Week 6.2
Attention
Short-term memory

10/3/2018
Roadmap

• Hemineglect
• Localization of attention in brain
• Memory
• Sensory memory
• Short-term memory
  ➢ Coding
  ➢ Capacity
  ➢ Retention
  ➢ Forgetting
  ➢ Retrieval
Hemineglect

(Source: https://goo.gl/aFuMZv)

Evidence from fMRI

- Zimmermann et al. (2012)
  - Finger tapping sequences
  - Subjects trained to either focus on their finger movements (internal focus “IN”) or the keys they have to press (external focus “EX”)
  - In the scanning session, each group did the same task but with both types of foci.
Evidence from fMRI

• Left primary somatosensory cortex
• Motor cortex
Memory

Diagram showing the processes of memory:
- Detection
- Incoming information
- Visual sensory register
- Auditory sensory register
- Olfactory sensory register
- Short-term memory
- Long-term memory
- Recognition
- Rehearsal
- Categorization
- Recoding
- Reorganization
- Manipulation
- Response output
Memory

• Encoding of input $\rightarrow$ memory trace
• Storage and capacity
• Retrieval
• Forgetting $\rightarrow$ Failure to retrieve memory trace
Memory

Modal model of theory

• Unattended information
  → sensory memory (iconic/visual or echoic/auditory)

• Attended information
  → Short-term memory
  → Long-term memory
Evidence supporting the existence of different types of memory

• Free-recall experiment

*Listen carefully. Memorize as many words as you can*
Evidence supporting the existence of different types of memory

• What factors may affect your recall?
• What are the possible confounding variables?
• Did you use any kind of strategy to help you recall?
Evidence supporting the existence of different types of memory

• What factors may affect your recall?
  ➢ Length of the list
  ➢ Whether you can see the actual object
  ➢ Speed of presentation

• What are the possible confounding variables?
  ➢ Word length
  ➢ Concreteness of words
  ➢ Word frequency
Evidence supporting the existence of different types of memory

• Serial position effect: Primacy vs. Recency effect
Evidence supporting the existence of different types of memory

• Serial position effect: Primacy vs. Recency effect
• Any way to disrupt primacy effect?
  → Speed up the presentation of words (Murdock 1962); recency effect still preserved
• Any way to disrupt recency effect?
  → Ask subjects to do a counting task before stating their recall
Evidence supporting the existence of different types of memory

• Serial position effect: Primacy vs. Recency effect
• Primacy effect: (not-so-) long-term memory
• Recency effect: short-term memory
• Any way to disrupt both recency and primacy effect?
Homework 3

• Replication of free-recall experiment
Sensory memory

Initial storage of “percepts”

• Visual (iconic)
• Auditory (echoic)
• Olfactory (smell)
• Gustatory (taste)
• Tactile (touch)
Iconic memory

• Iconic memory can be as short as one second (Neisser 1967)

• Partial-report technique (Sperling 1960)
  - Without the cue, only recall 35~45%
  - Recall performance improved when cued on what to recall
  - But the timing of cue matters!
  → If the cue is delayed (~ 1 sec), performance won’t improve compared to the whole-report condition (no cue)
Iconic memory

• Exception to the partial-report technique (Neisser 1967)
  - Letters contain both vowels and consonants
  - One cue for vowels and another cue for consonants
  - Recall performance DOES NOT improve when cued by category → Iconic memory formed before categorization
Iconic memory

• Exception to the partial-report technique
  ➢ Recall all the letters that rhyme with C
  ➢ Recall performance DOES NOT improve when cued by category

⇒ Iconic memory is visual, not auditory
How to erase your *icons* from memory?

- Present a *mask* right after the display of letters
Echoic memory

• Auditory

• Moray et al. (1965)
  - Auditory input from 4 channels
  - Strings of letters in each channel
  - Recall all the letters they heard
  - Partial-report also helps recall performance
Echoic memory

• Could be cued by category (Darwin et al. 1972)
• Larger capacity than iconic memory (Crowder 1976)
• Auditory mask (a *suffix*) presented right after the list can hinder recall of items presented auditorily

→ Suffix effect

→ *The interference of suffix is also a function of the similarity between the suffix and the items on the list*
Sensory memory - summary

• Modality specific
• Very brief
• Mostly storage of under-processed information
Short term memory

• Capacity
• Coding: the form of information being stored
• Retention
• Forgetting
• Retrieval
Short term memory

• Capacity
  ➢ Magic Seven (plus or minus two)
  ➢ One strategy for improving storage capacity: chunking

MLBONCBSNNFLONESPN

⇒ top-down process?
Short term memory

• Coding
  ➢ Representation
  ➢ The form of information being stored
  ➢ How do you memorize a string of numbers?
  ➢ Visual input (letters/numbers) → auditory code
    Feet, weed, suite, read, cheat, treat,
  ➢ Phonologically similar items cause poorer recall
Short term memory

• Retention
  ➢ ~ 20 seconds (Brown 1958; Peterson & Peterson 1959)

Try this: You will first see a string of letters. Then you will see a sequence of numbers. Count the numbers backward for 3 secs (e.g., 321, 321, 321, ....etc.) and then recall the letters you saw.
Short term memory

• Retention
  ➢ Peterson & Peterson 1959
  ➢ Trigrams (3-letter strings)
  ➢ 80% of people can recall the letter strings if counting lasts <= 3s
  ➢ Only 7% of people can recall the string if counting lasts >= 18 s.
  ➢ *Encoded info decays in about 20 s*
Short term memory

• Forgetting: Decay vs. Interference
  ➢ Is it the case that the encoded info decays or is interfered by something else?
  ➢ Waugh & Norman (1965)

Probe digit task
Short term memory

• Forgetting: Decay vs. Interference
  ➢ Probe digit task (Waugh & Norman 1965)
  ➢ 16-digit number
    6349203862104932
  ➢ In the example above, recall the number after the first occurrence of “2”. The last number serves as a cue.
  ➢ Two conditions: fast and slow presentation
Short term memory

• Forgetting: Decay vs. Interference
  ➢ Probe digit task (Waugh & Norman 1965)
  ➢ Hypothesis: Slow presentation should yield poorer performance than fast if the claim of information decay is valid.