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Neural compensation in manifest neurodegeneration: evidence from social cognition in frontotemporal dementia

Jan Van den Stock, Jiaze Sun, François-Laurent De Winter, Fiona Kumfor, Kristof Vansteelandt, Ron Peeters, Stefan Sunaert, Mathieu Vandenbulcke

State of the art: There is evidence that symptom onset in neurodegeneration reflects the overload of compensatory mechanisms. The present study aimed to investigate whether neural functional compensation can be observed in the manifest neurodegenerative disease stage, by focusing on a core deficit in frontotemporal dementia, i.e. social cognition, and by combining psychophysical assessment, structural MRI and functional MRI with multidimensional neural markers that allow quantification of neural computations.
Methodology: Nineteen patients with clinically manifest behavioral variant frontotemporal dementia (bvFTD) and 20 controls performed facial expression recognition tasks in the MRI-scanner and offline. Group differences in gray matter volume, neural response amplitude and neural patterns were assessed via a combination of voxel-wise whole-brain, searchlight, and ROI-analyses and these measures were correlated with psychophysical measures of emotion, valence and arousal ratings.
Results: Significant group effects were observed only outside task-relevant regions, converging in the caudate nucleus. This area showed a diagnostic neural pattern as well as hyperactivation and stronger neural representation of facial expressions in the bvFTD sample. Furthermore, response amplitude was associated with behavioral arousal ratings.
Conclusion: The combined findings reveal converging support for compensatory processes in clinically manifest neurodegeneration, complementing accounts that clinical onset synchronizes with the breakdown of compensatory processes. Furthermore, active compensation may proceed along nodes in intrinsically connected networks, rather than along the more task-specific networks. The findings underscore the potential of distributed multidimensional functional neural characteristics that may provide a novel class of biomarkers with both diagnostic and therapeutic implications, including biomarkers for clinical trials.

Conflicts of interest

N/A