

**Emotion regulation in frontotemporal dementia relies on semantic knowledge and control systems in the brain**

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**State of the art:** Mental processes related to emotions are impaired early in the disease course for frontotemporal dementia (FTD) patients, though the characteristics of these impairments can vary widely between individuals. Measuring impairments in emotion processing more comprehensively, e.g. with standard psychiatric questionnaires, may clarify drivers of this behavioral heterogeneity.

**Methodology:** We collected self-descriptions by early behavioral variant (bvFTD, N=68) and semantic variant primary progressive aphasia (svPPA, N=25) patients on the Difficulty in Emotion Regulation Scale (DERS), quantifying multiple dimensions of emotion processing. We applied principal component (PC) and cluster analysis to DERS subscales measuring impulsivity, regulation strategies, emotional clarity, and emotional awareness, and used voxel-based morphometry to characterize gray-matter atrophy in resulting cluster-groups.

**Results:** We identified six separate cluster-groups of patients, with two cluster-groups scoring especially high on PC1 (overall emotion dysregulation, 51% of variance explained), but showing a dissociation on PC2 (29% explained): one group reported lacking emotional awareness, whereas the other reported inappropriate responses to emotions. We found that the cluster group with emotion dysregulation due to lacking emotional awareness showed atrophy in the left temporal lobe ( $p < .0001$  uncorrected), and the group with inappropriate responses to emotion showed mainly bilateral inferior frontal and anterior cingulate cortex atrophy ( $p_{FWE} < 0.05$ ).

**Conclusions:** These particular temporal and frontal regions are important for semantic information and task control processes respectively, which suggests a heterogeneous cause for emotion dysregulation across different patients. Awareness of one's emotions may require clear conceptualization, but generating appropriate emotional responses may depend on executive and control functions.

**Conflicts of interest**

N/A