How can we improve MEMORY?

- Memory is the diary that we all carry about with us. ~Oscar Wilde
- Memory is the primary and fundamental power, without which there could be no other intellectual operation. ~Samuel Johnson
- How do you use your memory everyday? What techniques do you use?
  - Studying for school
  - Remember names
  - Remember list of things to do
- Encoding vs retrieval
  - How does encoding influence retrieval?
Factors that influence memory

• What is required for good memory performance?
• Need to pay attention to encode information
Learn the following list by READING each pair as many times as possible.

- Horse – Table
- Island – Hat
- Door – Note
- Bear – Apple
- Clock – Moon
- Building - Dog
- Basket – Cloud
- Ring – Ship
- Snow – Window
- Pencil – Hammer
- Bread – Car
- Meat - Envelope
RECALL as many words as possible.

- Horse –
- Island –
- Door –
- Bear –
- Clock –
- Building –

- Basket –
- Ring –
- Snow –
- Pencil –
- Bread –
- Meat –
Rehearsal or practice

Higher recall as a function of amount of rehearsal

Rundus (1971)
Primacy effect dependent on rehearsal

Distributed vs. massed practice

Hellyer (1962)
Repetition or rehearsal technique

- Repetition
  - Multiple memory traces
  - Multiple modality repetition
    - Visual and verbal codes for material
- Spacing effect
  - Distributed practice is best for delayed test
  - Massed practice ok for immediate test
- WHY?
  - Attention wanders over long period of time
  - Need time to consolidate info
  - Need to study under different conditions
Levels (or depth) of processing (LOP)

- The “durability of the memory trace is a function of depth of processing.” (Craik & Tulving, 1975)
- IV study condition: Shallow or deep processing
- Interpretations of LOP effect:
  - Attention on meaning
  - Association w/ knowledge
- Problems with LOP
  - Lack of objective index of depth of processing

![Graph](image.png)

Figure 1. Initial decision latency and recognition performance for words as a function of the initial task (Experiment 2).
Jacoby & Dallas (1981)

- **Study**: Levels of processing
  - Physical: contains letter “L”
  - Rhyme: rhymes with “train”
  - Semantic: Is it an animal?
- **Test**: “cold”
  - Explicit: Recognition test
  - Implicit: Perceptual identification test
- LOP effect only for explicit memory!
Rehearsal or practice

Higher recall as a function of amount AND TYPE of rehearsal

Maintenance vs. elaborative rehearsal

Hellyer (1962)
Encoding influences retrieval

- **Question:** What encoding methods can we use to improve retrieval (memory performance)?
- **Method:**
  - Give list of words or pictures
  - IV: memory encoding conditions
  - DV: memory retrieval performance
- **Encoding conditions:**
  - Elaboration: putting words into complex sentence
  - Forming visual images
  - Self-reference effect
  - Generation effect
  - Organizing information: retrieval cues, chunking
  - Testing effect
Self-reference effect

• Rogers et al. (1979)
  • Is memory improved if information is related to yourself?
• Method
  • Shallow: Is the word long?
  • Self-reference: Does the word describe you?
• Results
  • Better memory for self-reference condition
• Conclusion
  • YES!
  • Why?
Generation effect

- Mantyla’s (1986) method
  - Study 600 nouns
  - Generate cues
    - Generate 3 words associated w/ each word
  - Retrieval cues
    - See 3 words associated w/ each word
  - Surprise recall test
    - “w/o study”: performed just test
- Results
  - Better recall for self-generated cues
- Application to studying?
Organization

- Bower, et al. (1969)
  - Is memory better if material is organized?
- Method
  - Present words in a “tree” (1min)
  - Present words in randomized “tree”
- Results
  - Tree format = 73 words
  - Random format = 21 words
- Conclusion
  - Yes!
  - Categories serve as cues
Imagery

- Bower & Winzenz (1970)
  - Can imagery enhance memory?
- Method
  - Paired-associate learning
    - 15 pairs of nouns
  - Conditions: Silent repeat or mental picture
- Results/Conclusions
  - YES!
  - WHY?

![Graph showing percent correct recall for Repetition group and Imagery group. The Imagery group has a much higher recall rate.](image-url)
Mnemonics: Dual-coding technique

- Dual-coding hypothesis
  - Verbal representation
  - Visuospatial rep.
- Example acronym:
  - The Great Lakes: HOMES
- Effective visualization
  - Interactive
  - Vivid
  - Bizarre
Learn the following list by creating a vivid and bizarre interaction of the 2 items.

- Road – flower
- River – table
- Bird – fruit
- Rain – rock
- Dress – money
- Cow – paper
- Box – garden
- Book – cup
- Ice – train
- Fence – letter
- Egg – chair
- Paint – hammer
RECALL as many words as possible.

- Road –
- River –
- Bird –
- Rain –
- Dress –
- Cow –
- Box –
- Book –
- Ice –
- Fence –
- Egg –
- Paint –
Image–name mnemonic

• Use mnemonic to remember name with face
  • Think of vivid word that sounds like name
  • Link word with person’s appearance

• Example
  • Rodney Flanery
  • Image: Football player with rod in his knee, so benched and wearing flannel to stay warm

• Create one for your own name!
Keyword mnemonic

• Use to learn new or foreign language words
  • Think of vivid word that sounds like to-be-remembered word
  • Link vivid word with meaning
• Example
  • “Pato” – spanish for duck
  • Image: Pot on top of Donald duck’s head
• Example
  • Skulk – to hide in a sneaky manner
  • Image: Skull tip-toeing and hiding behind a couch
Method of Loci

- Used by Greek orators
  - Combines imagery and organization

1. Memorize familiar locations in natural order
2. Create visual image of word with each location
3. Recall: take a “mental walk”

“In the first place…”
First, memorize the locations in order…

- Olin
- DuPre
- Main
- Snyder
- Library
- Carlisle
- Daniel
- Milliken
- Burwell
- Shipp
Then link each TBR item with location…

<table>
<thead>
<tr>
<th>Olin</th>
<th>Apple</th>
</tr>
</thead>
<tbody>
<tr>
<td>DuPre</td>
<td>Piano</td>
</tr>
<tr>
<td>Main</td>
<td>Hammer</td>
</tr>
<tr>
<td>Snyder</td>
<td>Cake</td>
</tr>
<tr>
<td>Library</td>
<td>Planet</td>
</tr>
<tr>
<td>Carlisle</td>
<td>Pizza</td>
</tr>
<tr>
<td>Daniel</td>
<td>Kite</td>
</tr>
<tr>
<td>Milliken</td>
<td>Bus</td>
</tr>
<tr>
<td>Burwell</td>
<td>Butterfly</td>
</tr>
<tr>
<td>Shipp</td>
<td>Scissors</td>
</tr>
</tbody>
</table>
Then take mental walk through locations to remember each item...

- Apple
- Piano
- Hammer
- Cake
- Planet
- Pizza
- Kite
- Bus
- Butterfly
- Scissors

- Why helps?
  - Organized
  - Visualization
  - Locations are retrieval cue
  - Associations
  - Deep processing (meaning)

- Helpful for serial learning
  - But can also remember out of order

- Need distinct locations
- Need strong association
Peg-word technique

1: Use memorized concrete nouns
   - Rhyming helps to remember words and order

2: Create visual image of target word with peg-word
Why mnemonics work

- Attention
  - Ensure encoding
- Rehearsal
  - Spaced repetition
- Depth of processing
  - Make info meaningful
  - Notice similarities and differences
  - Use existing knowledge – top-down effects
- Elaboration
  - Think about *meaning* and make info distinctive
- Generation
  - Make it personal
- Dual-coding cues
  - Verbal and visual representations
- Organization
  - “chunks”
- Retrieval cues
Limitations of Mnemonics

• Time consuming
• Difficult to deal with abstract material
• Need creative ability
• Interference effects (if using same mnemonic)
• Doesn’t help memory in general
• Does not necessarily help understanding of material
• Need to practice mnemonics!
Long-term memory

“How does info become encoded/stored in LTM?”
- Rehearsal/practice
- Levels of processing
- Forming connections or associations
- Imagery
- Self-reference effect
- Generation effect
- Organization of info

“How do we retrieve info from LTM?”
- Retrieval cues
- Encoding specificity / State dependent learning
- Transfer appropriate processing