KEEL CALM AND...NOPE, LOST IT

HOW THE MEMORY WORKS

Tim Webster takes a walk down memory lane and visits the three stages of the memory process.

A while ago, the head of physiotherapy at a leading university visited one of my cancer classes. This is a lady I know very well but, as she stood there waiting for me to introduce her to the group, it dawned on me that I had completely forgotten her name. Our collective discomfort was only alleviated when she took charge and introduced herself. Let me tell you, when something like that happens, it will get you Googling Alzheimer's faster than you can say Jack Robinson[1].

This was the latest iteration of a condition that has beset me since my mid-fifties. It's normal age-related memory loss (for the moment at least) but every time I lose my phone, forget a name or leave the house with no trousers on, I wonder if it's escalating into something more serious.

Anyway, let's go for a wander down memory lane (with trousers on).

If the brain retained all the information it received from our senses, one's head would explode shortly after waking up in the morning. In order to avoid the mess, the brain employs a filter called attention.

Hands up if you've ever forgotten someone's name immediately after being introduced. Thought so. This is usually because you weren't paying attention in the first place, which told the brain the name wasn't important and could thus be discarded to make room for stuff that was important. In short, we don't remember what we don't pay attention to.

Models of memory

In 1968, Atkinson and Shiffrin developed the multi-store model[2], which defined memory as a three-stage process. The multi-store model has since been challenged, updated and amended, not least by Baddeley and Hitch (1974 and 2000), who introduced the concept of working memory. For the purposes of this article, we'll go with memory as a three-stage process in which the short-term memory is subsumed into the working memory to form stage two.

STAGE ONE

Information from the senses – sight, smell, touch and so on – is held briefly in the sensory memory before either being discarded or making it through to the next stage. Each sense has its own memory with its own characteristics: iconic memory for sight, echoic memory for sound, haptic memory for touch, olfactory memory for smell and gustatory memory for taste. Stage one can best be described as the capture of all this information – much of which is discarded, some of which is passed to stage two.

STAGE TWO

This is where the short-term memory (STM) and working memory (WM) store and manipulate information. Conventional wisdom says the STM stores 7 +/- 2 pieces of information at any given time and it can hold that information for around 20-30 seconds. During this time, the information is either processed and manipulated by the WM for real-time use (like mental arithmetic), or it's encoded for long-term storage, or it's discarded.

Encoding

Encoding is the act of getting information into our memory system. Some information is automatically encoded. For example, you can probably recall where you had lunch yesterday but I'm guessing you didn't make a conscious effort to remember it. Of course, we have no control over automatic encoding, but we do have some control over effortful encoding, like learning someone's name (see paragraph entitled mnemonics). The degree to which we are able to exert that control will, to a large extent, dictate how well we are able to manage our memory.

There are a variety of ways in which information can be encoded but, generally, acoustic encoding (sound) is the dominant method for processing information stored in the STM; we hold a phone number in our head by repeating it. Semantic encoding (attaching meaning) is used for storing and retrieving information in the LTM. You might remember a name by connecting it to someone of the same name you already know.

For references visit fitpro.com/references

STAGE THREE

The LTM is where information that has made it through stages one and two is stored, pending retrieval at a later date. How easily and accurately this information is retrieved is another matter.

Rumours

According to George Santayana, "Memories rarely return with their original clarity; they return as 'rumours' of the original event, often in the form of slips, ambiguities and downright lies."[4] There are several theories around why this happens:

➜ Encoding failure suggests we struggle to remember information because it was poorly encoded in the first place.
➜ Displacement theory says because the STM has limited capacity, new information quickly displaces older information that hasn't been rehearsed, and that information is discarded.
➜ Trace decay theory works on the use-it-or-lose-it principle (i.e., unused memory traces will weaken and gradually fade from the LTM).

Errors

And then there are different types of memory errors.

Confabulation occurs when gaps in memory are unconsciously filled with fabricated, misinterpreted or distorted information. Absentmindedness happens when we don't pay attention to what we're doing, like putting our phone down, for example. Blocking happens when we know something but can't quite bring it to mind (tip-of-the-tongue).

Suggestibility refers to our susceptibility to adapting behaviour based on the suggestions or language of others. For example, Loftus and Palmer (1974) conducted research in which they asked subjects to watch a video of a car accident[5]. They were then asked how fast the car was going when it: smashed (40.8mph), collided (39.3mph), bumped (38.1mph), hit (34mph) or contacted (31.8mph) the other car. Note how the estimated speed changes according to the language used.

There is also a tendency for new knowledge, beliefs and feelings to be distorted by the recollection of previous experiences (interference theory). To put it another way, what we *have* experienced affects what we *will* experience. This leads us nicely to schemas.

A schema is a cognitive framework that helps organise and interpret information in order to simplify the world around us; we'd be lost without them. But these frameworks can also cause us to exclude information that doesn't conform to our pre-existing beliefs and ideas, which is what underpins cognitive bias and prejudice.

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Losing it?

As you may have gathered, this topic is bigger than *Ben-Hur,* so I'm going to seamlessly segway to the question that I, and most of my peers, have asked ourselves on more than one occasion (it's also why those of you working with people anywhere north of 50 might like to pay attention): Am I losing it?

In most cases, what we might think is early-onset dementia – misplaced keys, blanking on someone's name or forgetting a phone number – is normal age-related memory loss.

When we're young, we have the storage capacity and processing speed to be able to manage lots of information fairly effectively. As we get older, storage capacity (STM) reduces and processing speed (WM) slows. This is why we find it increasingly difficult to juggle multiple thoughts simultaneously and why we can remind ourselves to remember something one minute and forget it the next.

Dementia

Mild cognitive impairment (MCI) is the stage between the expected cognitive decline of normal ageing and the more serious decline of dementia. Symptoms include repeating the same questions and stories, forgetting the names of close friends, forgetting appointments and misplacing items often. Having said that, MCI shouldn't cause major problems with everyday living.

Dementia is an umbrella term for a severe decline in mental abilities due to the brain's physical deterioration. It's characterised by a decline in memory (particularly STM), language, problem-solving and other cognitive skills that affect one's ability to perform everyday activities. This decline occurs because nerve cells in parts of the brain involved in cognitive function have been damaged. The most common form of dementia by far is Alzheimer's.

Mnemonics

What can be done to manage normal age-related memory loss? It helps people to develop a 'memory mindset' if they understand why they are experiencing senior moments. This involves giving them a rudimentary understanding of how the brain (particularly the STM/WM component) works.

Having laid that foundation, improving memory involves working with techniques that help to master the art of effortful elaborative encoding. Step up mnemonics.

Named after Mnemosyne, the goddess of memory in Greek mythology, a mnemonic is a device for aiding memory. The idea is to create a structure that links unfamiliar, dissociated ideas, which by themselves are difficult to remember, into a format that makes their retrieval easier. These include:

➜ using acronyms like RICE (Rest, Ice, Compression, Elevation)
➜ chunking information into smaller pieces – 021 0228 2551 has a greater chance of being remembered than 02102282551
➜ using rhyme – if I say, "Thirty days hath September," you will almost certainly follow with "April, June and November".

If we can make new information personal (the self-referencing effect) and/or connect it to stuff we already know, the chances of remembering it improve dramatically. The same is true if we can memorise information by placing each item to be remembered at a point along an imaginary journey (through a house, for example) and then retrace the steps. This is called the Method of Loci.

It really is horses for courses in terms of what works and for whom, but one of the mantras I've found very useful is from the BrainFit® for Life programme[6]: Focus, Connect, Rehearse. Focus on what it is you want to remember, connect it with something you already know and repeat (rehearse) it.

Of course, none of this happens without developing a memory mindset (in the same way you might develop an exercise mindset) and that starts with paying attention. fp

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