Say hello to BoB

Introducing the Back of the Brain Project

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Background

Face and words recognition has traditionally been thought to rely on highly specialised and relatively independent cognitive processes.

Strong evidence for this has come from single case studies of patients with:

- pure prosopagnosia: a selective face recognition deficit
- pure alexia: a selective word recognition deficit

Recent theories, such as the many-to-many hypothesis (Behrmann & Plaut, 2013), suggest instead that the cognitive and cerebral processes underlying visual recognition are more distributed and interactive.

While single case studies are well suited to investigate *dissociations* between deficits, larger groups of patients are needed to investigate *associations* predicted by a distributed model.

Aim of the study

The study aims to shed new light on the processes and cerebral architecture underlying visual recognition of faces and words.

Some of the core research questions:

- Do face and word processing rely on processes that are largely independent or highly distributed and shared?
- What is the relationship between deficits in object, word or face processing and lower-level and intermediate visual perceptual deficits?
- Is there a relationship between premorbid reading skills and type and severity of alexia and prosopagnosia following stroke?
- How do visual field defects affect higher-level visual perception?
- How are visual recognition and semantics related?
- Can reading be spared after a lesion in the left fusiform gyrus and can face recognition be spared after a lesion in the right fusiform gyrus?

Methods

70-100 patients
(stroke in posterior cerebral artery)

50 healthy controls
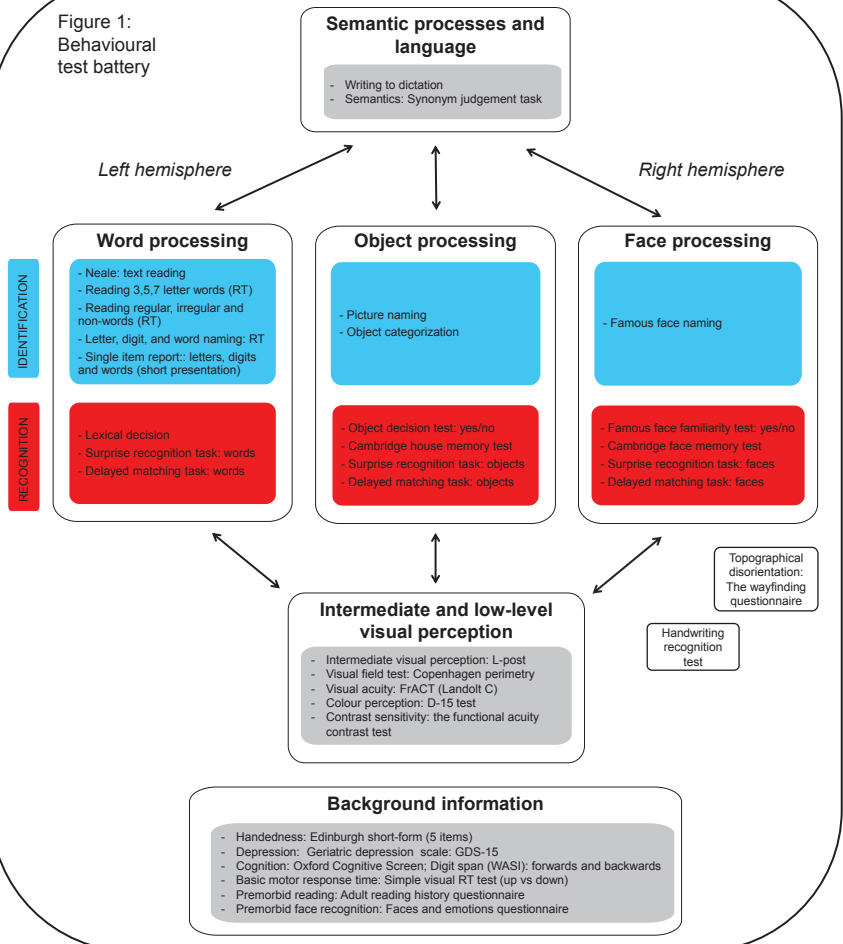(matched as group for age and education)

Behavioural tests
All patients are assessed (>9 months post-stroke) a large battery of sensitive behavioural tests (see figure 1 for overview of functions assessed).

Assessment of each patient carried out over 3 days (within maximum 3 weeks).

Imaging
- Structural T1 scan
- Functional localiser: faces and scrambled faces, words and checkerboards
- Diffusion tensor imaging (DTI) scan

Figure 1: Behavioural test battery

Semantic processes and language
- Writing to dictation
- Semantics: Synonym judgement task

Left hemisphere   *Right hemisphere*

IDENTIFICATION

Word processing
- Neale: text reading
- Reading 3,5,7 letter words (RT)
- Reading regular, irregular and non-words (RT)
- Letter, digit, and word naming: RT
- Single item report:: letters, digits and words (short presentation)

Object processing
- Picture naming
- Object categorization

Face processing
- Famous face naming

RECOGNITION

Word processing
- Lexical decision
- Surprise recognition task: words
- Delayed matching task: words

Object processing
- Object decision test: yes/no
- Cambridge house memory test
- Surprise recognition task: objects
- Delayed matching task: objects

Face processing
- Famous face familiarity test: yes/no
- Cambridge face memory test
- Surprise recognition task: faces
- Delayed matching task: faces

Topographical disorientation: The wayfinding questionnaire

Handwriting recognition test

Intermediate and low-level visual perception
- Intermediate visual perception: L-post
- Visual field test: Copenhagen perimetry
- Visual acuity: FrACT (Landolt C)
- Colour perception: D-15 test
- Contrast sensitivity: the functional acuity contrast test

Background information
- Handedness: Edinburgh short-form (5 items)
- Depression: Geriatric depression scale: GDS-15
- Cognition: Oxford Cognitive Screen; Digit span (WASI): forwards and backwards
- Basic motor response time: Simple visual RT test (up vs down)
- Premorbid reading: Adult reading history questionnaire
- Premorbid face recognition: Faces and emotions questionnaire

What's novel?

- Participants selected according to lesion localization, not according to symptoms → Expecting novel patterns of lesions and symptoms.
- All participants assessed with the same wide range of functions with sensitive tests → Enabling direct comparison across subjects, which is often not possible across single case studies.
- Tests of face, word and object processing: Same level of processing tested across stimulus type.
- Large group of PCA patients included.

Status

- 25 patients tested (right lesions n = 6; left lesions n = 16; bilateral lesions n = 3)
- 3 control participants tested

International collaboration

Study design

University of Copenhagen
- Prof. Randi Starrfelt
- Ph.d. student: Julia Ro Robotham

Patient/control recruitment and assessment

University College London
- Prof. Alex Leff
- Postdoc: Sheila Kerry

University of Manchester
- Prof. Matt Lambon-Ralph
- Postdoc: Grace Rice