Memory

We seem to be unable to control our memories

• learn things we don’t want to remember
• unable to learn things we want to remember

Is there any reliable cue that something will be remembered?

• no
• but there are several tricks you can use to improve memory in certain situations

Memory trick - grouping

• We often hear of people memorizing pages of the phone book
  • how do they do it?
  • some cheat (frauds)
  • others take advantage of organization and memory tricks
• SF learned to increase his digit span to 79 digits (any random sequence)
  • 230 hours of practice (over 20 months)
• Ericsson, Chase & Faloon (1980)

SF: Digit span

• Broke down and organized each digit list
• Long-distance runner
  • sequence like 3492 converted to “3 minutes 49.2 seconds - near world record time”
• Eventually created a hierarchy of tricks (ages, dates)
• Technique did not transfer to other memory tasks (e.g., letters)

Method of loci

• Used by ancient Greeks to remember complicated speeches
• To remember a list of words or key ideas
  • visualize walking around an area with distinctive landmarks
  • link the items to be remembered with landmarks by using bizarre mental imagery
  • to recall items in order, mentally walk through area
  • (any ordered sequence will work – e.g., a children’s rhyme)
• Memory piggybacks on the easy recallability of the bizarre imagery

e.g., grocery list

<table>
<thead>
<tr>
<th>ITEMS</th>
<th>LOCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>hot dogs</td>
<td>driveway</td>
</tr>
<tr>
<td>cat food</td>
<td>garage interior</td>
</tr>
<tr>
<td>tomatoes</td>
<td>front door</td>
</tr>
</tbody>
</table>

Add vivid, bizarre imagery
**Peg word system**

- Associate items in list with a previously memorized list

  One is a bun.  
  Two is a shoe.  
  Three is a bee.  
  Four is a door.  
  Five is a hive.  

  Six is a stick.  
  Seven is a heaven.  
  Eight is a gate.  
  Nine is a line.  
  Ten is a hen.

**“Hook” to be remembered items to the list**

- Visual imagery helps again!

<table>
<thead>
<tr>
<th>ITEMS</th>
<th>Peg word</th>
</tr>
</thead>
<tbody>
<tr>
<td>milk</td>
<td>bun</td>
</tr>
<tr>
<td>bread</td>
<td>shoe</td>
</tr>
<tr>
<td>bananas</td>
<td>tree</td>
</tr>
</tbody>
</table>

**Link word method**

- Foreign language vocabulary
  - find an English key word that sounds like some part of the foreign word
  - form a mental image of the key word interacting with the English translation of the foreign word
  - E.G.
    - patio -> Spanish for “duck”, sounds like “pot-o”  
      - imagine duck with pot on its head
    - zronok -> Russian for “bell”, sounds like “zrahn-oak”  
      - imagine an oak tree with bells as acorns

**In a study of learning 120 Russian words (Atkinson & Raugh, 1975)**

- Two groups
  - Control: heard Russian words, saw English translation
  - Experimental: heard Russian words, saw English translation, saw key words, and applied method

- Experimental group learned more words faster and for longer
  - 6 weeks later
    - Experimental (43% correct)
    - Control (28% correct)

**Mnemonists**

- Some people seem to have extraordinary memories
  - Professional - apply one of the techniques we’ve discussed
  - Spontaneous: seem to not consciously apply a technique

- Photographic memory?
  - Few documented cases
  - Generally, not happy outcomes
S.: Luria

- Luria: Russian psychologist
  - met S in 1920s
- S
  - able to recall without error a list of 70 words
    - took 2-3 minutes
    - able to report it again several months later
  - other unusual characteristics

Brain Training

- Several companies market activities to make you smarter
  - "Exercise" your brain with games that are adapted from neuroscience
  - Does that even make sense?
  - Often aimed toward elderly (Alzheimers) and young children

Brain Training

- Much of the hype comes from a study that trained people for a few hours on a dual n-back task (Jaeggi et al., 2008)
  - Does the current stimulus match the one from n trials back?
  - n is adjusted for each person so the task is always demanding
  - n is also a measure of how well subjects do the task
  - Subjects do get better at the n-back task with training
Brain Training

- Transfer effects for a measure of fluid intelligence (refers to the ability to reason and to solve new problems independently of previously acquired knowledge)
  - Training group does better than a control group
  - Amount of training time is related to gain in intelligence

Brain Training (WARNING!)

- Redick et al. (2013) cautions:
  - The conclusions are based on 4 small studies that varied in many ways
    - It is probably a mistake to average scores across these studies
  - Some selective reporting of measures of fluid intelligence
    - Measures that did not show an effect were not reported
  - No comparison to an “active control”
    - Where subjects complete a training task that should not improve fluid intelligence

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Brain Training (WARNING!)

- In October 2014, a group of memory researchers released a statement with the following summary:
  - We object to the claim that brain games offer consumers a scientifically grounded avenue to reduce or reverse cognitive decline when there is no compelling scientific evidence to date that they do. The promise of a magic bullet distracts from the best evidence to date, which is that cognitive health in old age reflects the long-term effects of healthy, engaged lifestyles. In the judgment of the signatories below, exaggerated and misleading claims exploit the anxieties of older adults about impending cognitive decline. We encourage continued careful research and validation in this field.

- You should be similarly skeptical about claims for improving attention, perception, and other mental capabilities
  - Playing video games does not seem to improve your attention or perception
- You can improve performance on specific tasks, but that does not typically transfer to other tasks
- You can make yourself smarter by learning new information

Sleep

- Many types of memory improve with sleep
- Some type of “consolidation” of memories
- The effect is not just time
  - Although time also has an effect
- We’ll look at one representative study
  - Ellenbogen et al. (2007)

Subjects learn to identify order relationships between “random” shapes
- Only shown one pair at a time
- Subjects have to learn/memorize the appropriate answer to each pair

Sleep

- There is an ordered arrangement to the stimuli
  - If you know this arrangement, deciding for any pair is easy
  - But subjects are never explicitly told about this arrangement

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Sleep

- Subjects are split into three groups, according to when they are tested:
  - 20 minutes later
  - 12 hours later
  - 24 hours later
- No differences when tested on the originally studied items.

Big differences when tested on new pairs that fit the ordered structure:
- E.g., A>C, C>E, B>D

Half of the 12-hour group had sleep and half did not.

It makes a difference for pairs of items that are far apart in the ordered structure:
- 1-degree: A>C, B>D,...
- 2-degree: A>D, B>E,...

Advice:
- Study early!
- Get some sleep!

Next time
- Mental representation
- Prototypes
- Exemplars
- Propositions
- CogLab on Prototypes due!
- What is a shoe?

Conclusions
- Lots of ways to improve memory:
  - Method of loci
  - Imagery
  - Mnemonics
  - Brain training
  - Sleep