Lecture 8

Self Representation

- Self as a sense of conceptual identity
  - The mirror self-recognition test
  - Representing "self" in the brain
- Self as a sense of a physical body
  - Self in body
  - A body in space
  - A body in time

Self as a Conceptual Identity

From *Finding Nemo*

Mirror Self-Recognition Test

How do you assess self-understanding of animals?

Does the animal recognize itself in the mirror?

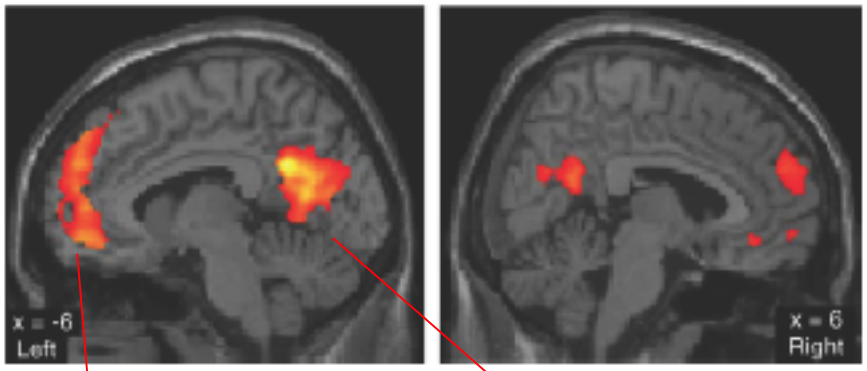
Mirror Self-Recognition Test

How do you assess self-understanding of animals?

- **Stage 1: Social response**
  - **Treating the image as another animal/conspecific**
- **Stage 2: Physical mirror inspection**
  - **e.g., looking behind the mirror**
- **Stage 3: Repetitive mirror testing behavior**
  - **Linking self-movements to mirror image movements**
- **Stage 4: Self-directed behavior**
  - **Recognition of mirror image as self**
  - **Passing the "mark" test?**

"Self" in the Brain

Where do we represent in the brain?



Medial prefrontal and medial parietal cortices activate when reflecting on aspects of "self" (e.g., your mood, disposition, preferences, etc.) relative to when reflecting on facts, other people, etc.

Ochsner (2005)

Self in Body

Phantom Limbs revisited

An example of how body representations interact

Self in Body

Supernumerary Phantom Limbs

Khateb (2009)

Figure 3. Patient's drawing representing herself while putting on her glasses with her third arm.

Staub (2006)

Self in Body

Brain, Vol. 125, No. 6, 1265-1274, June 2002

Whose arm is it anyway? An fMRI case study of supernumerary phantom limb

D. J. McGonigle[1,4], R. Hänninen[2], S. Salenius[1,3], R. Hari[3], R. S. J. Frackowiak[1] and C. D. Frith[1]

Under normal circumstances, information from a number of sources is combined to compute a unitary percept of the body. However, after pathology these influences may be perceived simultaneously, resulting in multiple dissociated conscious representations. In a recent paper, we described subject E.P., a right-handed female stroke patient with a right frontomesial lesion who sporadically experiences a supernumerary 'ghost' left arm that occupies the previous position of the real left arm after a delay of 60–90 s. We used a delayed response paradigm with functional MRI to examine the haemodynamic correlates of E.P.'s illusion. Comparison of periods of time during scanning when the ghost arm was present against when it was not revealed a single cluster (9 voxels, $t = 5.11$, $P < 0.012$ corrected for multiple comparisons) located on the right medial wall in the supplementary motor area ('SMA proper'). Our results suggest that areas traditionally classified as part of the motor system can influence the conscious perception of the body. We propose that, as a consequence of her injury, E.P. is aware of the position of the phantom limb in this 'action space' while also continuing to be aware of the true position of her real limb on the basis of afferent somatosensory information.

Self in Body

Misoplegia, or “alien hand syndrome”

Self in Space

An Autoscopic Experience

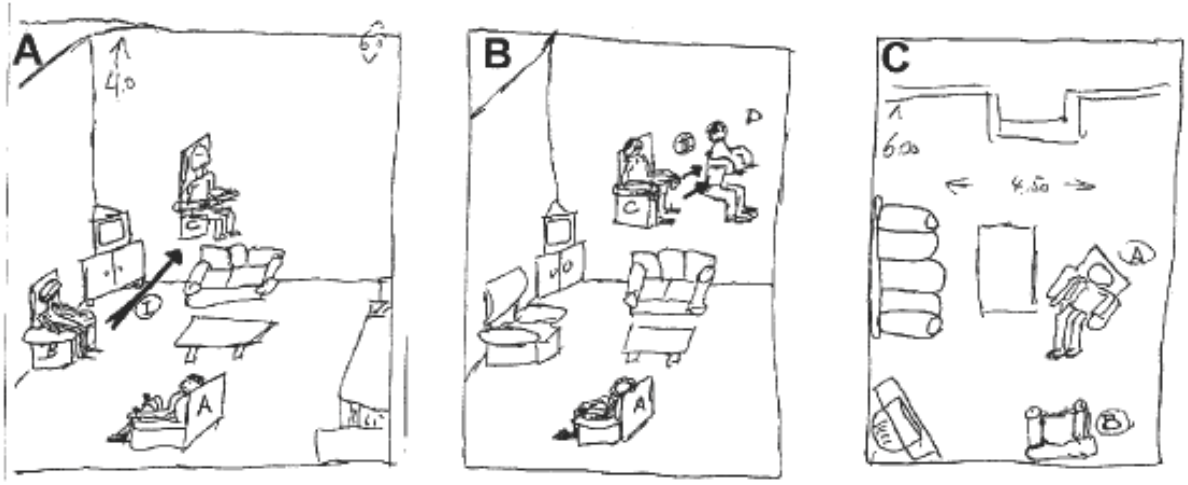


Fig. 3 Graphical depiction of experienced AS (as drawn by Patient 4). The patient divided his experience in two periods (**A**,**B**). In the initial period, he experienced being elevated in his living room chair into the air by ~3 m in the direction of the arrow (**A**). In the second period, he experienced a 'second' body, which continued to be elevated, but left the patient's body from the elevated position in the chair (see text). (**C**) depicts the visual scene as Patient 4 experienced seeing it from his elevated position in the chair. Numbers indicate the dimensions of the patient's living room in metres. The position of the patient's wife is indicated by (A) and the successive locations of Patient 3 during the he-autoscopic period by (B), (C) and (D).

Blanke (2004)

Self in Space

Lesion Analysis

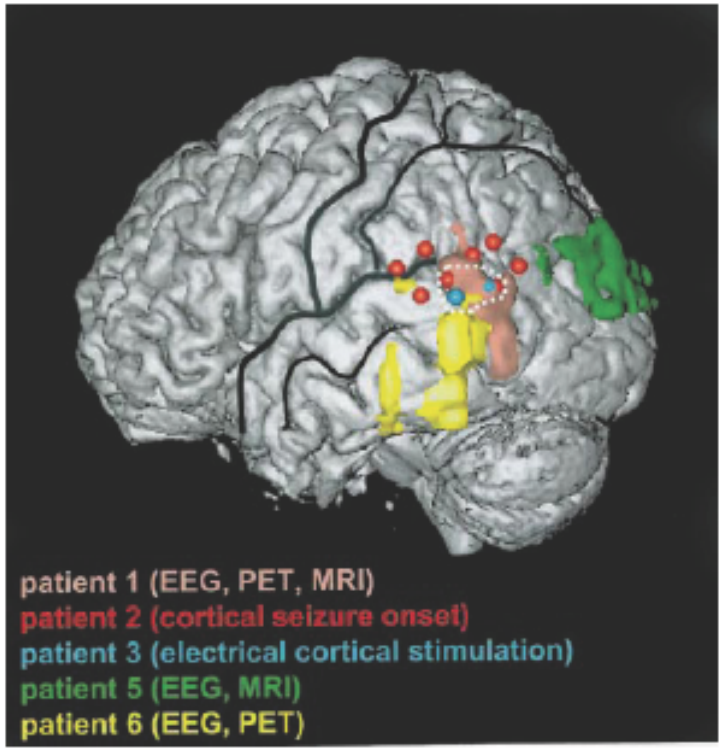


Fig. 4 Mean lesion overlap analysis of the five patients in whom a lesion could be defined (Patients 1, 2, 3, 5 and 6). Each patient is indicated in the same colour as in **Fig. 2**. The results of the individual lesion analysis of each patient were transposed onto the left hemisphere of Patient 5 (see Methods). Mean overlap analysis centred on the TPJ (area indicated by dashed white line). Thick black lines indicate sylvian fissure and central sulcus; thin lines indicate superior temporal sulcus, postcentral sulcus and intraparietal sulcus.

Blanke (2004)

Self in Time

Case 2: 'A Month of Sundays'

A lady in her seventies was referred because of confusion and wandering. She had been going to church for Sunday service every day of the week, only to find the church closed. She had caused concern by cooking a perfect Sunday lunch on a Friday evening at 11 p.m. This lady was living alone and had previously been in good health.

On mental state examination, she showed no abnormalities apart from an apparently isolated disorientation as to the day of the week: she said it was Sunday (it was Monday and she could not be persuaded that she was wrong). On further questioning, she said that all other days of the week had been substituted for Sunday. Underlying this belief was the delusion that the 'Daily Mirror' newspaper had engineered it all.

Investigations and physical examination were normal. EEG was normal and head CT scan showed diffuse cortical atrophy.

These symptoms persisted until over the following 6 months she began to show increasing cognitive impairment and was diagnosed as having probable Alzheimer's disease.

Aziz & Warner (2005)

Self in Time

Case 3: 'Eight Days A Week'

A lady in her sixties was referred for management of depression. She was living alone in increasingly squalid circumstances that had been building up over 2 months.

There were cats and dogs, which were unable to get out of the house, several weeks of washing up, and piles of clothes and rubbish. This followed an admission for a severe urinary tract infection from which she had made a complete recovery.

She had a history of hypertension and was taking bendrofluazide. She also had a history of cerebellar aneurysm, treated successfully by surgery 12 years previously.

On examination, she was very dishevelled and lethargic but showed no evidence of depression. She was orientated in time and place but her recall of recent events was impaired. She had the delusion that a china chicken was real and the visual hallucination of it turning its head to look at her. She had the delusion that time had been interfered with and that there were sometimes 2 or even 3 Sundays in a week. She said she found this annoying as it interrupted her shopping. Otherwise she believed she coped well with the extra Sundays, although there was the drawback that each extra Sunday was followed by an extra Monday morning.

On admission to hospital, her physical health deteriorated rapidly. Head CT scan showed a large primary tumour occupying extensive areas of the right temporal, parietal and frontal lobes. She died a few days later.

Aziz & Warner (2005)

Self in Time

Case 1: 'Groundhog Day'

A lady in her seventies presented with the delusion that she was living in a time warp. There were certain experiences during the day, which she perceived as being repeated. For example, when watching an episode of a soap opera on television, she became very bored because she believed she was seeing the same scene enacted for the third time. When she visited the shops she believed she had already been into them and undergone the same transaction three times before.

Six weeks previously, she was well, living independently and running her own business. She had then been admitted to the general hospital with severe dehydration from gastro-enteritis, which led to acute renal failure.

She was treated by haemodialysis. As a consequence of this illness, she developed an acute confusional state from which she recovered as her physical condition improved. The delusion of being in a time warp persisted over 3 weeks from this time.

At first, she experienced everything happening eleven times. This, she said, made eating her meals in hospital particularly difficult: one lunchtime, she had to get through an especially tough piece of plaice eleven times. Initially, she had no insight and believed the other patients shared her experience but that the hospital staff did not. When she presented, however, and the time warp was reduced to her 'triple experience', she recognised that others did not share her belief.

Aziz & Warner (2005)