Short-term memory (STM)

Chapter 5

Learning Objective Topics

- What is Short Term Memory (STM)?
- What is the capacity of STM?
  - Chunking
- What is the duration of STM?
Information-processing approach

- Sensory memory
- Short-term memory (STM)
- Long-term memory (LTM)
- Encoding
- Storage
- Retrieval

Short-term memory

- Questions
  - Are STM and LTM distinct systems?
  - What is the capacity of STM?
  - What is the duration of STM?
  - How is information retrieved from STM?
- Method
  - List learning
  - Recall or recognition
  - Immediate or delayed
Method: Memory span

- Measure of capacity of STM
- General method
  - Present increasing number of stimuli to repeat
  - 2 or 3 trials for each length
  - "Span" is longest string of stimuli can successfully reproduce
- Tasks
  - Digit span (Forward digit span)
  - Alphabet span, Word span
  - Picture span, Location span ("corsi blocks")

Nature of Short-Term Memory

- Active contents of consciousness
- Active nodes in LTM
- Fast access to contents
- Limited capacity
Learning Objective Topics

- What is Short Term Memory (STM)?
- What is the capacity of STM?
  - Chunking
- What is the duration of STM?

What is capacity of STM?

- Capacity estimates
  - Miller’s “magical” number 7 +/- 2
  - Cowan’s model: 4 items
Nature of Short-Term Memory

When I am done:

Write the letters in the same order as I say them

Answer:

- How did you do?
Nature of Short-Term Memory

Most people can remember ~7 +/- 2 items

What’s an item?

Most people can remember ~7 +/- 2 items
Nature of Short-Term Memory

When I am done:
Write the letters in the same order as I say them

Nature of Short-Term Memory

Most people can remember ~7 +/- 2 items

What’s an item?

A meaningful piece of information (a chunk)
“Magic number seven, plus or minus two”  
(G. Miller, 1956)

Chunk

- unit of knowledge that organizes sub-items
- Remembering part of information assists in remembering the rest
- Capitalizes on knowledge in long term memory (e.g., word meanings)

James the memorious

by Tim Czerwinski

A TASTE FOR PI

Niles-Joyal: "I grew a number, and I was able to remember it in the morning. It was 39 digits long." Photograph: Lee Pellegrini

The 1,000th decimal place of pi is 9. Ask James Niles-Joyal '08. He has memorized pi to the 10,500th digit. "People like doing things they're good at," he says. "If this were singing, I'd be on American Idol. But I'm memorizing digits."

RELATED LINKS
* Math Department Celebrates 4000th Pi Day! [link]

A quick refresher: Pi (which dates back to the second century B.C. in Greece) is the
**Chunking (Erikson & Chase, 1982)**

- Chunking #s as running times
- Had a normal letter span – not a change in STM capacity
- STM is capacity-constrained, but its operation can be supplemented by LTM
- Some tasks tap into multiple processes

**Capacity of STM Gathercole (1999)**

- Examine development of STM capacity
- Method
  - Memory span
  - Stimuli: Digits, words, spatial patterns, etc.
- Results
  - Steep increase to 8yrs
  - Gradual improvement until 12yrs
What is capacity of STM?

- Capacity estimates
  - Miller’s “magical” number 7 +/- 2
  - Cowan’s model: 4 items

Luck and Vogel (1997)

- You will see blocks in a display very quickly
- Then you will see another display.
- Your task is to say if the displays are the same or different. (It is different if the color of a box changes)
Same or different?
Same or different?
Same or different?
Same or different?
Why different capacity estimates?

- What are the differences between these two tasks that could have accounted for different estimates?
Why different capacity estimates?

- It depends on…Rehearsal rate
  - Naveh-Benjamin & Ayres (1986): #s in 5 languages
  - English: numbers are one syllable
  - Spanish/Hebrew: longer numbers
  - Arabic: longest numbers to say
- Which language do you think could remember more numbers?

Why different capacity estimates?

- It depends on…
- Type of information
  - Verbal vs. visuo-spatial
- Chunking
  - Create larger, meaningful units
- Knowledge (long-term memory)
  - Running times
  - Chess players
Learning Objective Topics

- What is Short Term Memory (STM)?
- What is the capacity of STM?
  - Chunking
- What is the duration of STM?
- Coding

What is the duration of STM?

- How long can we remember things if we don’t transfer them to long term memory?
Brown/Peterson & Peterson Task

You will hear 3 letters and then a number. Count backwards by 3 from the number out loud. When I say recall, say the letters that you heard.

How does this test STM duration?
How does this show decay?

Keppel & Underwood (1962)
Analysis of Brown-Peterson task

Finding: More trials -> worse performance
Conclusion: Effect due to proactive interference (PI)
PI: Old learning leads to worse performance on new info
What is duration of STM?

- Decay
  - Info fades
- Interference
  - Proactive interference
    - Previously presented material interferes with new learning
  - Retroactive interference
    - Recent material interferes with older learning
- How do you separate influence of decay vs. interference?
  - Blank interval = rehearsal
  - Busy interval = interference