Chapter 6 – Episodic Long-Term Memory

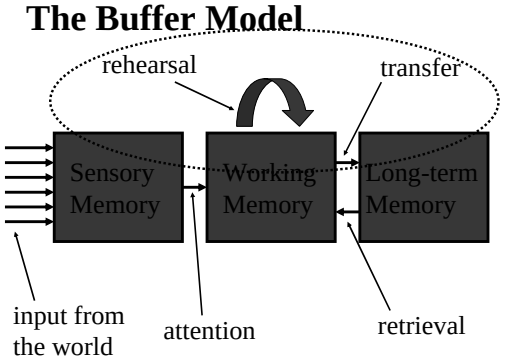
Types of Long-Term Memories

- Explicit – conscious
  - episodic – a person's autobiographical memory, memory of the personally experienced and remembered events of a lifetime
  - semantic – general world knowledge, knowledge that relates concepts and ideas to one another, including your knowledge of how to express those concepts and ideas in language
- Implicit - unconscious

Characterizing Memories

- ***Transfer***: How is information copied into the store?
- ***Capacity***: How much information can the store hold?
- ***Representation***: What is the format of information in the store?
- ***Forgetting***: How does information get lost from the store?
- ***Retrieval***: How is information recovered from the store?

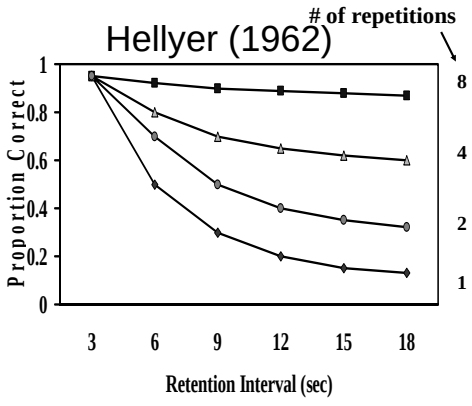
The Buffer Model



Rehearsal

- ***Rehearsal***: a set of techniques/strategies for encoding information into long-term memory
- discriminate two kinds of rehearsal:
  - ***Maintenance***: keeps information "alive" in WM; rote recycling
  - ***Elaboration***: "promotes" information to LTM; think about and connect

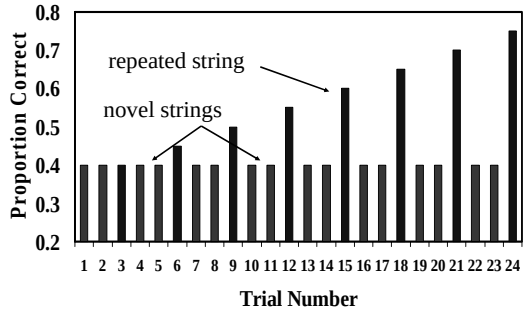
Hellyer (1962)



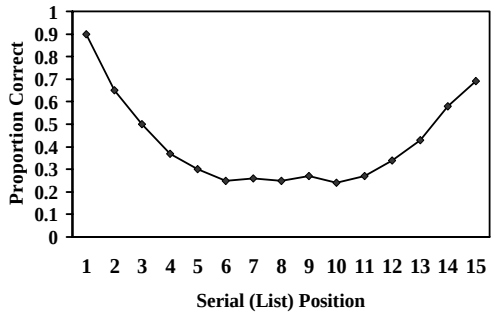
Donald Hebb

- Canada's best known psychologist
- interested in all aspects of ***learning***

Hebb (1961)



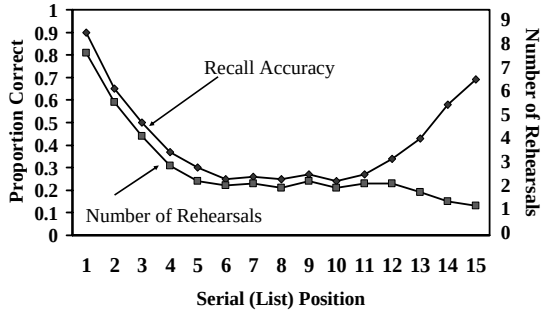
Rundus (1971)



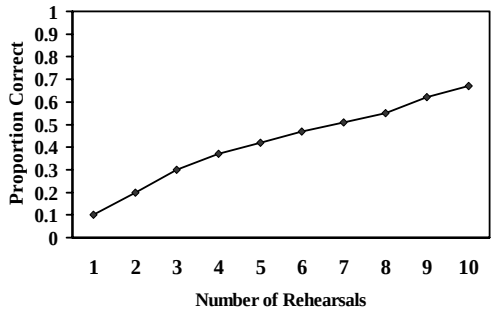
Rundus (1971)

- tape record overt (aloud) rehearsals, so they are no longer covert
- count number of rehearsals for each word and position
- number of rehearsal correlated with recall accuracy in primacy and asymptote, but not in recency

Rundus (1971)



Rehearsals & Transfer



Craik & Lockhart (1972)

- U of T
- 1972: Gus Craik & Bob Lockhart proposed a processing framework for memory
- highly influential view of “levels of processing”

Essence of Levels

- emphasis on processes, not stores
- memory is an outgrowth of perception
- shallow (‘perceptual’) vs deep (‘meaningful’) processing

Hyde & Jenkins (1969)

- varied depth of processing: Subjects studied lists under instruction to:
  - count # of letters
  - count ‘e’ sounds
  - make pleasantness judgment
- varied intention to learn: Subjects studied under instruction to:
  - just do the above task (incidental)
  - do the task and learn the list (incid + intent)
  - learn the list (intentional)

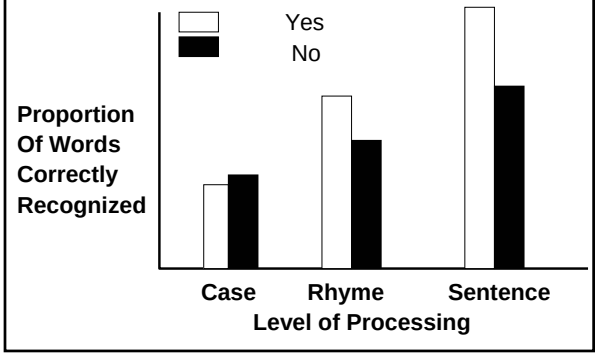
Hyde & Jenkins (1969)

	Incidental + Task	Intentional + Task	Intentional Only
Pleasantness (semantic)	67.9	69.2	
# of Letters (nonsemantic)	41.2	51.7	67.1
"e" Sound (nonsemantic)	39.2	43.3	

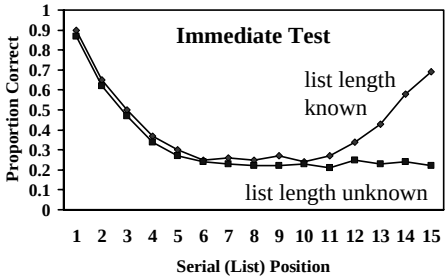
Levels of Processing
(Craik & Tulving, 1975)

Encoding Question	(trout or kite)	Level of Analysis
Is word in uppercase?		Structural
Rhyme with "shout"?		Phonemic
Does word fit in the sentence "She ate the _____"?		Semantic

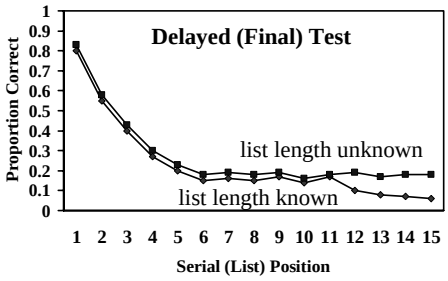
Levels of Processing
(Craik and Tulving, 1975)



Watkins & Watkins (1974)



Watkins & Watkins (1974)



Additional Evidence

- Craik & Watkins (1973) – listen to list of words remembering the last word that starts with a letter (e.g., P)
  - 0-12 intervening items
- MacLeod (1976) – bilinguals to decide if word was English/French vs. living

Criticisms of Levels

- Darley & Glass (1975) – word search
- Rundus (1971)
- **wrong** = even maintenance rehearsal *does* improve memory
- **circularity** = there is no independent measure of depth in the framework (Nelson, 1977; Baddeley, 1978)
- **task effects**

Value of Levels

- places emphasis on processes
- introduced a technique—incidental learning—for studying encoding processes

Organization in Storage

Bousfield (1953):

- randomized 60-item list to be learned for free recall
- *clustering* of related items in a list

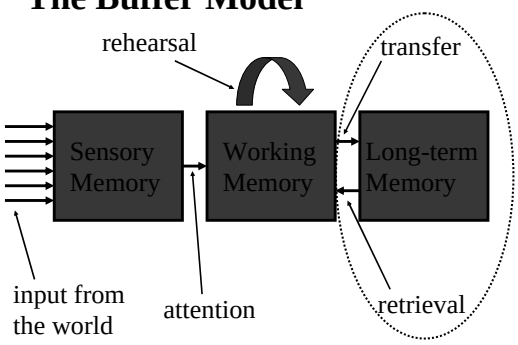
Mandler (1967)

Mean recall for groups who were told nothing, or to study words, or to categorize words, or both:

	RECALL INSTRUCTIONS	
	YES	NO
Categorized Words	31.4	32.9
No Categorization	32.8	23.5

Conclusion: categorization alone has the same benefit as rehearsal for memory.

The Buffer Model



Kintsch & Buschke (1969)

- list 1: tar…car…… ……fog…dog
  "tar…car……um……...log…dog"
- list 1: auto…car……..…..cat…dog
  "um…truck…car……cat…dog"
- 16 words per list (8 pairs)
- errors at the end of list 1 (sound) due to WM
- errors at the start of list 2 (meaning) due to LTM

Anisfeld & Knapp (1968)

- continuous recognition task
  - respond to every item YES/NO
- include identical repetitions, but critically also include associates—see king earlier and then queen later
- fairly long ***lag*** between related items
- heightened false alarms to associates indicate semantic basis of LTM

Interference

Retroactive

Exp'tal	**Learn A**	**Learn B**	**Recall A**
Control	**Learn A**	**---**	**Recall A**

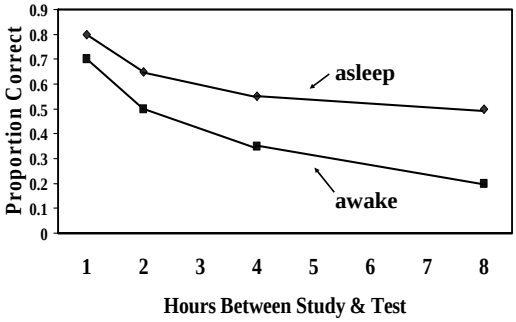
Proactive

Exp'tal	**Learn B**	**Learn A**	**Recall A**
Control	**---**	**Learn A**	**Recall A**

Jenkins & Dallenbach (1924)

- if retroactive interference (RI) is critical to LTM, then going to sleep immediately after learning should help memory
- learn a short list of Ebbinghaus-type nonsense syllables (e.g., TUV, BIJ, etc)
- sleep or stay awake for 1 - 8 hours prior to test
- Yaroush, Sullivan, & Ekstrand (1971) – REM deprivation

Sleep and RI

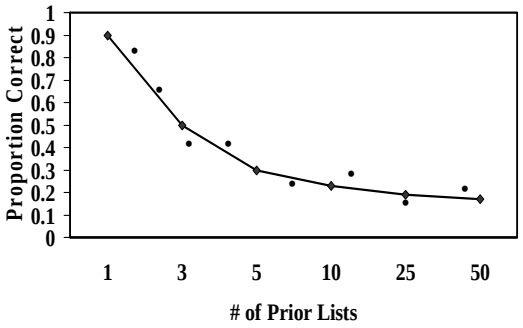


Benton Underwood

- most publications ever in psychology?
- developer with Leo Postman of the interference theory of forgetting
- emphasized role of proactive interference (PI) in LTM

Proactive Interference

Underwood (1948, 1957, 1964)



Retrieval from LTM

- vast amounts of information to search
- at 1 ms per memory and 10 billion memories, it would take on average 158 years to find a given memory – and search per item probably takes more like 100s of msec
- LTM may be “content addressable” to optimize access and speed

Endel Tulving

- U of T
- best known memory researcher in the world
- some of his key ideas:
  - encoding specificity
  - semantic/episodic
  - subjective organization

Light & Carter-Sobell (1970)

- **Encoding Cue Target**

strawberry	JAM
soda	CRACKER
chip	DIP
hefty	PUNCH
sliced	HAM

Light & Carter-Sobell (1970)

Target	Test Cue
JAM	traffic
CRACKER	safe
DIP	skinny
PUNCH	spiked
HAM	radio

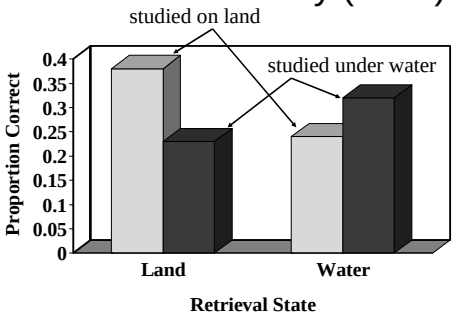
Encoding Specificity Principle

- Tulving & Thomson (1973)
- the idea that the way in which information is encoded determines the optimal way to retrieve that information
- the encoding-retrieval match is crucial

Context Dependency

- emphasizes the match between encoding (study) and retrieval (test)
- Godden & Baddeley (1975) with deep sea divers above surface or 20 feet under

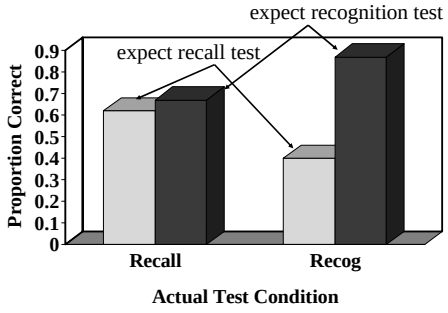
Godden & Baddeley (1975)



Context Dependency

- emphasizes the match between encoding (study) and retrieval (test)
- Tversky (1973)—learn pictures for recall test vs recognition test, and tested as expected or with the other test

Tversky (1973)



Summary

- transfer into LTM is via rehearsal—both maintenance and elaboration
- capacity of LTM is apparently unlimited
- representation of LTM is in terms of meaning (although other codes are held as well)
- forgetting from LTM is via retrieval failure and interference (both proactive and retroactive)
- retrieval from LTM is content addressable, involves the use of cues, and hinges on the encoding-retrieval match

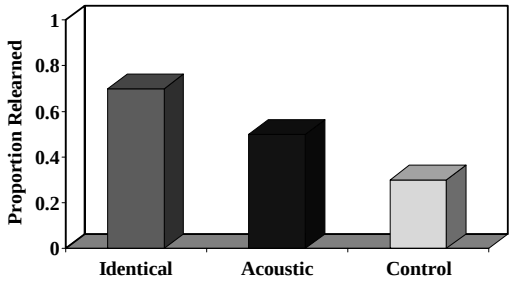
Hermann Ebbinghaus

- first to study memory empirically: *Uber das Gedachtnis* (1885)
- used technique of learning, allowing time to forget, then ***relearning***
- advantage of relearning over original learning = ***savings***

Nelson & Rothbart (1972)

- ***Original Learning 2 weeks Relearning***
  - 27-dough (identical) 27-dough
  - 56-pair (control) 56-horse
  - 81-tax (acoustic) 81-tacks
- learn 24 “paired associates” until perfect, go away and forget for a 2-week retention interval, return for relearning under 3 conditions
- advantage of related pair at relearning is evidence of savings in LTM

Acoustic Savings in LTM



The orthographic information about letters is stored in long-term memory, as evidenced by the research of Paul Kolers at the University of Toronto. His subjects had to read text in unusual orientations, such as upside down. After reading the texts only once, the subjects showed savings for them even a year later when they read them again.

Kolers (1975)

- The orthographic information about letters is stored in long-term memory, as evidenced by the research of Paul Kolers at the University of Toronto. His subjects had to read text in unusual orientations, such as upside down. After reading the texts only once, the subjects showed savings for them even a year later when they read them again.