Long-Term Memory: Structure

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Distinguishing LTM and STM

Unitary memory models

memory is memory is memory
Models that emphasize relation between encoding processes and retention

Models proposing multiple memory systems

Sensory Memory – STS – LTM (Atkinson-Shiffrin)
WM (Baddeley)
Multiple types of LTM (Tulving)

Conceptualizations of STM and LTM

STM and LTM as memory representations with different durations
STM and LTM as memory structures
memory as a location (if only a virtual location)
STM and LTM as types of neural codes
Functional codes: sensory codes, verbal codes
semantic codes
Physiological codes: active and inactive memory
(patterns of neural activity versus patterns of neural connections)
STM and LTM as types of research tasks
Evidence for Multiple Memory Systems

Double dissociation studies

Evidence based on functional differences
  Research tasks for STM and LTM

Neuropsychological evidence
  Case studies of individuals with brain injuries

Mixed findings from brain imaging studies

Serial Position Effects

Present lists of 15 or more words
Free recall of words immediately after each list
Plot the number of words recalled from each serial position in the list

Recall of all words from all lists following a filled delay produces a different pattern of recall

Typical Serial Position Effects Data
Rundus (1971) Effects of Rehearsal

Coding in LTM

Early distinctions: STM (verbal/acoustic) and LTM (semantic)
Current evidence: all types of codes in STM and LTM
Dominant coding:
  STM – verbal acoustic (working memory plus phonological loop)
  LTM - semantic

Neurological Evidence for STM & LTM

Case studies showing differential damage to STM and LTM function with specific types of damage (double dissociations)

Normal STM but no consolidation to LTM (HM, Clive Wearing, Korsakoff ‘s syndrome)
Impaired STM but functional LTM (e.g., patient KF, with impaired digit span)
Types of LTM (Tulving)

Explicit Memory (conscious)
Episodic
Semantic

Implicit Memory (non-conscious)
Priming
Procedural memory
Classical conditioning

How do explicit & implicit memory differ?

Explicit Memory  Implicit Memory

Explicit & Implicit Memory Tasks

Explicit memory tasks (conscious memory)
Recall
Recognition

Implicit memory tasks (memory without awareness; unconscious memory)
Priming – improved fluency of activation
Procedural memory (skill) – perform actions
Classical conditioning – emotional & reflexive responses
Episodic & Semantic Memory

Episodic Memory
- Event memory
- Autobiographical memory
  - what, when, where, source (who)

Semantic Memory
- World knowledge / Memory for facts
- Knowledge of language
  - what

Dissociations between episodic and semantic memory

Types of LTM (related brain structures)

Explicit (conscious)
- Medial temporal lobe
  - Episodic (personal events)
  - Semantic (facts, knowledge)

Implicit (non-conscious)
- Priming
- Procedural memory
- Classical conditioning (emotion)
- Classical conditioning (skeletal)
- Non-associative learning

Interaction of Semantic and Episodic Memory

Forgetting in episodic memory may leave semantic memories intact

What is forgotten when you do not remember the word cactus on a list of 15 words?

“morphing” episodic memories to semantic memory (e.g., fact information learned in school)

Improved retention with dual encoding

Improved episodic memory by strategic use of semantic knowledge (chunking)
**Procedural Memory**

Skill memory

Slow acquisition

Requires extensive practice to achieve fluent performance

Contrast to explicit memory (can learn a new fact or life experience through one learning trial)

Retention demonstrated by **performing** the skill