

# 2f. Memory - Episodic and Semantic

## Memory and Alzheimer's

**Explicit memories: when information CAN be consciously or intentionally retrieved and stated. Declarative memories are examples of explicit memories.**

- The LTM of specific facts and events most of which can be stated or 'declared'.
- Procedural memory is 'knowing how'
- Explicit memory is 'knowing that'
- Examples:
  - Identifying a type of flower
  - Explaining a statistic formula
  - Remembering what you ate last night
  - Recalling the capital of France
  - Recalling a happy or sad event from the past

### **1. Episodic memory: explicit memory for personally experienced events.**

- A mental 'personal' diary with records of 'autobiographical' episodes we directly or indirectly experience.
- Event details include:
  - time
  - place
  - psychological and physiological state of the person
- Episodic memory examples:
  - Your memory of the opening ceremony of the last Olympic games
  - How you felt during a trip to the dentist last week
  - What you ate for dinner last night and how it tasted
  - Your memory of your first day at school

- Your birthday party
- Recalling an episode of your life

## **2. Semantic memory: declarative memory for facts or knowledge.**

- Unlike episodic memories, semantic memories are NOT tagged with details of time and place.
- For example:
- Knowing that humans are mammals
- Knowing that January is first month of the year
- Knowing that the word 'assist' means help
- Knowing the 'i' comes before 'e' except after 'c' rule
- Shows facts or knowledge

### **The effects of brain trauma on areas of the brain associated with memory:**

- **Amnesia: any loss of memory, either partial or complete, temporary or permanent.**

- **Anterograde amnesia: Loss of memory for information or events experienced after the trauma has occurred.**

- Trauma includes car accident, blow to head, born with it developmental delay
- Difficulty learning new information:
- e.g. names of people they subsequently meet, regardless of how often they see them.
- Inability to encode and store new memories.
- Often associated with damage to the hippocampus and the medial temporal lobe and connections linking the medial temporal lobe with the frontal lobes.
- Memories prior to trauma remain intact.

- Believed to result from a failure of memory encoding and storage because of disruption to consolidation.
  - New information is processed, but almost immediately forgotten, never making it into the cortical regions where long-term memories are stored
- Implicit memories are not impacted – people can still learn new procedural motor skills.
- STM tends to remain intact but they cannot be transferred to long-term memory.
- **Retrograde amnesia: Loss of memory for information or events experienced before the trauma occurs.**
  - Retro = old
  - Loss can extend back minutes, days, weeks or years
  - Often of a temporary nature and most commonly come about from a blow to the head
  - Memories for the period immediately before the trauma are rarely recovered (cf. consolidation theory)

#### **H.M. Molaison case study:**

- Surgery to remove the medial temporal lobe from each hemisphere
  - included about two-thirds of each hippocampus, most of each amygdala, and adjacent cerebral cortex from around the hippocampus and amygdala.

#### **Brain surgery:**

#### **Hippocampus:**

- LEFT HIPPOCAMPUS = People without the left hippocampus tend to experience difficulty remembering verbal information (e.g. words), but they have little or no difficulty recalling visual designs (or locations).

- This provides evidence for the crucial role of the left hippocampus in verbal learning and memory

(Broca's area and Wernicke's area).

- RIGHT HIPPOCAMPUS = People (and animals) without the right hippocampus tend to have difficulties learning and remembering the location of objects or places.
  - This provides evidence for the crucial role of the right hippocampus in spatial learning and memory.

### **Amygdala:**

- When surgically removed, loss tends not to result in STM, procedural or explicit memory problems.
- Acquisition of conditioned fear responses appears to critically involve the amygdala. People (and other mammals) without an amygdala or severe damage to both are typically unable to acquire a conditioned fear response.
  - E.g. An individual without an amygdala may remember the semantic and episodic details of a traumatic or joyful event stored in long-term memory, but not the emotional qualities of that event (cringe reaction).

### **Cerebral cortex:**

- Frontal lobe loss tends to disrupt the retrieval process.
- Damage to the frontal lobes, particularly the prefrontal cortex, also interferes with the efficiency of other memory processes, such as attention that is required for transfer of information from sensory memory to STM.
- The parietal lobe is also involved in attention so damage to cortical areas within this lobe may also massively impair STM, but not necessarily our ability to maintain information in STM.
  - e.g. Being able to retrieve information but not pay attention to short-term memories

### **Cerebellum:**

- Classically conditioned motor responses involving simple reflexes (eg. Eye blink) are stored in specific locations within the cerebellum.
- If these specific locations are damaged or removed, then the patient can no longer create and store the long-term memory of the simple conditioned reflex.
- All components of the conditioned response are abolished but there is no effect on the reflex itself.

### **Neurogenerative diseases: Characterised by progressive decline in the structure, activity and function of brain tissue.**

- Permanent loss of ability which is usually age-related.

**Dementia: Umbrella term used to describe a variety of symptoms of a large group of neurodegenerative diseases that cause a progressive decline in:**

- 1. Mental functioning**
- 2. Behaviour**
- 3. The ability to perform everyday tasks**

**One of the main symptoms is memory loss**

### **Alzheimer's disease:**

- A type of dementia characterised by the gradual widespread degeneration of brain neurons, causing:
  - Memory loss
  - A decline in cognitive and social skills
  - Personality changes
- In early stages, STM loss, apathy and depression are common.

- Both loss of past memories (retrograde amnesia) and difficulties forming new memories (anterograde amnesia) distinguish Alzheimer's disease from other disorders involving amnesia.
- Declarative and procedural memories are impaired, gradually eroding as the disease progresses.

### **Progression of Alzheimer's disease:**

- One of the first brain structures to be affected by this disease is the hippocampus.
- When the cells are lost here, it causes the brain to shrink and the damage to the temporal lobes means that the hippocampus becomes isolated.
- The earliest symptom is usually impaired declarative memory, where the patient has difficulty remembering events from the day before, forgets names and has difficulty finding the right word when speaking.
- Next, the patient might repeat stories or questions, and eventually will fail to recognise familiar people and family members.
- As their recent memories start to fade it is common that people with Alzheimer's will begin to believe they are a younger version of themselves

### **Alzheimer's related brain damage:**

The neural tissue of brains suffering Alzheimer's disease show high levels of abnormal structures that interfere with neural communication (cause of Alzheimer's):

- 1. Amyloid plaques – accumulate and inhibit communication between neurons.**
- 2. Neurofibrillary tangles – inhibit transport of substances within neurons and lead to neuron death.**

<https://www.youtube.com/watch?v=dj3GGDuu15I>

Reduced levels of the NT acetylcholine (ACh) are more prominent in brains of Alzheimer's patients.

