CALVIN & HOBBES

Here I am, all set to write my autobiography, and I'm stuck!

What's the problem?

I can't remember the whole first half of my life!

Maybe your mom knows what you did.

I asked her. She said I did revolting things that are probably unpublishable.

Well, no wonder you suppressed the memories.

Maybe I was in jail!
‘Infantile Amnesia’

Sheingold and Tenney (1982):

*Participants:*
- College students and children (ages 4–12)

*Task:*
- Answer specific questions about a sibling’s birth from when they were 3–11 years old e.g. “Who took care of you while your mother was in the hospital?”
- Mothers were asked the same questions
Development of LTM
Long-term Memory

Encoding

Retrieval

Explicit (declarative)
- conscious
- effortful
- recall

Semantic
- words + facts

Episodic
- personal events

Implicit (procedural)
- unconscious
- automatic
- recall

Skills
- motor skills
- cognitive habits

S–S Associations
- conditioning
Explicit (declarative)

Implicit (procedural)

(A) Henry was given this mirror-tracing task to test motor skill.

(B) Although Henry never recognized the task, his performance progressively improved over successive days, demonstrating a type of long-term memory.
Memories are considered declarative, provided they pass two filters (Richmond & Nelson, 2007):

**Amnesia Filter:**
If an amnesiac can do the task, then it’s implicit
If not, then it’s declarative

**Parameter Filter:**
If the memory is affected by factors known to influence declarative tasks in adults, then it’s also declarative, e.g.:
Changes in study time
Retention interval
Contextual changes
Russo et al. (1995) compared implicit to declarative memory development.

**Task:**
- Asked children to ID degraded (or intact) pictures of objects
- Implicit measure: Perceptual priming
- Declarative measure: Free Recall

Data from Russo et al. (1995).
Maybe preverbal infants lack explicit memories.

Maybe because preverbal infants lack explicit memories, we get the phenomenon of ‘infantile amnesia’?

If so, memory development involves true qualitative change, somewhat along the lines that Piaget had described.
Declarative Memory Development in Infancy

- Conjugate reinforcement procedure
- Deferred imitation
Conjugate Reinforcement Procedures

Baseline kicking rate (3 minutes, unattached to apparatus)
Reinforcement period (9 minutes, ribbon attached to apparatus)
Delay
Test period (unattached to apparatus)
- https://www.youtube.com/watch?v=1Ep6sX-VRa0
Rovee-Collier’s (1989) Mobile Conjugate Reinforcement Paradigm

- The learned kicking behavior is quite specific:
  - Perceptual discrimination:
    - If the babies were trained on an mobile with yellow blocks, they wouldn’t respond to a mobile with metal butterflies instead
    - However, if they’re trained on many different mobiles, they would then generalize the kicking response to novel mobiles
      - It is as if they learned the mobile “concept”
  - Context-sensitivity:
    - If an infant was trained in a crib but tested in the kitchen, they wouldn’t kick
    - If the crib’s décor was changed, the amount of kicking would be reduced
Is it declarative memory?
Probably (Rovee-Collier, 1997):  
- Infants’ performance is determined by factors that are more important in declarative than implicit memories, e.g.:
  - Participant’s age
  - Retention interval
  - Context

The Mobile Conjugate Reinforcement paradigm isn’t suitable for infants over 7 months, so:
- Hartshorn and Rovee-Collier (1997) introduced a similar task for older infants:
  - Infants instead learn to press a lever to make a miniature train move
  - They demonstrate memory by pressing the lever even when the train no longer moves
Maximum duration of retention from 2 to 18 months (from Rovee-Collier, 1999)
Rovee-Collier’s (1989) Mobile Conjugate Reinforcement Paradigm

- **Rovee-Collier et al.**’s (1980) results:
  - At short delays:
    - Both 2 and 3-month-olds showed evidence of retention
  - After 2 days:
    - 2-month olds were back at baseline
  - After a week:
    - 3-month olds still show a reliable effect

- Presenting a **reminder** (a moving mobile) before testing reactivated kicking:
  - After a 2-week delay: Retention bounced back up to its initial levels
  - After a 1-month delay: Still significant kicking behavior
Evidence of Cued Recall

- Campbell & Jaynes (1966) demonstrated that rat pups can retain fear conditioning over 28-days retention intervals, if they are given reminders.

- Rovee-Collier, et al (1980) demonstrated that 3-month-olds can retain mobile training if they are given just one reminder.

- Subsequent research demonstrated that the reminder phenomenon is pervasive in infant memory.
Three Major Developments in CR

1. Retention intervals increase (e.g., 2-month-olds can be reminded after RI of 18 days, whereas 12-month-olds can have RI of 9 weeks).

2. Time required for reminders decrease (i.e., 3-month-olds require 180 s, whereas 6-month-olds require 7.5 s).

3. Generality of reminders increase (for 6-month-olds, a reminder must be highly specific, but that 12-month-olds can be successfully reminded in a novel environmental context).
Deferred-Imitation Procedure

• Demonstration of novel actions on objects
  – Touching box with head to turn on light (Meltzoff)
  – Placing bar across two posts, hang plate from bar, strike bar with mallet (Bauer et al.)

• Delay
• Test
The “gong” task. Infants watched as a model performed a three-step sequence: placing the bar across two posts, hanging a plate on the bar, and striking the plate with a mallet. Infants were later given the opportunity to reproduce the sequence, demonstrating evidence of deferred imitation, and thus memory.
Percentage of 13-, 16-, and 20-month-old infants displaying deferred imitation of three-step sequences as a function of length of delay (from Bauer et al., 2000)
Is deferred imitation a form of **explicit** memory?

- McDonough et al. (1995) tested patients with amnesia on deferred-imitation task
- Baseline
- Demonstration
- Delayed test
- Various control groups
Mean number of actions correct (Max = 12) by group (from McDonough et al., 1995)
So what’s happening here?
Maybe early memories can be recovered through hypnosis?

Adults asked to perform conservation tasks (Nash, 1987)
Group 1: Age-regressed to 4-years of age
Group 2: Pretend you’re a 4-year old

Neither perform like real 4-year olds
Regressed adults perform like adults who are pretending to be 4-years old
Other Hypotheses

What accounts for the onset of autobiographical memory?
Changes in event encoding?
Changes in sense of self?
Changes in discussions about past events?
Verbal Encoding Hypothesis
(Simcock & Hayne)

• Events that were encoded before child has language to describe those events may not be accessible to verbal memory
• Autobiographical memory emerges once children have the ability to encode an event verbally
Verbal Encoding Hypothesis
(Simcock & Hayne)

Evidence:
27-, 33- and 39-month-old children took part in a unique event (“magic shrinking machine”)
Tested 6 months to 1 year later; verbal abilities measured during both time points
Although children demonstrated successful nonverbal memory performance they could not verbally recall the event any more than they could verbally encode the event.

Problems:
At 3 children talk quite well but they don’t form memories that endure into adulthood
Cognitive Self Hypothesis

Howe: Advent of “cognitive self” (18-24 months) accounts for offset of autobiographical memory
  Pass mirror self-recognition task at this age
The self functions to bind memories (referent around which events can be organized) and for events to have personal significance
Changes in sense of self (Howe)

Evidence:
- Kids with successful MSR performance have better event memory (controlling for language and retention length)
- No child successful on event memory task before achieving MSR

Problems:
- Advent of autobiographical memory is later than successful MSR performance
Narrative construction hypothesis

Transition to activity of remembering: learning to structure events in a narrative format

Talk may contribute to memory processes:
  Structure and reinstatement

Autobiographical memory enables us to predict and interpret future events to share experiences with others
Narrative construction

Evidence:
Children of elaborative mothers remember more than children with pragmatic/repetitive mothers
Culture differences in emergence of autobiographical memory; linked to prevalence of elaborative mothers
Children don’t remember things that aren’t talked about with their mothers

Problems:
Parents discuss events with 2- and 3-year-olds and yet these events aren’t always remembered