

THE GENETICS OF LEARNING AND MEMORY

Remember Amnesia?

Do you know the most common form of amnesia? It's Soap Opera Amnesia - -that is, in soap operas on TV, people suffer amnesia far more often than in real life – especially if they are the lost heir of the bad-tempered billionaire...

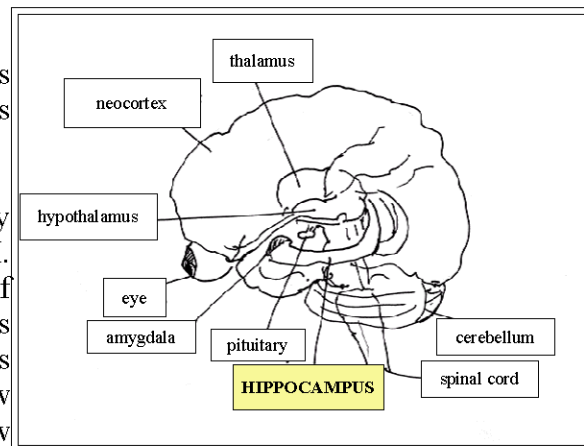
Seriously, amnesia is a devastating illness in real life. Take the famous case of a patient referred to simply as H.M.

Remembering H.M.

H.M. suffered from horrible and dangerous brain seizures. He had a terrible form of the disease known as epilepsy. The seizures were so bad that his doctors decided to remove a small part of his brain known as the hippocampus. There are two hippocampal regions, one on each side of the brain.

The good news: The operation was successful. The patient recovered and his seizures were cured.

The bad news: The surgery had a very unfortunate and surprising side effect. H.M. could no longer build new memories of specific information. He could recall things from his early life up to about three years before the surgery. He could remember how to *do* things, and he could learn to do new things. But he could not recall any new event after it was past.



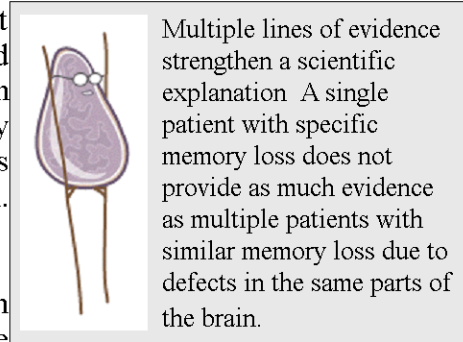
Think about what you did in the last hour – and then imagine that that hour of your life, and each new hour, was instantly erased. Imagine the horror of having every moment feel like “waking from a dream”. This was how H.M. described his life after the surgery. H.M.’s inability to make new memories of events was a terrible condition. He would read or hear or see something, and just minutes later he couldn’t remember it. For example, he could remember an old address where he had lived, but when he moved to a new place, he could never learn the new address. Although H.M. could not learn new facts, like his address, he could learn how to do new things, suggesting that the removal of his hippocampus affected his **declarative** memory but not his **procedural** memory.

The surgery performed on H.M. was never done again. The only consolation was that we were able to learn about how the brain works. People have wondered if memories are made and stored in the same parts of the brain. The damage done to H.M.’s hippocampus and the resulting amnesia provided part of the answer. Although the hippocampus was needed to make new memories, its removal did not destroy all old memories. This observation supports the idea that the hippocampus works to transfer specific information that has just been learned into long-term memory, but it is not where the memory is then stored.

Korsikoff's Syndrome

What if you looked in the mirror one day and saw someone else looking back? Oliver Sacks, in a book called *The Man Who Mistook His Wife for a Hat*, tells of a patient he saw in 1975. This patient thought he was a young man, a sailor. This man was stunned when he looked in a mirror – and saw a middle-aged man looking back!

This patient thought the year was 1945. He had been a sailor as a young man in World War II, and thirty years later he thought he was still a young man. He was horrified to see his reflection as an older man in the mirror. But minutes later he could not recall why he was upset. He had lost his ability to build and store new memories, and he had lost all the intervening years of experience. His own choices of behavior were the cause: he was a heavy drinker, and alcohol had damaged his brain. This was an example of a kind of amnesia caused by alcohol. The result is known as Korsikoff's syndrome.



In comparison with patients like H.M., patients with Korsikoff's alcohol induced damage have more problems with their thinking. Not only can formation of new memories be blocked, some old memories are erased. In addition, Korsikoff's patients no longer reason well, and they have trouble solving problems. In this way, they are less intelligent than before they damaged their brains with alcohol. The brain damage in these cases is much more widespread than just the hippocampus damage in H.M.

Soap Opera Amnesia

Real cases of amnesia do share some qualities with the amnesia of soap opera characters. Have you ever wondered how it is that the character cannot recall his/her original name, place of birth, who their parents are or similar facts of personal history, but the character can remember how to do things. For instance, the character remembers how to speak, how to drive a car, and how to dress in a stylish way likely to please the potential rich uncle/mother/grandfather from whom they hope to inherit... This aspect of the fictional amnesia is not entirely wrong. There are forms of amnesia in which the victim forgets *facts* but recalls *procedures*. In other words, the person forgets *what they know* about personal history and other facts, but they remember *how to do things*. Recall that H.M. retained his ability to learn new procedures even though he could not remember new facts.

References

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