Learning outcome: Explain how biological factors may affect one cognitive process

Command term: Explain-*give a detailed account including reasons and causes*

Points to remember:

* The cognitive process we will focus on is **memory.**
* The focus of the response should be **biological factors**.
* The learning outcome demands that **two different factors** are included in the response.
* When writing about HM you must specifically mention a researcher by name (i.e Corkin 1997).

Factor 1: Damage to the hippocampus and amnesia.

Using the sheet entitled “The HM case study” complete the following:

* Briefly describe what caused the damage to HM’s brain
* State which type of memory loss best describes HM’s condition.
* Describe which aspects of HM’s memory were damaged and which were intact.
* Draw a diagram to show where in the brain is the hippocampus found.
* Specify the role of the hippocampus in memory
* Describe specific evidence from Corkin’s (1997) use of MRI

Also supported by the case study of Clive Wearing. See p78 Textbook. The Herpes simplex virus damaged his hippocampus and some of his frontal regions and caused his amnesia. **HM should be the main study** due to the academic studies that can be cited.

Factor 2: The role of Acetylcholine in Alzheimer’s disease (AD).

Download the Alzheimer’s factsheet from Murphology and complete the following questions.

* What is Alzheimer’s disease?
* Alzheimer’s is a Progressive/Degenerative disease. What does this mean?
* What are the main symptoms of Alzheimer’s disease?
* Who is at risk of developing Alzheimer’s disease?

More about Alzheimer’s disease

Alzheimer’s disease occurs in about 10% of the population over the age of 65. Between 30-50% of adults over 70 exhibit Alzheimer’s symptoms and over 80, more than 50% develop the disease.

Disruptions of **episodic memory** are the earliest symptom of AD and episodic memory deficits continue to be one of the most significant problems throughout progression of the disease. Salthouse and Becker (1998) analysed data from 180 AD patients and over 1000 normal elderly individuals and found that AD was primarily a disorder of episodic memory.

*What is episodic memory?*

*If someone has problems with their episodic memory, what symptoms might be displayed?*

**AD affects semantic memory as well**. Hodges et al (1994) measured semantic memory in AD patients with such tasks as naming pictures of objects or animals, or picking the appropriate picture given its name. They found a steady decline in semantic memory.

*What is semantic memory?*

*If someone has problems with their semantic memory, what symptoms might be displayed?*

**Procedural memory is less affected.**

*What is procedural memory?*

**The brain and AD**

The **medial temporal lobe** (MTL) is the first area of the brain to show pathological changes in AD. Schwindt and Black (2009) did a meta-analysis of functional magnetic resonance imaging (fMRI) studies of episodic memory and concluded that AD patients show decreased activation of the MTL.

AD develops in a series of stages. First the MTL, in particular the hippocampus is affected, then the parietal lobes and other brain regions. The symptoms of AD seem to be caused by the loss of brain cells **and the deterioration of neurons involved in the production of acetylcholine**.

Acetylcholine (ACh) is a neurotransmitter which is a chemical messenger released by neurons. ACh is particularly prevalent in the hippocampus. The hippocampus is very much involved in the formation of new memories (**think back to HM**). The hippocampus of normal people contains high levels of ACh. **Low concentrations are found in people with AD**. This is the result of severe brain tissue loss in areas of the forebrain, which are known to secrete ACh.

**Autopsies reveal two characteristic abnormalities in these ACh producing neurons.**

**Amyloid plaques**: caused by deposits in the brain of a sticky protein, which accumulates and damages neurons.

**Neurofibrillary tangles**: caused by the accumulation of an abnormal protein, which causes the structural support of neurons to collapse. This causes tangles.

The **plaques** and **tangles** are thought to contribute to degradation of neurons in the brain and the subsequent symptoms of Alzheimer’s disease.