The effects of bilateral versus unilateral anterior temporal lobe damage on face processing and semantic memory

Matthew A. Rouse¹, Siddharth Ramanan¹, Ajay D. Halai¹, Karalyn Patterson¹,², James B. Rowe¹,²,³, Matthew A. Lambon Ralph¹
¹MRC Cognition and Brain Sciences Unit, University of Cambridge; ²Department of Clinical Neurosciences. University of Cambridge; ³Cambridge University Hospitals NHS Foundation Trust, Cambridge

Introduction

- There is evidence that the anterior temporal lobes (ATLs) are important for face recognition¹.
- The ATLs are also thought to be critical for general semantic memory, including but not limited to knowledge about faces/people².
- We explored the effects of bilateral versus unilateral ATL damage on general semantic memory, person-specific semantic knowledge and perceptual face matching.

Methods

Participants:
- 16 people with bilateral ATL damage from semantic dementia
- 17 people with unilateral ATL resection for temporal lobe epilepsy (left TLE=10, right TLE=7)
- 14 healthy controls

Participants completed a battery of tests and had a 3T MRI scan

General semantic memory

- Bilateral ATL damage -> severe impairment
- Unilateral ATL damage -> very mild impairment

Person-specific semantic knowledge

- Bilateral ATL damage -> severe impairment
- Unilateral ATL damage -> very mild impairment

Perceptual face matching

- Famous
- Unfamiliar

Statistical Analysis

- Group differences were analysed using Kruskal-Wallis ANOVAs and post-hoc Dunn tests.

Perceptual Face Matching

- Accuracy -> increased for famous faces in all groups

Voxel-based morphometry

Discussion

- Bilateral ATL damage impairs both general semantic memory and person-specific semantic knowledge.
- Unilateral ATL damage causes very mild semantic deficits with no differences between left versus right damage.
- Bilateral ATL damage is worse than unilateral damage even when equal amounts of total ATL volume loss.

- Our findings are in line with a shared role of the bilateral ATLs in supporting both general semantic memory and knowledge about people/faces.

Acknowledgements

The study was funded and supported by the Medical Research Council, NIHR Cambridge Biomedical Research Centre, Wellcome Trust and the British Neuropsychological Society.

References