

Cognitive Psychology

PSYC230

Lecture # 6

Review

Sensory Register

Iconic Memory

Large capacity, brief duration memory
Backward masking experiments showed
two stages of icon representation

Direct measures = *visible persistence*
Indirect measures = *informational persistence*

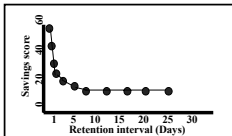
Echoic Memory

Similar to Iconic memory with partial report
and masking effects, but trace lasts longer

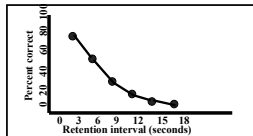
Echoic memory is not stored pre-categorically

Last Time...

Memory Duration Experiments



Ebbinghaus (Ger)



Brown (UK)
Peterson & Peterson (USA)

Different curves of forgetting



Meanwhile, in **Russia ...**

Luria's "*Mind of a mnemonist*"

Studied a young man, "S"
who appeared to have almost no
curve of forgetting

After 3 minutes study, S could recall
long strings of words or digits
in any order, as long as he wished,
with **no errors**

S could recall them perfectly for 15 years!

Luria's memory task was different
than the one used by Ebbinghaus,
Brown, & the Petersons

S could practice the words any
way he wished

S was apparently using imagery to remember
converting words and digits into images

Synaesthesia: *converting from one sense
modality to another*

S did this automatically

"What a crumbly yellow voice you have"

*Were these different curves of
forgetting due to:*

different experimental conditions?

different kinds of memories?

Types of memory tests

Recognition

Multiple choice questions

Cued recall

Paired associates: time - city, time "*city*"
"fill-in" questions, blind as a "*bat*"

Serial recall

Ordered lists of items: telephone numbers,
"to-do" lists, procedures

Free recall

List recalled in any order, or
questions with no cue: Name the "7 seas"

Many experiments were conducted
with the *recall* and *recognition* memory tasks

The type of task makes a difference...

Recognition tasks are easiest,

Free recall seems to be easier than cued recall
(depending on the cue)

Serial recall is hardest

Different tasks provided evidence for
different types of memory effects

Researchers documented a wide range of
memory effects

PRIMACY EFFECT

RECENCY EFFECT

REPETITION/REHEARSAL EFFECT

DISTINCTIVENESS EFFECT

SEMANTIC ORGANIZATION EFFECT

"FALSE MEMORY" EFFECT

Researchers began mapping out how
STM worked

Memory Span Experiments

George Miller (1956)

Capacity of STM is **7 items (± 2)**

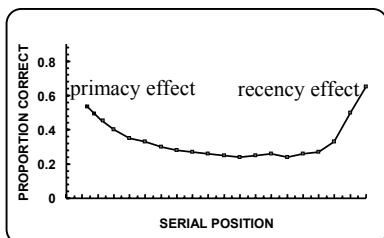
Doesn't matter what the items are
you've got 7 to work with!

Short-Term Memory Scanning

Saul Sternberg (1966)

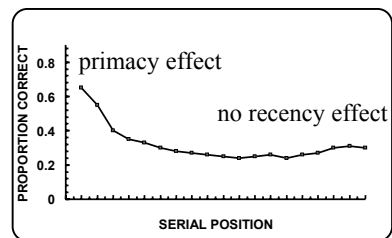
Serial exhaustive search of STM

Serial Position Effect
evidence that STM & LTM are
separate memory systems



(Found in both serial recall & free
recall tasks)

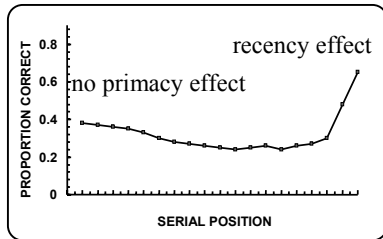
Serial Position Effect
evidence that STM & LTM are
separate memory systems



Delay the recall test (or add an interference
task for 20 sec) no recency effect

Serial Position Effect

evidence that STM & LTM are separate memory systems



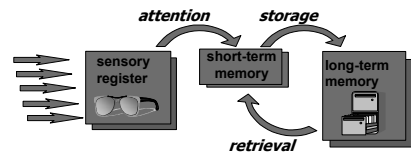
The traditional view of STM
(Primary memory)

A limited capacity memory “buffer”
7 (± 2) discrete items
Full awareness of contents
but STM search is automatic

The longer information stays in the STM
buffer, the better the storage in LTM

Maintenance rehearsal -- repetition keeps info
in STM and helps to transfer it to LTM

The Three Store Model A very tidy system!!



If only we could make these last few
pieces of data fit.....

Preconscious processing Modality effects
Implicit procedural memories
Meaningfulness effects

Look at these problems one at a time

Preconscious processing

Flanker effect

Priming effect

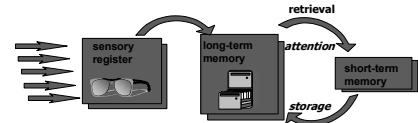
Ironic effects

Subliminal messages

Preconscious processing

*How did the information get into
LTM without us being aware of it?*

Shiffrin's *Active Trace Model* (1976)



ECT studies and sleep studies tended to confirm the
idea of active traces

Active Trace Theories

The Organisation of Behaviour
Donald O. Hebb
(Colleague of Lashley)



Reverberations of neural activity
store information for short periods

Strengthening of connections
between activated neurons store
information over the long term
(Hebbian Learning)

*“Let us assume that the persistence or repetition
of a reverberatory activity (or ‘trace’) tends to
induce lasting cellular changes that add to its
stability... When an axon of cell A is near
enough to excite cell B and repeatedly or
persistently takes part in firing it, some growth
process or metabolic change takes place in one
or both cells such that A’s efficiency, as one of
the cells firing B, is increased.”*

Modality Effects in STM

Word Length Effect

A list of short words is easier to recall than a list of long words

Seven 1 or 2 syllable words

Six 3 syllable words

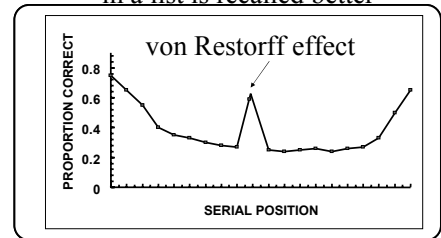
Three or four short phrases

Three longer phrases

*Memory span = all the words
subjects could say in 2 sec
not 7 ± 2*

Modality Effects in STM

An unusual or highlighted item
in a list is recalled better



(Release from proactive interference)

Phonological Similarity Effect

Words in a list that rhyme cause greater interference

Implicit Procedural Memories

*How do we memorise skilled actions
and how are we able to execute them,
automatically, without awareness?*

How to: ride a bicycle, play the
piano, sign your name, etc

Bringing them into STM (making them explicit
actually interferes with the memory!

Levels of Processing Framework

Craik & Lockhart (1972)



Differences between STM and LTM are due to
different *rehearsal strategies*, not different
memory systems

Maintenance rehearsal => fragile

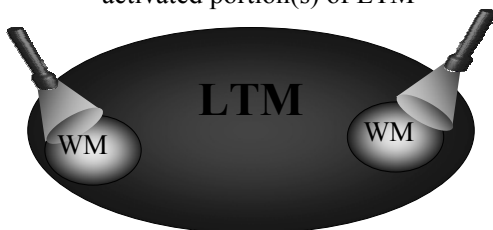
STM

Elaborative rehearsal => stronger LTM

Working Memory

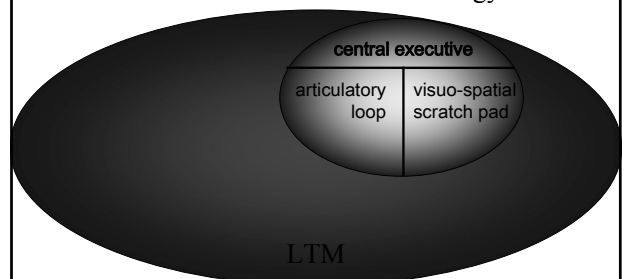
Baddeley & Hitch (1974)

No such thing as STM
Working memory is the most recently
activated portion(s) of LTM



Working Memory

Working memory made up of three components:
articulatory loop – 2 sec phonological loop
visuo-spatial scratch pad
central executive decides best strategy to use



Working Memory

There were a few problems with Baddeley & Hitch's model of Working Memory

Articulatory Suppression Studies: repeat "the, the, the, ..." while memorising a word list

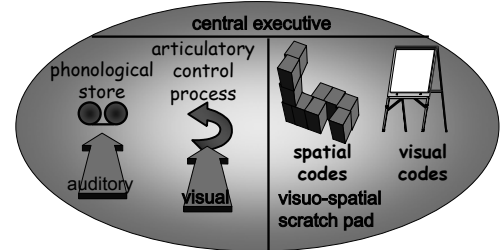
No Word Length Effect for visually presented words (vs. auditory presentation)

No Phonological Similarity Effect for visually presented words

Little retroactive or proactive interference between visual and spatial information

Working Memory

articulatory loop divided into phonological store (2 sec loop) & articulatory control process
visuo-spatial scratch pad divided into sketch pad (images) and spatial codes



Baddeley & Hitch's approach explains more of the research findings than the old 3-store model but still a few problems for Working Memory

Divided attention experiments: *Is there more than one central executive?*

Implicit procedural memories: *How do automatic motor programs work, and why does awareness interfere?*

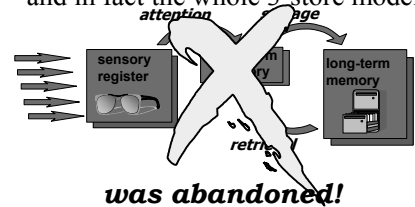
Meaningfulness effects: *Why are some types of stimuli easier to remember?*

Summary -- STM

Short-term memory as workbench with room for 7 ± 2 items wasn't capturing all the research findings!

As more and more evidence mounted,

The concept of short-term memory, and in fact the whole 3-store model



Working memory may be that portion of LTM most recently activated

Could be images, sounds, meanings, motor memory, or whatever

Procedural LTM
scripts & schemas

Declarative LTM
Episodic **Semantic**

There is a limit on how much of LTM can be active

Questions?