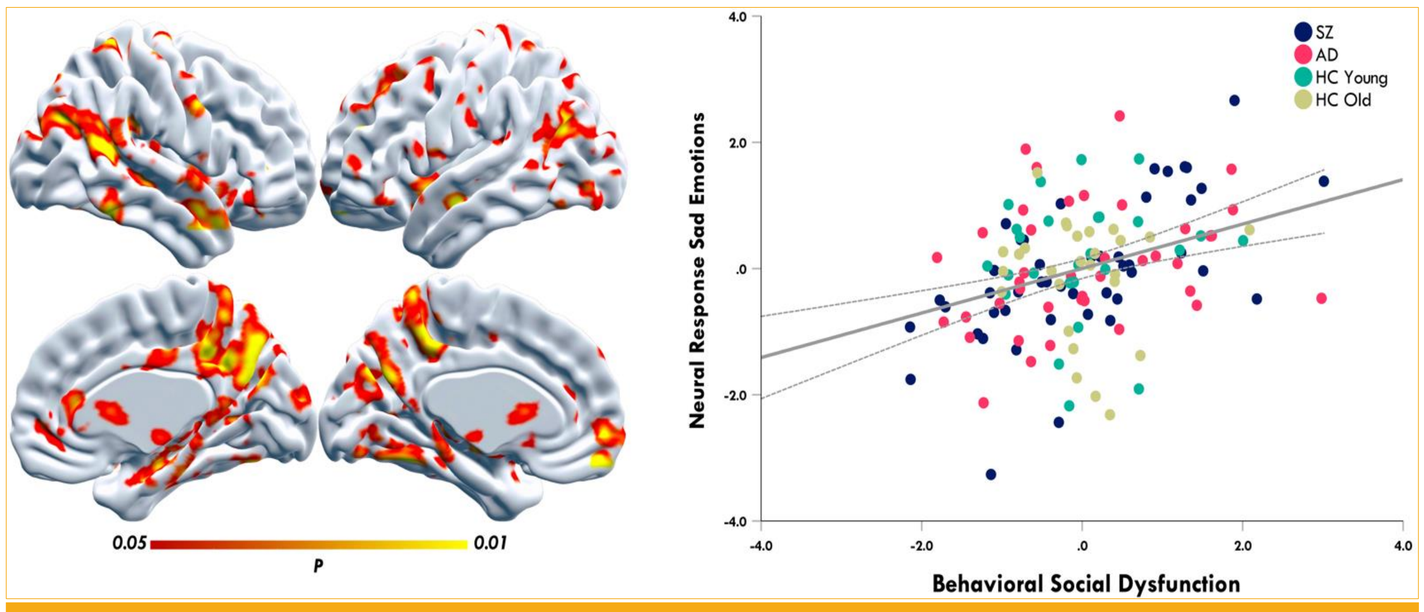
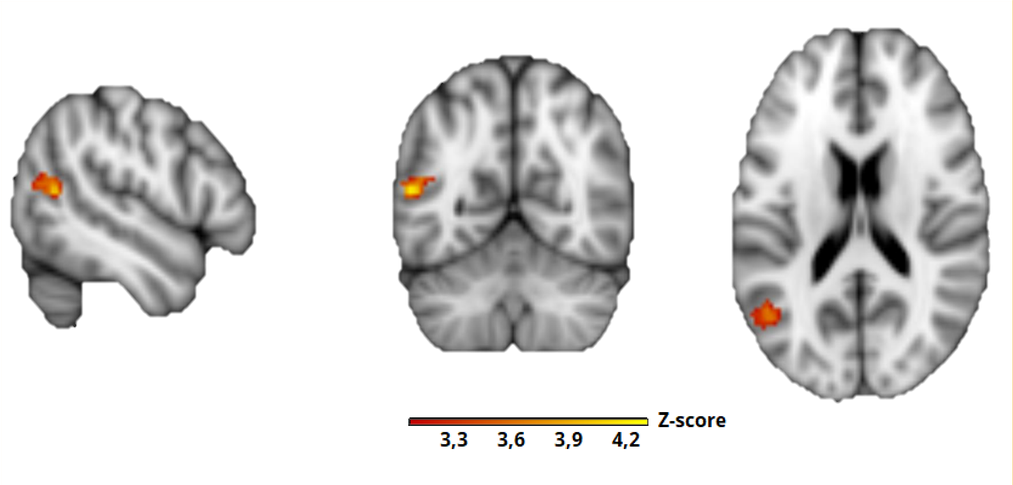


*Figure 3. SFS scores and **sad** emotion processing. Values on the y and x axis are Z-score residuals. Higher scores on the x axis indicate more severe social dysfunction. Higher scores on the y axis indicate stronger neural responses to sad emotions.*



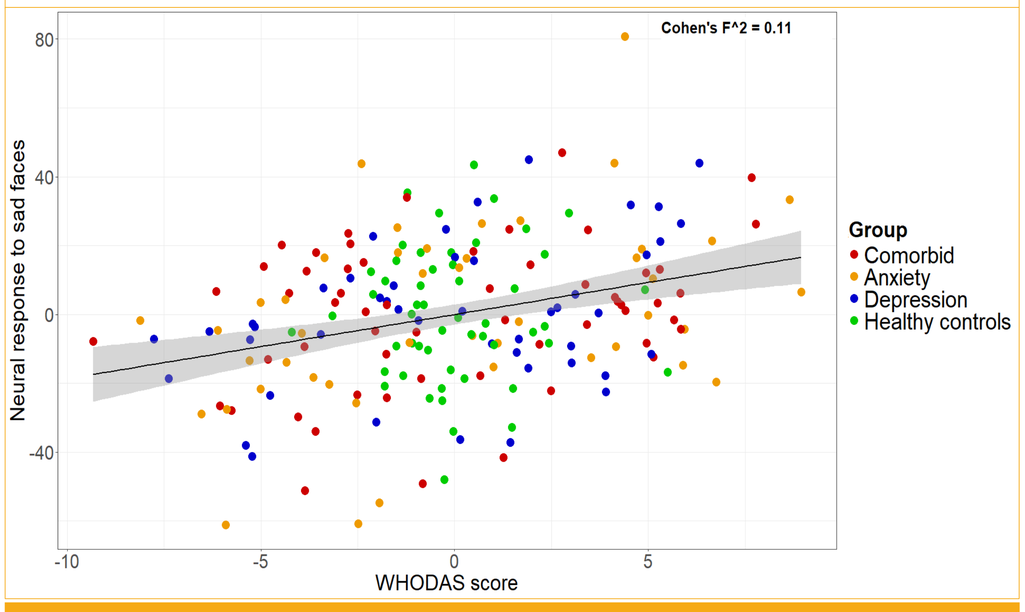


*Figure 4. WHODAS scores and **sad** emotion processing. Values on the y and x axis are residuals. Higher scores on the x axis indicate more severe social dysfunction. Higher scores on the y axis indicate stronger neural responses to sad emotions.*

Conclusion

Social dysfunction across neuropsychiatric disorders converges specifically on sad emotional valence processing of the brain

Limitations

- Cross-sectional analyses can only demonstrate associations rather than causality, therefore it remains unclear if social dysfunction gives rise to alterations in neural processing of sad emotions or vice versa.
- The use of questionnaires to capture the notoriously complex phenomenon of social dysfunction is a vast simplification.

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Disclosure

No conflicts of interest.