Investigating the role of face processing in behavioural variant frontotemporal dementia

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Background

Impairment of emotional processing is a core feature of behavioural variant frontotemporal dementia (bvFTD) but has been poorly studied. This study investigated simple and complex emotional face recognition both cross-sectionally and on a longitudinal basis.

Methods

30 individuals were recruited to the study: 18 with behavioural variant frontotemporal dementia (bvFTD) and 12 controls (*Table 1*). Individuals completed a task of facial perceptual analysis, the Benton Facial Recognition Test, as well as two tasks of facial emotion recognition: the Ekman simple emotion recognition Task (24 pictures) and the more complex Reading the Mind in the Eyes Test (RMET).

	bvFTD (n = 18)	Controls (n = 12)
Gender (M / F)	17 / 1	4 / 8
Age at assessment	62.3 (8.0)	65.5 (5.1)

Table 1. Participant demographics

16 of the 18 bvFTD participants also underwent T1-weighted 3D volumetric imaging on a 1.5T GE scanner. Neural correlates associated with each of the emotion recognition tasks were investigated using a voxel-based morphometry (VBM) analysis in SPM12. Analyses included age, gender and total intracranial volume (TIV) as covariates.

7 bvFTD patients completed follow-up assessments at a mean (standard deviation, SD) of 1.1 (0.1) years from baseline.

Results

Cross-sectional analysis

There was no significant difference seen between the bvFTD group and controls on the Benton Facial Recognition Test (*Table 2*). However, the bvFTD group scored significantly worse than controls on both the Ekman Task and the Reading the Mind in the Eyes Test (*Table 2*).

A more detailed analysis of the Ekman Task showed that the bvFTD patients performed worse on recognition of negative emotions (sadness, anger, fear and disgust: 30.0% lower than controls) than positive emotions ((happiness and surprise: 18.6% lower than controls).

	bvFTD	Controls	Result
Benton Facial Recognition	43.6 (7.7)	48.1 (3.2)	U = 69.5, p = .101
Ekman Task	15.7 (5.6)	21.2 (1.3)	U = 21.0, p < .001
Reading the Mind in the Eyes Test	16.7 (7.4)	27.4 (2.2)	U = 17.0, p < .001

Table 2. Mean (standard deviation) scores in bvFTD and Controls on the Benton Facial Recognition Test, the Ekman Task (max score 24) and the Reading the Mind in the Eyes Test (max score 36) with results of statistical comparison of the two groups using the Mann Whitney U Test.

Results

In the bvFTD patients, the score on the Ekman Task correlated with grey matter volume bilaterally in the inferior frontal gyrus and the anterior cingulate (*Figure 1*), whilst the score on the RMET correlated with grey matter volume also in the inferior frontal gyrus bilaterally as well as the right superior temporal gyrus. The results within the left inferior frontal gyrus survive after correction for FWE (*Figure 2*).

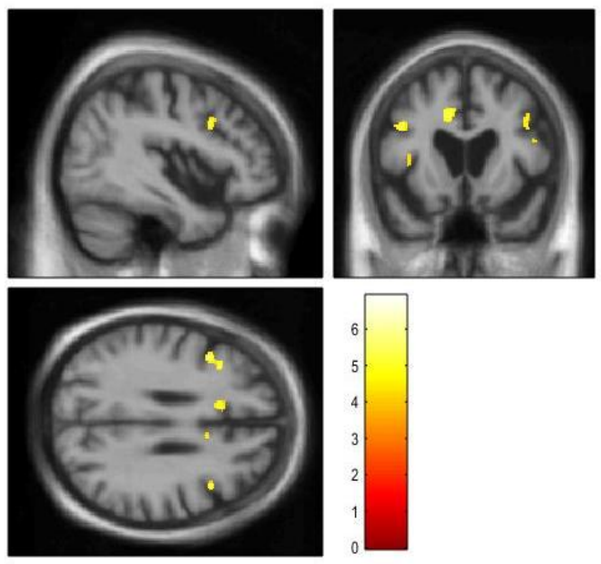

Figure 1. Voxel-based morphometry analysis. Positive correlations between grey matter volume and Ekman Task score, adjusted for age, gender and total intracranial volume (uncorrected p-value <0.001). The colour bar indicates the t score.

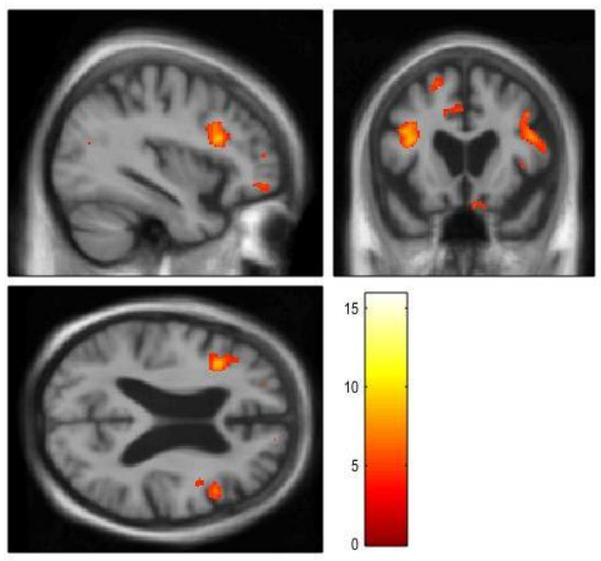

Figure 2. Voxel-based morphometry analysis. Positive correlations between grey matter volume and RMET score, adjusted for age, gender and total intracranial volume (uncorrected p-value <0 .001). The colour bar indicates the t score.

Longitudinal analysis

The annualised mean (SD) change in score on each task was -1.6 (4.5) on the Benton Facial Recognition Test, -1.4 (1.3) on the Ekman Task and -1.8 (4.7) on the Reading the Mind in the Eyes Test.

Conclusion

These results suggest that while bvFTD patients are able to recognise faces, their understanding of both simple and complex emotional facial expression is impaired. In addition, patients with bvFTD appear to have greater impairment in processing negative than positive emotions. Moreover, the bvFTD patients' ability to understand both simple and complex emotions in faces deteriorates over time. Facial emotion processing in bvFTD appears to rely on a network of anatomical areas particularly involving the dorsolateral prefrontal cortex.

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