

The multi-store model

Memory in the mind

Memory experts **Kristofer Romero** and **Morris Moscovitch** look at the current status of this classic theory

The multi-store model of Atkinson and Schiffrin (1968) was an important step in refining how we conceptualise memory. Specifically, it distinguished between three different memory systems:

- 1 sensory memory (temporary storage of visual/auditory stimuli for a few seconds)
- 2 short-term memory (STM)
- 3 long-term memory (LTM).

In terms of the distinction between STM and LTM, the idea is quite simple: there is a difference between how we remember information that is currently in mind (i.e. within the past 30 seconds), compared to how we remember earlier information (i.e. 15 minutes ago). For example, if your friend tells you to Google the words 'shiba inu', 'doge' and 'Twinlike', you can keep those bits of information in mind long enough to type them into your smartphone, but then you can forget about them.

Conversely, LTM is a fundamentally different type of cognitive process, involving the retention and recall of any type of information over time, like remembering what you did last weekend. Crucially, any information in mind initially goes into STM, and through rehearsal can eventually be encoded into LTM.

Evidence from patients with brain damage

This theoretical distinction between STM and LTM was confirmed by comparing patients

Signposts

hippocampus, double dissociation, amnesia

retained in LTM. Conversely, patients with lesions in the lateral temporal cortex showed deficits in STM but not LTM: that is, they couldn't keep more than a few bits of information in mind at any one



Box | Double dissociation

'Dissociation' refers to un-associating two things, i.e. separating them. In psychology the term is used to describe situations where a person is in some way separated from their immediate environment, as in being detached from reality.

The term is also used when referring, for example, to the situation where brain damage leads to low performance on one task while performance on a second task remains intact. The two tasks have become dissociated.

Psychologists then suggested that such a *single* dissociation inferred two separate mental processes — one mental process related to task 1 which has been affected by the brain damage, and a different mental process that is related to task 2 which was not affected by the brain damage.

However it might just be that task 1 places greater *general* demands on mental processing and that's why it is more affected by the brain damage. Therefore psychologists prefer to look for *double* dissociations, where a second dissociation is found that is the reverse of the first. A different kind of damage would affect task 2 but not task 1.

In Romero and Moscovitch's article, the double dissociation is:

- 1 Damage to the hippocampus results in loss of ability to form LTM but intact STM — these abilities had become dissociated.
- 2 Patients with other lesions have intact LTM but can't use their STM.

This double evidence indicates that STM and LTM are governed by separate processes which is why they can dissociate.

time, but could remember that information at a delay (Warrington and Shallice 1969). This demonstration of a double dissociation between different brain regions being important for STM and LTM, suggests that these two aspects of memory are indeed separate. See Box 1.

Recent evidence

However, recent evidence has started to poke holes in the theoretical divisions between STM and LTM, suggesting that the nature of memory is not so cut and dry. For example, although patients with amnesia were originally shown to have intact STM, this may have been due to the stimuli in STM tests being too simplistic, and thus easy to rehearse (i.e. numbers, simple patterns).

Remembering faces

If you ask patients with amnesia to remember a small number of items that are unfamiliar/novel (i.e. faces), they show difficulties in remembering such stimuli, even for a short delay. This happens because faces are difficult to rehearse or keep in mind because they are a special class of visual stimuli, and they are highly detailed. (Try it out: look at a stranger, close your eyes, and see if you can keep the person's face in your mind's eye.)

whether they could remember the face after a delay of either 4 or 8 seconds. Across several trials using different faces, patients showed surprisingly poor memory for a single face, even after only 4 seconds. The authors found similar results in other experiments testing amnesics' ability to remember three locations on a screen, or three colour patches, suggesting these patients had difficulty keeping unfamiliar stimuli in mind.

Different types of LTM

There are other phenomena which the multi-store model does not predict. For example, these are other phenomena which the multi-store model does not predict. For example, memories (memory for specific events in time), and semantic memories (general knowledge or facts). We know this because

Pick a face, then close your Psychology Review magazine. Can you still see the face? Describe it?

