

# M2: Interactions of semantic memory with other cognitive systems: perception, language, working memory

<https://neurodegenerationresearch.eu/survey/m2-interactions-of-semantic-memory-with-other-cognitive-systems-perception-language-working-memory/>

## Title of project or programme

M2: Interactions of semantic memory with other cognitive systems: perception, language, working memory

## Principal Investigators of project/programme grant

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United Kingdom

## Source of funding information

Medical Research Council

## Total sum awarded (Euro)

1281597.857

## Start date of award

01-04-2005

## Total duration of award in months

60

## The project/programme is most relevant to

- Alzheimer's disease and other dementias

## Keywords

brain disease/damage; memory; language; conceptual knowledge; object recognition; reading

## **Research abstract in English**

The aims of Project M2 are to explore the nature and extent of interdependence in various aspects of knowledge. The principal, though by no means only, approach in this project is to identify relatively specific acquired cognitive deficits (resulting from neurodegenerative disease or stroke), and then to determine whether other abilities – typically considered to belong to a different component of the cognitive and neural architecture – are compromised by or unaffected by the patients' central impairment. Because this research programme requires case series and also substantial information about the patients' structural and (where possible) functional brain abnormalities, its success relies on its joint base at the MRC-CBU and the Neurology Department of the University of Cambridge Clinical School.

Consider the following example. Patients with a neurodegenerative condition known as semantic dementia (SD), which arises from bilateral atrophy of the anterior temporal lobes, suffer a steady deterioration of conceptual knowledge about words, objects, people, everything. Until late in the disease, the patients continue to use their own everyday objects at home appropriately. Does this mean that object recognition and use are independent of conceptual knowledge? Our research suggests otherwise, and demonstrates that the patients' success at home reflects familiarity with a specific instance of an object that does not generalise to other similar objects: the patients often fail to recognise/use other instances of the same objects that are completely equivalent to a normal individual. The patients' residual conceptual knowledge reveals further reliance on the form of familiarity inherent in typicality. For example, typical mammals like dogs and horses have smooth backs; the hump on a camel is atypical. In a test of object recognition, we offer two pictures of a camel, one with and one without a hump; SD patients, as their conceptual knowledge declines, increasingly prefer the incorrect but more typical hump-less camel. Moreover, shown a picture of a camel with a hump and asked to reproduce it after a 10-second delay, the patients' drawings are often generically accurate but hump-less. Both the recognition and production tests indicate that domain typicality has come to dominate over individual-object experience. The impact of degraded conceptual knowledge, powerfully modulated by familiarity and typicality, also reveals itself in aspects of language competence previously thought to be independent of semantic knowledge. For example, SD patients retain the ability to read 'typical' words aloud; but we have now demonstrated, in more than 100 paired assessments of reading and semantic memory, that as conceptual knowledge deteriorates, the patients reliably and increasingly assign typical pronunciations to words with an atypical spelling-sound relationship (e.g. *sew* pronounced "sue", *gauge* pronounced "gawdge").

## **Lay Summary**