Memory

Chapter 8
If you could have your memory of any part, event, period, instance, etc. of your life erased what would you choose and/or would you do it?

In your everyday life, what sorts of strategies do you use to help you remember things you don’t want to forget? (e.g. studying for a test, remembering all the things you must do in a day, attempting to remember the name of someone whom you have just met, etc.)

How, or why, do you think these strategies work or not work for you?
In your everyday life, what sorts of strategies do you use to help you remember things you don’t want to forget? (i.e. studying for a test, remembering all the things you must do in a day, attempting to remember the name of someone whom you have just met, etc.)

How, or why, do you think these strategies work or not work for you?
What is Memory?

- If technological advances would allow it, would you ever want to intentionally get rid of memories of some specific events?
- If you were a Holocaust survivor, would you want that memory erased?
Introducing Memory
The Phenomenon of Memory

*Introduction

*Information Processing
Can you name...

- On paper, write down the 7 dwarfs BE SILENT!!!!

- **Difficulty of task**
  - Easy or hard for you...why?

- **Tip of the tongue phenomenon**
  - Did you feel that you knew a name but couldn’t retrieve it?
  - What did you know about it?
    - Syllables?
    - Beginning letter? (s and d occur most frequently)
    - Meaning / connotation?
7 Dwarfs

- **Organization by sound, letter, and meaning**
  - Were wrong responses similar in sound? 5 of 7 end in y-sound & have 2 syllables
  - Did you recall Lazy, Clumsy, Droopy, or Grouchy? They are similar in meaning to the real names!
  - Most likely to be recalled vs. least = Sleepy, Dopey, Grumpy, Sneezy, Happy, Doc, and Bashful
  - Most likely to recall the 5 rhymers in a row (orgo by sound)

- **Recall vs. Recognition**
  - Recall is a 2-step process (generation of targets and identification of correctness)
  - Recognition eliminates the 1st step
7 Dwarfs

- Which “store” of memory did we access when I asked you this question?
  - LTM

- What is this process of accessing this info called?
  - RETRIEVAL

- Now, turn paper over and write down the 7 dwarfs again!

- Now, which “store” of memory is the information being “retrieved” from?
The Case of Clive Wearing

- Types of Memory
  - Episodic is totally gone
  - Procedural is still there though!

http://www.youtube.com/watch?v=Vwigmktix2Y
Write down in a sentence or two each of your most vivid memory from your life.

How many remember the moment when:

- 9/11 occurred
- Shootings at Virginia Tech?
- Death of Osama Bin Laden?

Often, these societal event type of memories can be somewhat constructed (inaccurate) in our minds because of other people’s accounts of the same events.

Actually, however, most flashbulb memories (and more accurate ones) are of personal events:

- Car accident
- Early romantic experience
- First public speaking performance
- First airplane flight
- First time your parents left you alone

Defined: clear memories of emotionally significant moments or events and thus differ from other memories in their striking clarity.
Close your eyes
Imagine a standard loaf of bread
Estimate its size with your hands and freeze
Open your eyes
Near and Far Sighted individuals both overestimate the object’s size
Blind participants are the MOST ACCURATE!
WHY?
Blind people do not rely on visual memory! Rather, they rely on manual representations. Therefore, we can assume then that visual memory is not a true reflection of reality.
INFO PROCESSING: 3 Box Model

- Atkinson & Shiffrin (1968)
- Sensory stores = split second holding tank

Sensory stores

Some info lost

Short-term memory
aka "primary memory"
aka "working memory"
aka "attention"

Some info lost

Long-term memory
also known as "secondary memory"
Storage is at the heart of memory. Three stores of memory are shown below:

- **Sensory Memory**
  - Encoding

- **Working Memory**
  - Encoding
  - Retrieval

- **Long-term Memory**

Notice: Working memory is the new name of STM because it emphasizes a more active role of REHEARSAL and association with existing memories.
Stages of Memory: 3 Processes

Keyboard (Encoding)
Disk (Storage)
Monitor (Retrieval)
Sequential Process
Encoding: Getting Information In

*How We Encode
*What We Encode
Rehearsal

- An executive process (effortful rather than automatic) in working memory
- In other words, its *consciously controlled*
- **Example in Gray**
- Can you name all the presents in the "12 Days of Christmas?"
- Let’s create a frequency chart (pg.8)
Serial Position Effect

- Remember the following list of groceries:
- Which did you recall?
- First 1/few = Primacy effect
- Last 1/few = Recency effect
- Together, this makes up the *serial position effect*

Similar effects include:

- Next-in-line effect: tendency to forget what the person ahead of us in line has said b/c we are focusing on what we will say in our upcoming turn to speak

- Spacing effect: given equal amounts of time, it is easier to retain info if we practice it repeatedly vs. 1 long session (TRY IT OUT w/ AP Psych vs. some other less important class!)
DON’T GO ON UNTIL THE EXPERIMENT IS COMPLETE!

- Control: 2-14 typically right
- Imagery Group: 12-20 typically right

Lesson: visual encoding (imagery) is usually better than acoustic encoding
The Self-Reference Effect

- Number a scrap sheet of paper 1-18.
- I will read a list of adjectives.
- CIRCLE the # of any of the adjectives if you feel it describes you.
- Good...we’ll come back to this later...put it away.

LATER

- Write down any of the 18 adjectives I read aloud, regardless of whether you circled its corresponding circle.

WHY?

- Even more elaborate than visual or auditory or semantic! The self is one of the most highly elaborated structures in memory...therefore, tying the adjective to yourself would provide the most access points to that info later
- DEFINED: making info “relevant to me” forces deeper processing and therefore allows for easier access
Adjectives...

1. Forceful
2. Quiet
3. Generous
4. Dominant
5. Tender
6. Loyal
7. Independent
8. Compassionate
9. Adaptable
10. Courageous
11. Cheerful
12. Secretive
13. Principled
14. Romantic
15. Responsible
16. Dynamic
17. Forgiving
18. Careful
Now, we’ll do an exercise about encoding based on meaning.

I will read a passage. When I say so, write down as much as you can remember (word for word as much as possible)

Half the room GET OUT!

DON’T GO ON UNTIL THEY ARE OUT!

Tell students in room “THE CONTEXT IS KITE FLYING.”

Have other students come back in

Even a simple sentence is easier to recall with context and meaning.

Read page 11 bottom (1), (2), and (3)
Distribute Handout 9-5
KEEP UPSIDE DOWN...
Turn the handout over and study the two figures (briefly)
B is, “An early bird who caught a very strong worm.”
Give me back the pictures
DON’T GO ON UNTIL LATER!
LATER: recall them both by writing the figures down on a scrap paper
Which one is recalled better? WHY?
1st Trial: Remember this list: tiger, butterfly, iced tea, sweat, monkey, flag, newspaper, iPod, fire, Iraq, dwarf

2nd Trial: B: Remember this list: time, peace, store, clean, arrogant, stereo, principle, deserve, love, direction, science

Which is easier to remember? WHY?

DEFINED: We remember words that lend themselves to picture images better than we remember abstract, low-image words.
Mnemonic Devices

- I need some volunteers to orally create a list of 10 concrete objects.
- 1 at a time please
- As each is said, I need a volunteer to write each in order behind the screen. WRITE CLEARLY!
- SILENTLY!!! Remember them.
- Recall them by writing them down in order.
- Does Mr. Miller remember them? Let’s find out.
Peg Word System

One is a bun.
Two is a shoe.
Three is a tree.
Four is a door.
Five is a hive.
Six is a pile of sticks.
Seven is heaven.
Eight is a gate.
Nine is a line.
Ten is a hen.
Method of Loci: Simonides

- Places: baseball field positions (or any sport), rooms of your house, places along your drive to school
The Key Word Method

- Useful for parts of the brain perhaps?
- USE IT if you can remember the mental pictures
- Distribute copies of page. 13 chart
Chunking

- How many sentences are there in the Pledge of Allegiance?
- 1!!!
- Half the room leave...
- Control: Remember the following list of 12 numbers...recall on paper when I say so
- Experimental: Other half also remember the list...recall on paper when I say so
- Defined: clustering of info into familiar, manageable units, such as 757-235-5692
Storage: Retaining Information

* Sensory Memory
* Working / Short-Term Memory
* Long Term Memory
* Storing Memories in the Brain
**Iconic Memory**

- Time Dependent: *PSYCH SIM 5 or other powerpoint*
- KNOW THIS EXPERIMENT: George Sperling’s 3x3 matrix of letters
- Free recall of all 9, 44% accuracy
- Directed recall (through a tone) = approaches 100% accuracy
- Time delayed directed recall = 33%
- What does it prove exactly?
  - We have a sensory memory store that allows iconic memories to be stored for a very brief period
  - If it is not processed immediately, it is erased / never makes it to working or long term memory

**DEFINED**: momentary sensory memory of visual stimuli, a photographic or picture-image memory lasting less than a second

[http://bcs.worthpublishers.com/gray/content/psychsim5/launcher.html](http://bcs.worthpublishers.com/gray/content/psychsim5/launcher.html)
The exposure time for the stimulus is so small that items cannot be rehearsed.

George Sperling (1960)

```
R  G  T
F  M  Q
L  Z  S
```

“Recall”

R T M Z

(44% recall)

50 ms (1/20 second)
Sperling (1960) argued that sensory memory capacity was larger than what was originally thought.
## Time Delay

<table>
<thead>
<tr>
<th>A</th>
<th>D</th>
<th>I</th>
<th>N</th>
<th>L</th>
<th>V</th>
<th>O</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
</table>

**50 ms (1/20 second)**

- **Low Tone**
- **Medium Tone**
- **High Tone**

- **“Recall”**
  - N _ _
  - (33% recall)
The longer the delay, the greater the memory loss.
The duration of sensory memory varies for the different senses.

- **Iconic**
  
  0.5 sec. long

- **Echoic**
  
  3-4 sec. long

- **Hepatic**
  
  < 1 sec. long

**Echoic Memory Example:**

Person 1: “What time is it?”

Person 2: “What did you say? Oh, 2:30”

Echoic memory holds the sound of the question for 3-4 sec. You can “hear” the words when you turn your attention to them!

**THIS IS ANNOYING!**
Working Memory

- Sensory Memory
- Working Memory
- Long-term Memory

Events → Sensory Memory → Working Memory → Encoding → Retrieval → Long-term Memory
Working memory, the new name for short-term memory, has a limited capacity \((7\pm2)\) and a short duration \((10-30\text{ seconds})\).

Sir George Hamilton observed that he could accurately remember up to 7 beans thrown on the floor. If there were more beans, he guessed.
Memory Capacity

- I will read a series of numbers.
- Your job is to remember them as I say them and them recall and write them all down in order when I say so
- "Ready?" "Recall," are the cues (14)
- Mean for the class should approach 7+/- 2
  - Recall for random digits is slightly better than for random letters (also slightly better for info we hear vs. see)
- Time Dependent: Psych Sim 5: STM
- Memento: We may watch this at the end of the year!
  - Chapter 3 (6:25 to 11:05) It’s Like Waking
  - Chapter 6 (22:15-28:28) Memories Can be Distorted
The Magical Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information (1956).

Ready?

M U T G I K T L R S Y P
You should be able to recall 7±2 letters. But, you can get more if you practice!!!
"Example in Gray"

George Miller
Who can recite the most digits of Pi?

U of Tennessee psychologist from India can recite the first 31,811 digits of Pi!! (Read 15)

Says he can’t explain how he does it, but observationally we see that he rocks his chair rhythmically and taps his feet

Strangely, it’s over for #'s. He is quite average for faces, names, words

Please remember the following sequence of 30 numbers in order! (Lift the screen) (15)

- 4-9 average
- 10-19 good to extraordinary
- 20-30 brilliant

Brain: #20 "A Super-Memorist Advises on Study Strategies"
Effortful learning usually requires rehearsal or conscious repetition.

Ebbinghaus studied rehearsal by using nonsense syllables: TUV YOF GEK XOZ

Hermann Ebbinghaus (1850-1909)
Storing Memories

- Brain 2-16: The Locus of Learning and Memory
- Brain 2-18: Living with Amnesia: The Hippocampus and Memory
- Brain 2-17: Learning as Synaptic Change
- Psych Sim: When Memory Fails
Long-Term Memory

- Sensory Memory
- Working Memory
- Long-term Memory

Events → Encoding → Retrieval
Unlimited capacity store. Estimates on capacity range from 1000 billion to 1,000,000 billion bits of information (Landauer, 1986).

The Clark’s nutcracker can locate 6,000 caches of buried pine seeds during winter and spring.
# Memory Stores

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<td>Encoding</td>
<td>Copy</td>
<td>Phonemic Visual Rehearsal Attention</td>
<td>Semantic</td>
</tr>
<tr>
<td>Capacity</td>
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Hippocampus

Hippocampus / temporal lobe:
a neural center in the limbic system that processes explicit memories.

Remember Clive Wearing? He had encephalitis. Lost explicit, but not implicit memory.
Explicit memories (declarative) = conscious memories of facts or events we actively try to remember

*Types of explicit:*
- Semantic = general knowledge of the world, stored as facts, meanings, or categories (What is the meaning of the word “dubious?” or What is the capital of Florida?)
- Episodic = specific events (When did you last go out on a date?), information linked to their identity (*think:* This was an event in my life.)
Cerebellum – a neural center in the hindbrain that processes **implicit** memories.
Implicit memories (nondeclarative) = unintentional memories that we might not even realize we have.

- **Types of Implicit:**
- Procedural = skills and how to perform them, often difficult to put into words (How does one shoot a free throw?)
Explicit Memory refers to facts and experiences that one can consciously know and declare. Implicit memory involves learning an action while the individual does not know or declare what she knows.
Eidetic (Photographic) Memory

- Alexandra Luria studied this
- Found a patient who could repeat a list of 70 letters or digits up to 15 years after hearing it ONCE!!!
- This occurs extremely rarely!
Anterograde Amnesia

After losing his hippocampus in surgery, patient Henry M. (HM) remembered everything before the operation but cannot make new memories. We call this anterograde amnesia.

WHAT ARE YOU BEING TESTED ON???? THAT WILL TELL YOU WHETHER IT’S ANTERO OR RETRO GRADE AMNESIA

Anterograde Amnesia (HM)

<table>
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<th>Memory Intact</th>
<th>No New Memories</th>
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<td>Surgery</td>
<td></td>
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</table>
HM is unable to make new memories that are declarative (explicit), but he can form new memories that are procedural (implicit).

HM learned the Tower of Hanoi (game) after his surgery. Each time he plays it, he is unable to remember the fact that he has already played the game.
Retrieval:
Getting Information Out

*Retrieval Cues
Distribute 8-7a to everyone...
Study for 1 minute
Distribute 8-7b to \( \frac{1}{2} \) of students
Recall as many of the sentences as possible
I will show you a set of words. Try to remember as many as possible. (pg. 18)

DON’T GO ON UNTIL THIS IS DONE!

How many remember the word **aardvark**?
How many remember the word **tired**?
How many remember the word **sleep**?

Perhaps, this created for you an experience of deja-vu.
Defined: when associations cause a person to feel that an event has occurred when really it has not
Some Interesting Facts About Deja-Vu

- Decreases with age
- Increases with educational level
- More common among those who travel, remember their dreams, or have liberal political and religious beliefs
- Is most likely to be triggered by a generally physical context, though spoken words are enough to produce the illusion
- Is relatively brief (10-30s) and is more frequent in the evening than in the morning; more on weekend than weekdays
State and Context Dependent Learning

**DEFINED:** When memory retrieval is influenced by body state and environmental factors; if your body state/environment is the same at the time of learning AND the time of retrieval, retrievals will be improved.

- If Grandpa is drunk and forgets where his car is parked, it will be easier to recall the location if he gets drunk again!
- Take your Physics test in your English room? Won’t do as well!

**So, when studying for the AP PSYCH EXAM, here are some helpful hints:**

- Use smells to remember different things, then reproduce those smells in the test room.
- Wear the same clothes while studying and taking the exam.
Fig. 9.15 The effect of mood on memory. Subjects best remembered a list of words when their mood during testing was the same as their mood was when they learned the list. (Adapted from Bower, 1981.)
3 Explanations of It

1) Biological dysfunction
2) Divided perception
3) Implicit familiarity in the absence of explicit recollection
Forgetting

*Encoding Failure
*Storage Decay
*Retrieval Failure
Page 231 of book: Remember the switch-a-roo the people with the billboard pulled?

The experimenters were all college students.

College students tended to notice the change more than older people.

WHY? College students noticed the differences in people most like them.

Change the participants to construction workers, now the college students perform equally badly.
More Encoding Failures

Let’s see how observant we are...
Ebbinghaus’s Forgetting Curve

Rapid forgetting of some information relatively soon after Ebbinghaus learned the nonsense syllables.

Very little memory loss of the remaining information over the course of the following several weeks.

Interval between Original Learning of Nonsense Syllables and Memory Test
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How is that forgetting log going?

PsychSim 5: Forgetting
Clean sheet of paper

I will read a word and say “first, second, or third”.

You write down the 1\textsuperscript{st}, 2\textsuperscript{nd}, or 3\textsuperscript{rd} answer that comes to mind

Fold and save for next time

LATER: write down as many of your answers as possible

Next, on a separate list, I’ll say the original stimulus.

How many “repressed memories” did we recover?

It’s not necessarily repressed memories, but rather we had to create the proper context for you to recall your answers

For therapists, the trick to “recovering repressed memories” is to elicit the proper feelings, moods, images, and so forth of their patients’ pasts
Even More (!) Theories of Encoding & Retrieval Failures

- **Retroactive Interference**: Tendency for new learning to interfere with retrieval of old learning
- **Proactive Interference**: Prior learning inhibits (interferes with) recall of later learning

- WHAT ARE YOU BEING TESTED ON? THAT IS THE KEY TO RETRO VS. PRO
- **A Different Way to Think About it / Some Examples**
Memory Construction

* Misinformation and Imagination Effects
  * Source Amnesia
* Discerning True and False Memories
  * Children’s Eyewitness Recall
* Repressed or Constructed Memories
The Misinformation Effect

- Young children and elderly are particularly susceptible to the misinformation effect.

- **Ways to get the misinformation effect:**
  - Exposure to subtle misinformation
  - Asking leading questions can plant false memories
    - Ppl fill in gaps in memory with plausible guesses
  - Vivid retellings may implant false memories
  - Repeated imaging and rehearsing nonexistent events
Source Amnesia

- Source Monitoring = ability to recall the source of a fact
- Develops between 3 & 5, mature by 6
- Psychologists orally teach children a bunch of novel facts (Nile is the longest river in the world)
- 1 day later, 70% of 4 year olds remember the facts
- Almost all, though, were unable to recall where they learned this information. Most said from a parent, teacher, or the media. 6-8 year olds knew they were just taught that yesterday by the psychologists.
Source Amnesia

- People with damage to prefrontal cortex have difficulty in identifying sources
- Apparent more in the elderly
- Kids have poor episodic memory. WHY?
- Inability to bind together specific combos of memory characteristics (perceptual, contextual, affective info)...memories for real events vs. imagined generally include more perceptual info (color), more spatial-temporal info, and more meaningful details than memory for an imagined event
I will read a list of words.
Recall as many as possible (1 min)
Handout 8-10 (Recognition: 1 min)
pain / thread VS point / sharp = Serial Position Effect
How many recalled (3/4) sharp? Recognized?
How man recalled (3/4) hurt? Recognized?
How many recalled (3/4) needle? Recognized?
That’s funny, needle wasn’t one of the words!!! We just created a false memory!
Repressed Memories

- Childhood abuse happens
- Current estimates say 18-59% of these cases are not remembered