
THE BRAIN, BIOLOGY⁺ AND COGNITION

Structure of LTM and Formal
Assessment of H.M.

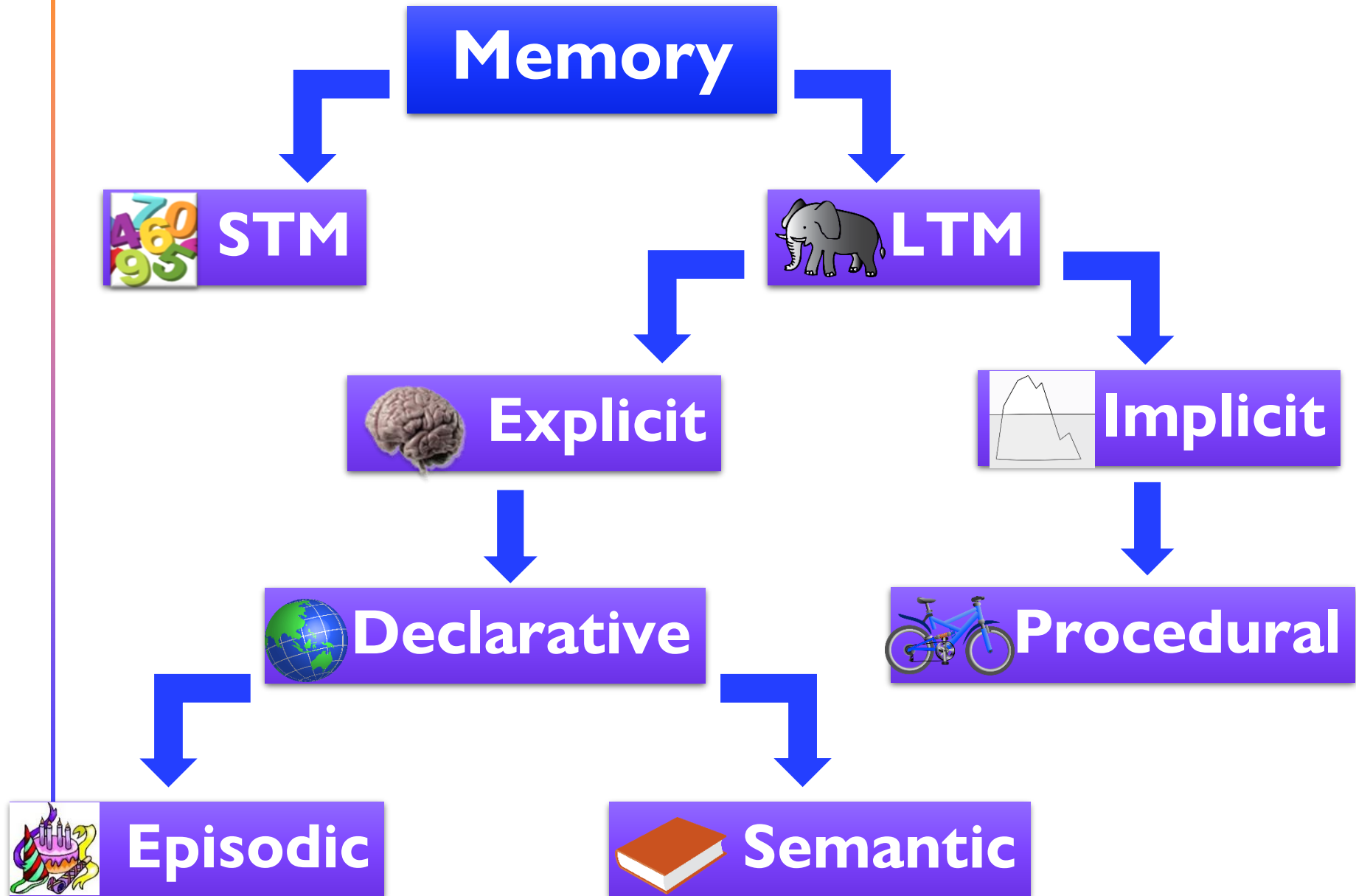
Long-Term Memory

- Difficult to theorise Psychology that does not refer to memory
 - Holding of information
 - Use of that information
- What we mean by understanding or knowledge
- Related to concepts like 'intelligence' or 'ability'



+

Sub-types of LTM



Sub-types of LTM



- LTM: composed of separate aspects due to fragmentation of different memory types:
 - +
 - Episodic v Semantic memory (Tulving, 1972)
 - **Episodic memory**: holds conscious recollection of an episode of encoding
 - E.g., Being at a concert/sports event
 - **Semantic memory**: knowledge for a fact without memory for an episode
 - E.g., Knowing the capital city of a country

Sub-types of LTM



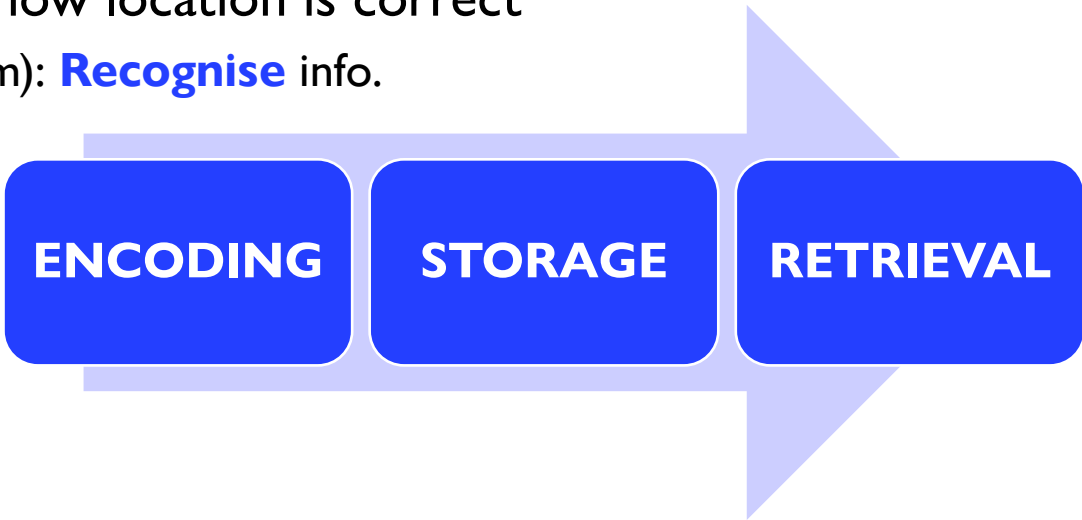
- **Procedural memory:** Procedures/routines
 - E.g., Riding a bike, driving a car
 - (Cohen & Squire, 1980; Schacter et. al, 2000)
- **Autobiographical memory:** memory for events of one's own life.
- **Declarative memory:** knowing something is the case
 - Conscious recollection and memory for facts (semantic) and events (episodic).
 - Known as *Explicit memory*.
- **Non-declarative memory:** Influences behaviour but does not involve conscious recollection (procedural).
 - Known as *Implicit memory*.

Long-Term Memory



- Depicts LTM as 'store' of info (of different forms)
 - This represents 'structure'
- But not only a store (passive), but also active
- Accurate retrieval of information
 - Appropriate access and choice of information
- Active in encoding (representing) and storing (organising) forms of information

- Elaborate Rehearsal needed to pass info from STM to LTM (Craik & Lockhart, 1972).
- **Retrieval**: crucial process of memory function
 - Info needs to be retrieved to be useful
- **Different** ways to access this?
 - Imagine task of 'getting to the lecture' today
 - Remembering to check timetable
 - No external cue: **Recall** information from LTM
 - When you reach room and know location is correct
 - External cue present (see room): **Recognise** info.



ENCODING

STORAGE

RETRIEVAL

+
•
0

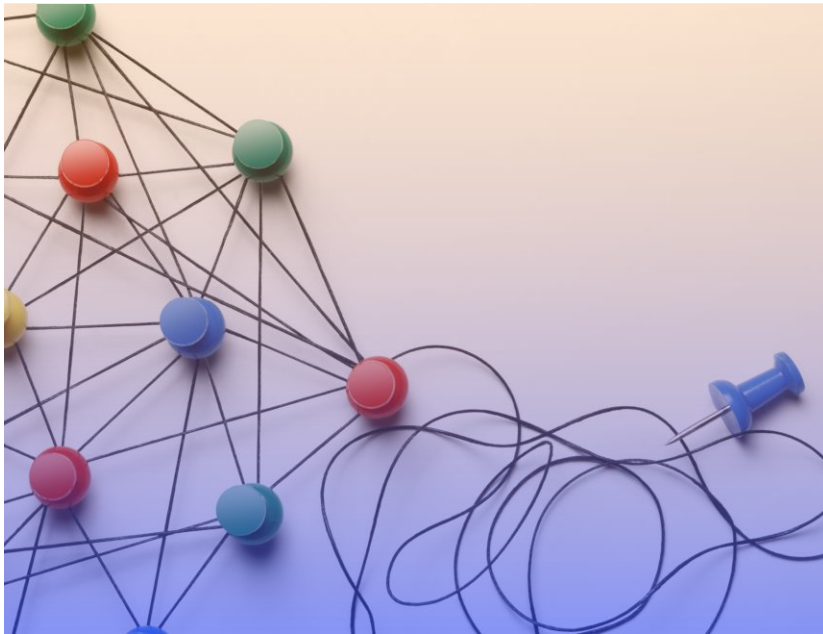
Organisation

- LTM two key roles:
 - Storage of info
(in useful form)
 - Retrieval of info
(in accurate way)
- Consider scale of task in terms of amount and variation of info
- Organisation is key to this ability

Organisation of semantic memory

- What is the capital of France?
- How did you access the fact 'Paris'?
 - Memory retrieval process of stored fact
 - Meaningful links to information stored
 - Key components: What is a Capital/what is a Country?
 - Starting to see *organisation* in process and structure
- How about 'Did Henry VIII have feet'?
 - Memory retrieval of that as a 'fact'?
 - Related semantic information and connections

Mental representation of knowledge



- Powerful forms of organisation:
 - **Categorisation** of information
 - Grouping of info
 - Connections between info

Answer these questions

- Name a fruit **beginning** with the letter **p**
- Name an animal **beginning** with the letter **d**
- Name a metal **beginning** with the letter **i**
- Name a bird **beginning** with the letter **b**

Answer these questions

- Name a fruit **ending** with the letter **t**
- Name an animal **ending** with the letter **r**
- Name a metal **ending** with the letter **e**
- Name a bird **ending** with the letter **n**

Organisation of semantic memory

- How do we access the answers?
- E.g. 'Animal beginning with d?'
 - Access category of 'animals'
 - Category of 'beginning with d'
- May interpret as:
 - Previously stored categories of information
 - Created through encoding of previous cases
 - Previously encoded 'dog' as member 'animals'
 - Also stored in category 'd words'

Evidence for distinct LTM components

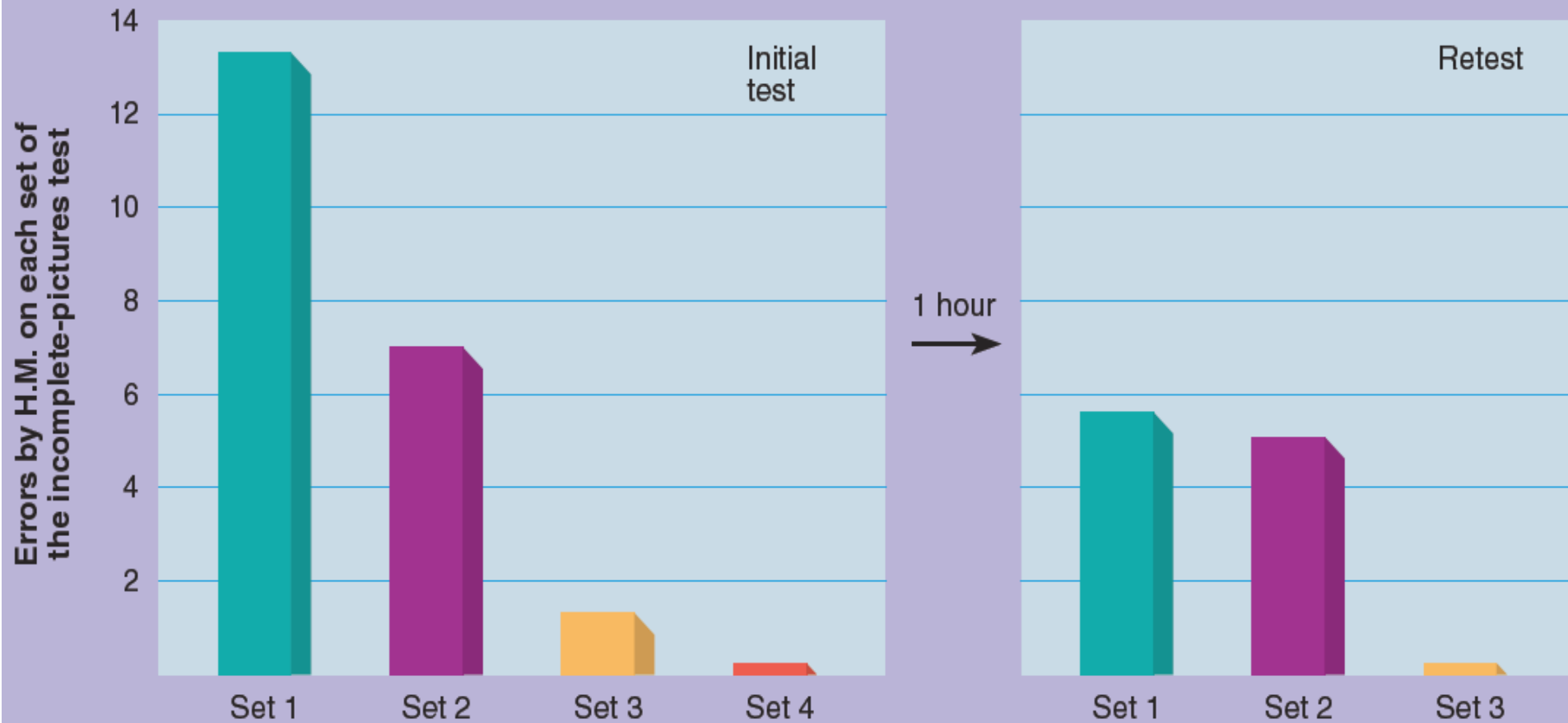
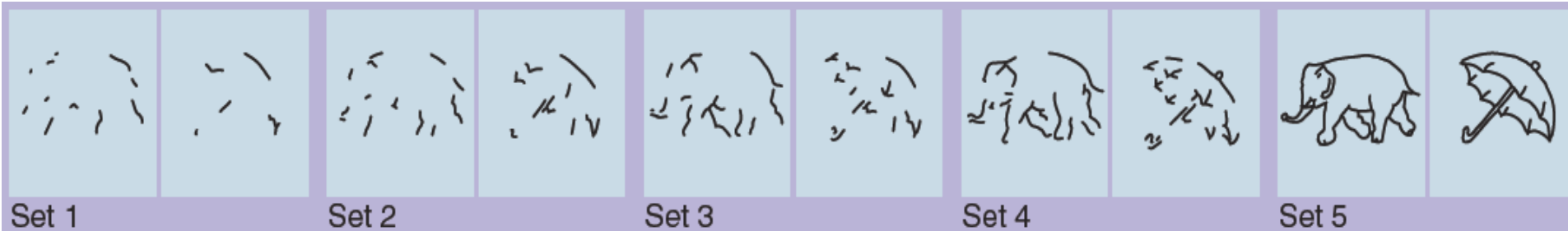
Famous Case Study – Patient H.M.

- Underwent surgery to hippocampal area of brain to control severe epileptic seizures.
- During surgery, front half of both sides of hippocampus and amygdala removed.
- After Surgery: intact STM & memory for events before surgery, suggesting normal functioning
 - **HOWEVER:** unable to transfer new information to LTM (Anterograde Amnesia).

Formal Assessment of H.M.'s Anterograde Amnesia: Discovery of Unconscious Memories

- To characterise his memory deficit, researchers measured his performance on various tasks (7 in total)
- Some tasks (e.g., Digit span & Block-tapping memory-span) showed extent of his LTM deficits.
- Remaining tests (mirror-drawing, rotary pursuit, incomplete-picture, and Pavlovian conditioning), suggested his brain could store long term memories but he had no conscious awareness of them

Incomplete-picture task





Major Scientific Contributions of H.M.'s case

1. Medial temporal lobes are involved in memory
2. STM, remote memory, & LTM are distinctly separate – H.M. unable to move memories from STM to LTM, problem with memory consolidation
3. Memory may exist but not recalled – H.M. exhibits a skill he does not know he has learned
 - Difference between explicit (conscious) vs. implicit (unconscious) memories
 - Amnesiac: The case of H.M. - <https://www.youtube.com/watch?v=7mvx-mAUJL8>

**COMPLETE THE WORKSHEET
ON METHODS USED TO
EXAMINE MEMORY DEFICITS
IN H.M.**