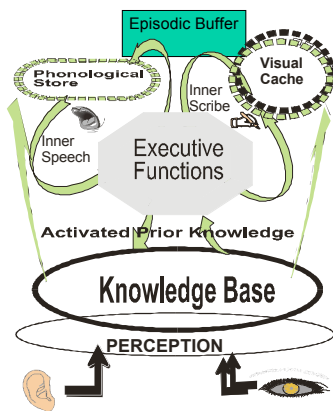


Memory

Intro Psychology
Georgia Tech
Instructor: Dr. Bruce Walker

Multiple Forms of Memory?

- Memory for short periods of time seems to be different than memory for longer periods of time
- Brain damage can disrupt some kinds of memory but leave other kinds unaffected.
- Some things seem easy to remember and some things really difficult.



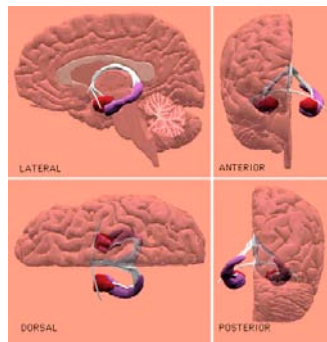
Donald O. Hebb

- Reverberations of neural activity store information for short periods
- Strengthening of connections between activated neurons store information over the long term (Hebbian Learning)



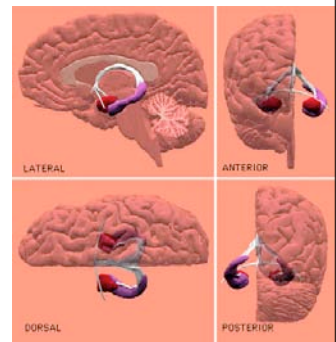
Temporal Distinctions in Memory

- Retention of information over short periods of time depends on specific brain regions.
- Hippocampus and surrounding cortex



Temporal Distinctions in Memory

- Over time, hippocampus appears to become less important.
- Memories become more dependent on cortical areas, less on hippocampal regions



Damage to Hippocampus and Associated Areas.

Hippocampus nearby areas

- quick acquisition of information.
- Can't store the information forever.

Cortical areas

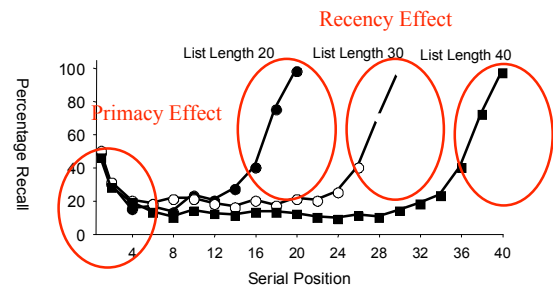
- slow acquisition of information.
- much longer term storage.

Learning Lists of Words

- Present a list of words
- After presentation, a signal to recall is given and subjects attempt to recall as many as possible.
- Plot the probability of recall for words as a function of their position in the list (serial position)

Barbara Bush
Peter Smith
Bill Kingstone
Kate Moss
Susan Sarandon
Warren Albert
Shelby White
Danielle Steele
Linda Hamilton
Olaf Meyer
Bart Kiele
Emily Dickinson
Oscar Blanc

Serial Position Curve



Murdock (1962)

Working Memory

- “A system for temporarily holding and **manipulating** information as part of a wide range of essential cognitive tasks such as learning, reasoning, and comprehending”

Baddeley (1990)

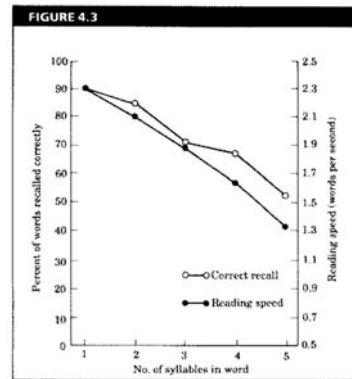
Phonological Loop

- Phonological loop functions very similar to overt speech
- Subjects can generally remember about as many words as they can say in 2 seconds.
- Is this meaningful?
 - Is memory span influenced by speaking rate?

Phonological Loop - Mental Rehearsal

- Phonological Similarity
 - 1 Z L Q N K S J
 - 2 P B V C T D G
 – Note: 2 is more difficult than 1
- Word Length
 - 1 bus clock spoon fish
 - 2 refrigerator hippopotamus
 - 3 Friday Typhoon versus Cricket Wicket

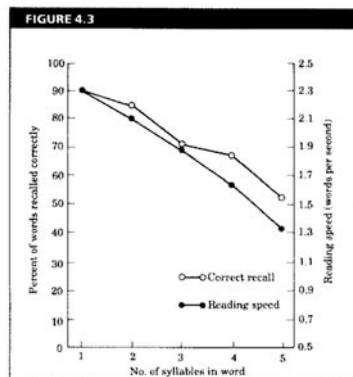
Phonological Loop



Word Length Effect:

Longer words take longer to say, shorter memory span.

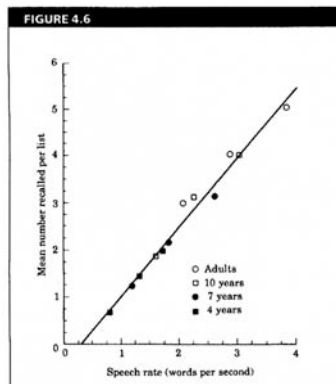
Phonological Loop



Word Length Effect:

Also, memory span for 2 syllable, long words (e.g., furlough) is less than for 2 syllable short words (e.g., bishop)

Phonological Loop



As children get older, overt speaking rate increases and this tracks closely to their increase in memory span.

Visuospatial Memory

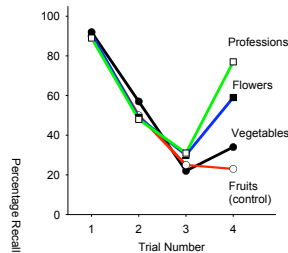
- Not quite as nicely developed
- Some interesting analogies with the phonological loop but just not much research.
- Definitely seems to be something different

Proactive Interference

- Previous items interfere with current memory set.
- Previous items are confused with current memory set, and they are more likely to be recalled.
- Reduce interference by making items more distinct?

Release from Proactive Interference

- Wickens (1972)
 - Presented FRUITS for first 3 trials
 - Either switch (75%) or continue with same.
 - Big increase in performance on 4th trial with switch.
 - Amount of increase inversely related to similarity



What does all of this research suggest?

- Similarity is bad – causes interference
- Distinctiveness helps make individual memories easier to recall.

Encoding Specificity

- What kinds of things serve as cues?

Godden & Baddeley (1975)

Memory capacity of deep sea divers.

Learn lists of words:

On the beach

Under 15 feet of water.

Tested:

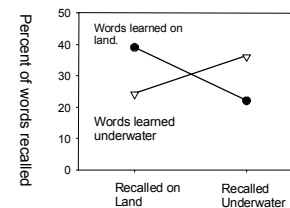
On the beach

Under 15 feet of water.

Encoding Specificity

- What kinds of things serve as cues?

Godden & Baddeley (1975)



State Dependency

- Recall is better when individuals are in the same emotional and physical state as they were in during learning.

Test

Ordinary Marijuana

| Study | Cigarette | Cigarette | Average |
|---------------------|-----------|-----------|---------|
| Ordinary Cigarette | 25% | 20% | 23% |
| Marijuana Cigarette | 12% | 23% | 18% |

Eich (1975)

Getting Stuff in for the Long Haul

- Hyde & Jenkins (1973)
 - Presented a list of words
 - 3 Different Instructions:
 - Study words for a later memory test
 - Rate the Pleasantness of the words (not told of any test)
 - Count the number of letters in the word
 - What is the effect of processing words on later memory performance?

Getting Stuff in for the Long Haul

- Hyde & Jenkins (1973)

Intentional Learning - 69% of words recalled

Incidental Learning - Pleasantness, 68%

Incidental Learning - Count letters, 39%

Levels of Processing

- Craik and Lockhart, U of Toronto
 - Any perceived stimulus is processed
 - Stimuli may be processed at an incidental, “shallow” level. (e.g., maintenance rehearsal using the phonological loop)
 - Alternatively processing may be intentional, focused on meaning.
 - Deeper gives better memory performance than shallow.

Levels of Processing

- Craik & Tulving (1975)

Answer questions about words

- Semantic: “Is the word a type of fish? – SHARK”
- Rhyme: “Does the word rhyme with park – SHARK”
- Orthographic: “Does the word start with S – SHARK”

Levels of Processing

- Craik & Tulving (1975)

Answer questions about words – Recognition results

- Semantic: 73%
- Rhyme: 56%
- Orthographic: 17%

(note: these scores are corrected Hits – False alarms, chance performance is 0%)

False Recall

| | | |
|----------|----------|-----------|
| low | hill | thread |
| clouds | valley | pin |
| up | climb | eye |
| tall | summit | sewing |
| tower | top | sharp |
| jump | molehill | point |
| above | peak | prick |
| building | plain | thimble |
| noon | glacier | haystack |
| cliff | goat | thorn |
| sky | bike | hurt |
| over | climber | injection |
| airplane | range | syringe |
| dive | steep | cloth |
| elevate | ski | knitting |

False Recall

- Remember versus Know Judgements
 - Roediger & McDermott asked subjects if they:

Remember: Items for which they have a vivid memory of the actual presentation

Know: items that they were sure had been presented but for which they lacked specifics.

Memory Distortions

- Elisabeth Loftus (1974)
 - Students viewed films depicting vehicle accidents.
 - After each film, students asked to give an account of the accident they just saw.
 - Questions were asked to elicit additional information.



Memory Distortions

- Elisabeth Loftus (1974)
 - “How fast were the cars going when they _____ each other?”
 - “hit”, “smashed into”, “collided with”, “bumped”, “contacted”
 - Later question asked students to report the speed of the car.

Memory Distortions

- Elisabeth Loftus (1974)

| <u>Verb</u> | <u>Mean Speed Estimate</u> |
|-------------|----------------------------|
| Smashed | 40.8 |
| Collided | 39.3 |
| Bumped | 38.1 |
| Hit | 34.0 |
| Contacted | 31.8 |

Memory Distortions

- Elisabeth Loftus (1974)
 - One week later, students were asked if they saw broken glass (no films showed any broken glass)
 - 32% of “smashed” students said yes
 - 14% of “hit” students said yes

Memory Distortions

- Loftus & Coan (1993)
 - Participants read detailed descriptions of four events.
 - 3 events were actually from their childhood, 1 event (being lost in a shopping mall) had never occurred.

Memory Distortions

- Loftus & Coan (1993)
2 weeks later, 25% of participants reported high levels of confidence in their memory of being lost.

Memory Distortions

- Loftus & Coan (1993)
“I was with you guys for a second and I think I went over to the toy store, the Kay-bee toy and uh, I got lost and I was looking around and I thought “Uh-oh. I’m never going to see my family again. I was really scared you know. And then this old man, I think he was wearing blue flannel, came up to me. ... he was kind of old. He was bald on top...”

Eye Witness Testimony



The Sleeper Effect

- Information from low credible source is rated as having low credibility.
- Over time, the source of the information is lost, and the information becomes rated as more credible.
- In other words, lose details like source, but we keep enough information to be misled.

Mere Exposure

“Because you see,” says Bloom, “for an advertisement you must have repetition. That’s the whole secret.”

James Joyce from Ulysses

Bob Zajonc, Stanford University

Simple repetition of a stimulus can result in a shift in preference toward the repeated stimulus.



Memory Distortions

- Memory reports are combinations of
 - Information from original event
 - Person’s background knowledge and schemas (Bartlett)
 - Information presented after the event
- Implications
 - Accuracy of eye witness testimony
 - Identification of criminals from photos or a lineup.
 - Recovered memories

What function is served by having two types of memory?

- Similarity is bad.

- Similarity is good.

What function is served by having two types of memory?

- Semantic similarity is bad if you want very specific information

- Semantic similarity is good if you want to acquire and retain useful, general knowledge.

What function is served by having two types of memory?

- Hippocampus and surrounding structures
 - Fast acquisition of information
 - little overlap in representations to help reduce interference
- Cortical Brain Areas
 - Slower acquisition of information
 - highly overlapping representations to allow generalization

But let's not go overboard

- Imagine a library with limited money, people, and space.
- To save money, it is decided to remove books that are not useful for students and faculty.
- How do you identify those books?