Amnesia

By Richard H. Hall, 1998

Description

We are all familiar with the word **amnesia**, which occurs when someone sustains brain damage that results in a memory deficit. What you may not be so familiar with is the fact that there are two basic types of amnesia. These are defined based on the nature of the deficit, with respect to memories before vs. after the accident that caused the amnesia. The inability to remember events that occurred before the accident is called **retrograde amnesia**. The inability to remember events that occur after the accident is referred to as **anterograde amnesia**. In terms of the multi-store model, retrograde amnesia is a deficit in retrieval, since this is the inability to retrieve information from long term memory that was already stored. On the other hand, anterograde amnesia is a deficit in storage, in that it is the inability to store new information into long term memory. We now turn to two specific examples with humans of brain damage that primarily resulted in anterograde amnesia, Korsakoff's Syndrome and the case of HM.

Korsakoff's syndrome is profound anterograde amnesia, which is normally caused by chronic alcoholism. Those with this disorder usually suffer from some retrograde amnesia as well, but their primary deficit is the inability to store any new information in long term memory. Another example of damage resulting in anterograde amnesia is the famous case of HM. **HM** is a patient who was suffering from chronic, intense, and debilitating epileptic seizures. Since his seizures were unresponsive to any sort of drug treatment he underwent brain surgery, which cured his seizures, but also resulted in one of the most "pure" cases of anterograde amnesia ever documented. The case was "pure" in that his intelligence and personality were left relatively in tact, and the amount of retrograde amnesia he showed was relatively small. HM lived very much in the here and now. For example, he could carry on a conversation, because his short term memory, his "attentional pool", was fine. He could also remember things from before his surgery, but he did not have conscious memories of things that happened after. For example, he could not remember any people he met after his surgery, but he could remember those he knew before. In case you're wondering, he was aware of his condition as illustrated in his often quoted statement:

> *Every day is alone in itself, whatever enjoyment I've had, and whatever sorrow I've had. Right now, I'm wondering. Have I done or said anything amiss? You see, at this moment everything looks clear to me, but what happened just before? That's what worries me. It's like waking from a dream; I just don't remember.* (Milner, 1970, p. 37)

Neurological Basis

In Korsakoff's patients the damage varies and usually affects more than one brain structure, but the principal and most consistent locus of the damage are the **mammillary bodies**. HM's damage is more specific since it involved surgery. His operation consisted of bilateral removal of the temporal lobes. This surgery was also performed on thirty psychotic patients in an effort to alleviate their psychosis, before the anterograde amnesia effect was discovered. Further examination of these cases indicated that the anterograde amnesia occurred only in cases where

the **hippocampus** was removed in this operation, for example, in the case of HM. The hippocampus and mammillary bodies are connected via a large bundle of nerve fibers called the **fornix**. Subsequent research indicated that the neural circuit that includes the hippocampus, fornix, and mammillary bodies is the important brain area, in that damage to these areas results in anterograde amnesia. Thus, it would seem logical to conclude that the brain area important for long term memory storage is the hippocampus-fornix-mammillary bodies circuit. However, research indicates that this conclusion is an overgeneralization, and, in fact, the real function of these areas is more specific. (See modules on "explicit and implicit memories" and "contextual memory" for more on their specific roles).

References

1. Milner, B. (1970). Memory and the temporal regions of the brain. In *Biology of Memory*, K.H. Pribram and De.E. Broadbent (Eds.). New York: Academic Press.