2.2 Examine one study related to localization of function in the brain

The case study of H.M.

- This case study is important because it provided evidence that there are different memory systems in the brain (see unit 3.3).
- **Milner (1957)** was the first to report the case of H.M. and the profound effects on memory functioning, following an operation which removed the hippocampus and adjacent areas in H.M.'s brain.
- **Corkin et al. (1997)** did a MRI scan of H.M's brain. Brain imaging was used because it allowed the researchers to get a precise picture of the brain damage. They discovered that parts of the temporal lobe, including the hippocampus and the amygdala, were missing, but also that the damage was not as extensive as previously believed.

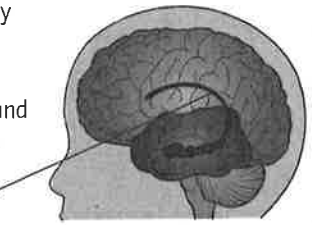
H.M. suffered from epileptic seizures after he fell off a bike, aged seven. It was assumed that the seizures were connected to the accident and he became increasingly incapacitated.

When H.M. was 27, the neurosurgeon William Scoville, performed experimental surgery in order to stop the seizures. Tissue from the medial temporal lobe, including the hippocampus, was removed on both sides of his brain.

After the operation H.M. suffered from amnesia. He could not create new episodic and semantic memories, but he was able to learn a few procedural memories. His personality remained unchanged and there was no general intellectual impairment.

This case study shows that the hippocampus is important in memory processing and particularly in the storage of new memories.

H.M. participated in research studies until his death in 2008, and his brain was donated to science.



The hippocampus

What can be learned about localization of function in the brain in relation to memory from the case study of H.M?

- The hippocampus and the areas around the hippocampus play a critical role in converting memories of experiences from short-term memory (contemporary store) to long-term memory (permanent store).
- H.M. could retain memories of what had happened before the surgery. This indicates that the hippocampus is a temporary rather than a permanent memory store.
- H.M. could learn a few new procedural memories so this indicates that such memories are not stored via the hippocampus.
- The fact that H.M. (and other people with amnesia) had deficits in one part of the memory system but not in others is evidence that the brain has several memory systems and that these are supported by distinct brain regions.
- The study shows that memory processes are much more complex than originally believed. Although the hippocampus is very important in the storage of new memories it is not the only structure involved in the process.

The case of HM

At the age of 27, HM underwent surgery to remove the medial temporal lobes in order to reduce the frequency of his epileptic seizures. This operation was not expected to result in the problems that occurred, partly because at the time (1953) it was not clear what role the temporal lobes might have in memory. HM's operation resulted in the removal of more of his brain than was intended – removal of the hippocampus was a particular concern – and had profound effects on his memory. MRI brain scans were carried out in 1996 and showed the surprising extent of damage: besides damage to the temporal lobes, other parts of the brain had been damaged, and it is supposed that this was caused by a bad reaction to the epileptic medication HM was taking.

HM's memory problems most famously included an inability to create long-term memories. This means that he could hold information in his working memory, but when distracted, HM would 'forget'. He was able remember some of his childhood, but very little from the 11 years prior to his surgery. This kind of amnesia is known as retrograde amnesia – loss of memory from before an event (surgery in HM's case). Ogden (2005) describes him as unable to detect that time has passed, probably because he is not forming new memories. This form of amnesia is called anterograde amnesia – an inability to remember relating to the time since his operation. It is clear that he picked up a few facts after the operation as he had some idea who Elvis Presley and John F. Kennedy were. His mood is reported by Ogden to be generally calm, perhaps because years of medication have dulled his mood or because of damage to the emotional amygdalae caused by the operation – such damage might prevent the kind of anger that others have felt at being unable to exist beyond a single moment in time. She adds that HM may also be genuinely conter and good natured.

Task

1) Create a page of notes "Practice Analysis"

2) With a partner, complete a MAGEC GRAVE for HM.

But - focus on the most relevant parts of the acronym.