Autobiographical and Emotional Memory

Chapter 8

Learning Objective Topics

- Autobiographical Memory (AM)
  - Neuroscience of AM
  - Characteristics and Functions of AM
  - AM over the lifespan
- Memory and Emotion
  - Flashbulb Memories
  - Lab Studies
  - Neural Evidence
Class Activity

Please take a few minutes to write down details about a memory you have from high school. The memory can be about any event that you choose, as long as it comes from the time period of high school. You will not be asked to turn this paper in or to share your memory with the class.

Defining AM

Declarative
Semantic
Paris is the capital of France

Procedural (Skill)
- tying shoes, riding a bike

Episodic
- high school graduation

Autobiographical memory

“Memory for specific points in the past, recalled from the unique perspective of the self in relation to others” (Nelson & Fivush, 2004)
What are some challenges with studying AM?
How could you test it in a controlled manner?

Techniques for Studying AM

- Retrospective methods
  - Galton-Crovitz cue word task
  - Interviews

- Prospective methods
  - Diary/calendar studies
  - Create memories in the laboratory

- Neuroimaging
**Diary/Calendar Studies**

- Write down 1-2 events each day for several weeks/months
- Make ratings for each event
- Experimenter can test memory for a random subset of memories
*Accuracy can be measured*

**Memories Created in the Lab**

SenseCam

Laursen, 2009, *Science*
Learning Objective Topics

- Autobiographical Memory (AM)
  - Neuroscience of AM
  - Characteristics and Functions of AM
  - AM over the lifespan
- Memory and Emotion
  - Flashbulb Memories
  - Brain

AM Retrieval

Cabeza & St. Jacques (2007)
Cabeza et al. (2004)

- Method:
  - Autobiographical photos vs. photos by another person
  - Test: did they take photo?

- fMRI Results:
  - Both pics (memory network: MTL, frontal)
  - Pics taken by participant (mPFC, parahippocampus, hippocampus)

Learning Objective Topics

- Autobiographical Memory (AM)
  - Neuroscience of AM
  - Characteristics and Functions of AM
  - AM over the lifespan

- Memory and Emotion
  - Flashbulb Memories
  - Lab Studies
  - Neural Evidence
AM Characteristics

- At least 2 routes to AM retrieval

Generative Memory Retrieval

```
Cue word
  ↓
Semantic associate
  ↓
Generic (categoric) memory
  ↓
Specific memory

Sample

Angry
  "My Dad"

Angry
  "Every time I failed an exam my dad used to criticise me"

Angry
  "The time he threw a fit when I told him my marks"
```

Williams et al. (2006)
Generative Memory Retrieval

- Cue word
  - Semantic associate
    - Generic (categoric) memory
      - Specific memory

Sample

Angry
“My Dad”

Angry
“Every time I failed an exam my dad used to criticise me”

Angry
“The time he threw a fit when I told him my marks”

Williams et al. (2006)
Direct Memory Retrieval

10 years later ...

“The time he threw a fit when I told him my marks.”

AM Characteristics

- At least 2 routes to specific AM retrieval
  - Generative (start at top of hierarchy and move downward)
  - Direct (immediate access to event specific knowledge)
Functions of AM

- Having a stable, coherent sense of self across time
  - Memories in line with our current goals are most accessible to us.

When told extraversion OR introversion leads to academic success, individuals recall a greater number of instances in which they were extraverted or introverted, respectively.

Sanitioso, Kunda & Fong (1990)
Functions of AM

- AM plays a key role in social relationships
  - Meeting new people
  - Material for conversation and entertainment
  - Bonding

Functions of AM

- AMs are directive.
  - Plan for future
  - Regulate our emotions
  - Solve problems
Functions of AM

- AMs are directive.
  - Plan for future
  - Regulate our emotions
  - Solve problems

Imagining the Future

- More left turn lanes and fewer potholes.
- A rail line that gets me to LAX, not near LAX.
- A subway to the Westside.
- More express buses in the carpool lanes.
Remembering the Past vs. Imagining the Future

Imagining the future is very similar to remembering the past!

The Neural Basis of Prospective Memory

Imagining the future is very similar to remembering the past!
Learning Objective Topics

- Autobiographical Memory (AM)
  - Neuroscience of AM
  - Characteristics and Functions of AM
  - AM over the lifespan
- Memory and Emotion
  - Flashbulb Memories
  - Lab Studies
  - Neural Evidence

not all memories are created equal ...

• Based on normal rates of forgetting, we would expect that the greatest number of autobiographical memories available to us for recall would come from the recent past, but then drop off.

• This is what is known as the standard forgetting curve.
What is your first memory?  
How old were you?

Not all memories are created equal ...

• There are 2 places where the number of autobiographical memories recalled deviates from the standard forgetting curve.
  • Infantile amnesia
  • Reminiscence bump
Infantile Amnesia

Lack of memories from before the age of 3 1/2

Fewer memories from before the age of 7 than can be explained by forgetting alone

Development of autobiographical memory

- Infantile or childhood amnesia
  - Paradox: memory system intact; yet no AM
- Why?
  - Biological: lack of prefrontal cortex development
  - Self-concept: schemas inconsistent with current self
- Other influencing factors:
  - Cognitive/Language: IQ and age of first memory: $r = -.30$
  - Social: reasons to reminisce
Reminiscence Bump

The number of memories generated in response to cue words is greater for ages 15-25 years than would be expected based on standard forgetting curve.

Why the reminiscence bump?

- **Cognitive Hypothesis:**
  - Primacy effects of “firsts”
  - Life scripts that emphasize major transitions (e.g., getting married) guide recall

- **Self Image Hypothesis:**
  - Many decisions made between the ages of 15 and 25 relate to our self-definitions
Why the reminiscence bump?

- Cultural life script hypothesis:
  - Culturally expected events happen at this time
  - You can remember your life story better if it fits with the cultural schema

- Neurological hypothesis:
  - “Neurological peak”
  - Most efficient time of life for encoding and storing memories

Learning Objective Topics

- Autobiographical Memory (AM)
  - Neuroscience of AM
  - Characteristics and Functions of AM
  - AM over the lifespan

- Memory and Emotion
  - Flashbulb Memories
  - Lab Studies
  - Neural Evidence
Recall these AMs:

- What is your memory for the first day you began at Wofford?
- of hurricane Katrina?
- of the Virginia Tech shootings?
- of Columbine HS massacre?
- of 9/11?

Flashbulb Memories

“Like a photograph you preserve the scene in which you first heard about the events.”

Brown & Kulik, 1977
Are flashbulb memories perfect?

Talarico & Rubin (2003)

Consistency

Talarico & Rubin (2003)
Consistency

Talarico & Rubin (2003)

Confidence

Talarico & Rubin (2003)
Confidence, not consistency characterizes flashbulb memories.

When I first heard about the explosion I was sitting in my freshman dorm room with my roommate and we were watching TV. It came on a news flash and we were both totally shocked. I was really upset and I went upstairs to talk to a friend of mine and then I called my parents.

I was in my religion class and some people walked in and started talking about it. I didn’t know any details except that it had exploded and the schoolteacher’s students had all been watching which I thought was so sad. Then after class I went to my room and watched the TV and I got all the details from that.

These accounts are from the same person!

Confidence ratings for each detail were 5 on a 1-5 scale.

Neisser & Harsch, 1986
Why might these memories have changed?

Flashbulb Memories

People are confident about their memories
But they aren’t immune to distortion!
Confidence

- 2004 American League Playoff
- Red Sox Fans (positive event) - more confident, not consistent
- Yankees Fans (negative event) - more consistent

Learning Objective Topics

- Autobiographical Memory (AM)
  - Neuroscience of AM
  - Characteristics and Functions of AM
  - AM over the lifespan
- Memory and Emotion
  - Flashbulb Memories
  - Lab Studies
  - Neural Evidence
Laboratory Studies

Ideal study:

- vary emotional importance of stimuli

BUT keep constant nonemotional features of stimuli

- frequency & familiarity of stimuli
- visual complexity of stimuli

Cahill & McGaugh, 1995

Story, Phase 1 (neutral)

1. A mother and her son are leaving home in the morning.

2. She is taking him to visit his father’s workplace.

3. The father is the chief laboratory technician at a nearby hospital.

4. They check before crossing a busy road.
Story, Phase 2 (neutral)

5. While walking along, they pass the scene of a minor accident, which the boy finds interesting.
6. At the hospital, the staff are preparing for a practice disaster drill, which the boy will watch.
7. All morning long, surgeons practiced the standard disaster drill procedures.
8. Special make-up artists were able to create realistic injuries on actors for the drill.

Story, Phase 2 (emotional)

5. While walking along, the boy is struck by a runaway car, which critically injures him.
6. At the hospital, the staff prepare the emergency room, to which the boy is rushed.
7. All morning long, surgeons struggled to save the boy’s life.
8. Specialized surgeons were able to successfully reattach the boy’s severed feet.

Story, Phase 3 (neutral)

9. While the father stayed with the boy, the mother left to phone her other child’s preschool.
10. She phones the preschool to tell them she will soon pick up her child.
11. Heading to pick up her child, she hails a taxi at the number nine bus stop.
Recall of Arousing Information

“Recall as much of the storyline as well as any specific details that they saw or heard”

Cahill & McGaugh, 1995

Emotion and memory

- Explicit memory for emotional events stronger than non-emotional events
  - LaBar & Phelps (1998): ability to recall arousing words vs neutral words is higher
  - Dolcos et al. (2005): ability to recognize arousing words 1yr later stays higher than neutral words

- Increased memory for emotional events relative to neutral after a multi-day delay
  - Why?
Learning Objective Topics

- Autobiographical Memory (AM)
  - Neuroscience of AM
  - Characteristics and Functions of AM
  - AM over the lifespan
- Memory and Emotion
  - Flashbulb Memories
  - Lab Studies
  - Neural Evidence

Amygdala’s Role in Emotional Memory

It’s all in a nut
Amygdaloid Atrophy in Aging & Alzheimer’s Disease

AD patients show less memory enhancement

Neural enhancement at:
- Consolidation
- Encoding (attentional changes?)
Consolidation

- What part of the brain do we often mention when we talk about consolidation?

Amygdala & Consolidation

Emotional event

Attention Elaboration

Encoding effects

Consolidation

Post-encoding effects

Time

TRENDS in Cognitive Sciences
The Amygdala and the Hippocampus

Amygdala and Encoding

Emotional event

Attention Elaboration

Consolidation

Encoding effects

Post-encoding effects

TRENDS in Cognitive Sciences
Elaborative Encoding Benefits Memory

- Emotional items may be more likely to be processed deeply (using elaboration) - Why? . . .
Valence

Do we remember positive and negative things the same way?

Subsequent Memory

LEARNING PHASE  TEST PHASE

Subsequent Memory = Remembered - Forgotten
**Subsequent Memory: Emotion**

(subsequent memory for emotional items) > (subsequent memory for nonemotional items) at $p<.005$.

**Hippocampus**

**Amygdala**

---

**Subsequent Memory: Negative**

- Lingual Gyrus (BA 19)
- Precentral Gyrus (BA 4)
- Middle Temporal Gyrus (BA 21)

(subsequent memory for negative items) > (subsequent memory for positive items)
Subsequent Memory: Positive

- Middle Frontal Gyrus (BA 8/9)
- Inferior Parietal Lobule (BA 40)
- Cingulate Gyrus
- Superior Frontal Gyrus (BA 11)

(subsequent memory for positive items) > (subsequent memory for negative items) at p<.001
Review

- Consolidation: the amygdala may work with the hippocampus to increase consolidation

- Encoding
  - Emotion may bias attention (make you notice it)
  - Emotion may prioritize processing (make you process it more deeply)
  - But it may depend on the valence