

WEEK 4 BRAIN AND COGNITION – memory

Memory is *crucial* for behaviour- every cognitive process depends upon memory

EARLY VIEWS- memory was seen as a passive store, however experimental research in the last century has identified several functions: encoding, storage retrieval and processing of info. Memory isn't just one thing...

'two memory system' **SCOVILLE+MILNER**- patient with epilepsy undergoes surgery – HM after surgery was unable to store new memories into long-term memory but could perform tasks requiring STM = an intact short term mem but damaged long term mem (ablation of temporal lobe, hippocampus and amygdala)

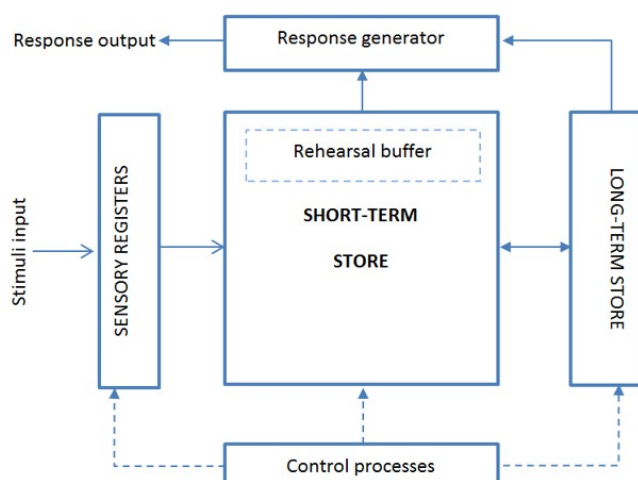
MURDOCK (1962)- used a recall task – tested hypothesis that there are 2 diff memory systems (STM + LTM). Ptps had to remember lists of 10,20,30 and 40 words

POSTMAN+PHILLIPS (1965)- used a free recall paradigm with lists of 10,20 and 30 words- the presence of retention interval led to the elimination of recency effect

WAUGH+NORMAN- ptps were shown a list of digits, then given a probe, they had to retrieve the digit following the probe e.g. list 1,2,3,4... probe=2, answer=3. **RESULTS-** ptps had weak memory for last items, suppressing rehearsal eliminates the recency effect... SO info is put into STM where it is constantly rehearsed and if rehearsed enough it is put into LTM- otherwise forgotten

MODAL MODEL- **ATKINSON+SHIFFRIN**- very influential model. A cognitive architecture is proposed with 3 major stages: input is received, this input in turn generates cognitive processing, some behaviour is produced (the output of the system). Memory stores are places where info is maintained/processed. **CONTROL PROCESSES** regulate and control the info flow between memory components.

ARCHITECTURE- the way memory system is organised, **PROCESSES-** the activities occurring within the memory system



Memory is mostly a question of attention.

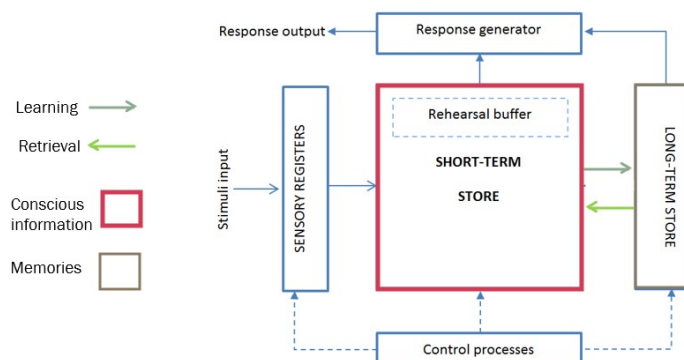
Sensory registers- keep a trace of sensations until info is forwarded to the STM- hold modality-specific info for a few milliseconds, one store for *visual* info (**iconic**) and another for *auditory* (**echoic**)- this info is not accessible in consciousness

THE LONGTERM STORE- holds all info that we acquire through learning, info is stored permanently, capacity is assumed to be infinite, insensitive to interferences

SHORT TERM STORE- holds and processes info in all modalities, organises info to produce a behaviour. Info is sensitive to interferences, forgetting is RAPID in absence of rehearsal (rehearsal must be constant). Can also be called primary, immediate or working memory.

Control processes- control the input of short-term store, filter the amount and quality of info received through sensory registers and control how much info is retrieved from the long-term store.

Memory systems



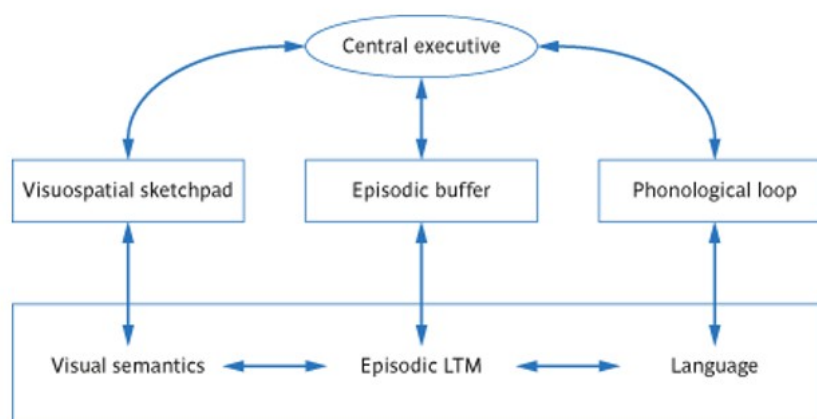
Understanding is not learning- learning is moving this understanding to the long-term store. SO, if we don't process info (through rehearsal) it won't move from STM to LTM- we won't learn.

FORGETTING -

Decay theory of forgetting (fading over time), *Interference theory* (distractions by neural events)

2 types of interferences- **PROACTIVE** - the influence of previously learnt items in the learning of new material. **RETROACTIVE**- the opposite influence from new items to already learnt items. **MCGEOCH+MCDONALD**- showed interferences are likely to occur when new items are similar to items in memory, in particular semantically

BADDELEYS WORKING MEMORY- they questioned the concept of ST store proposed by Atkinson and Shiffrin- ptps STM was filled with material (e.g. list of numbers) then had to perform a wide range of resource-demanding tasks. If the ST store both holds and processes info, filling it should impair the other task- but performance isn't affected as much as predicted.



THE PHONOLOGICAL LOOP- dedicated to speech-based info- consists of 2 subcomponents that cooperate:

The phonological store- holds items online in a passive way (either acoustic or phonological format), activation of items decreases over time, info is lost if it is not refreshed, this happened after 2 seconds!!

The rehearsal process- sets items activity back to its maximum – item by item, the input of phonological store can be auditory or visual, the output is spoken in words.

The visuospatial sketchpad- holds and manipulates info (only 3/ 4 items can be held at a time. It is split in 2 subcomponents: visual cache (holds info) and inner scribe (cognitive operations)

THE CENTRAL EXECUTIVE- close to NORMAN+SHALLICE's supervisory activating system- monitors attentional processes and controls info flow within and between phonological loop and visuospatial sketchpad....

The **EPISODIC BUFFER** essentially replaced this for coordinating between the 2 slave systems- aims to explain that we perceive things as wholes not as parts.

Evaluation-😊 does a better job than **ATKINSON** etc at accounting for the data on STM, 😊 offers useful framework for organising a large amount of empirical data on working memory... 😐 it is vague and the phonological store and the articulation mechanism have been challenged

COWAN'S THEORY OF WORKING MEMORY- info is processed only when it is under the focus of attention (attention is limited- only a few items at a time) ... A 3-level view of memory processing-

1. Set of long-term memory records that aren't activated and are outside the scope of central executive active processes
2. The set of activated memory records that constitute the short-term store but that aren't focused upon
3. The set of items under the focus of attention that can benefit from cognitive operations

The power of memory- Working memory maintains information active and processes it, but

- It is very limited in span
- It does not process quickly