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Facial expressiveness and physiological arousal in frontotemporal dementia: Phenotypic clinical profiles and neural correlates

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Abstract

Early theories of emotion processing propose an interplay between autonomic function and cognitive appraisal of emotions. Patients with frontotemporal dementia show profound social cognition deficits and atrophy in regions implicated in autonomic emotional responses (insula, amygdala, prefrontal cortex), yet objective measures of facial expressiveness and physiological arousal have been relatively unexplored. We investigated psychophysiological responses (surface facial electromyography (EMG); skin conductance level (SCL)) to emotional stimuli in 25 behavioural-variant frontotemporal dementia (bvFTD) patients, 14 semantic dementia (SD) patients, and 24 healthy older controls, while viewing emotionally positive, neutral, or negative video clips. Voxel-based morphometry was conducted to identify neural correlates of responses. Unlike controls, patients with bvFTD did not show differential facial EMG responses according to emotion condition, whereas SD patients showed increased zygomaticus responses to both positive and neutral videos. Controls showed greater arousal (SCL) when viewing positive and negative videos; however, both bvFTD and SD groups showed no change in SCL across conditions. Regardless of group membership, right insula damage was associated with dampened zygomaticus responses to positive film stimuli. Change in arousal (SCL) was associated with lower integrity of the caudate, amygdala, and temporal pole. Our results demonstrate that while bvFTD patients show an overall dampening of responses, SD patients appear to show incongruous facial emotional expressions. Abnormal responding is related to cortical and subcortical brain atrophy. These results identify potential mechanisms for the abnormal social behaviour in bvFTD and SD and demonstrate that psychophysiological responses are an important mechanism underpinning normal socioemotional functioning.

Keywords: Electromyography; Imaging; Semantic dementia; Skin conductance.

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