Episodic memory. So far:

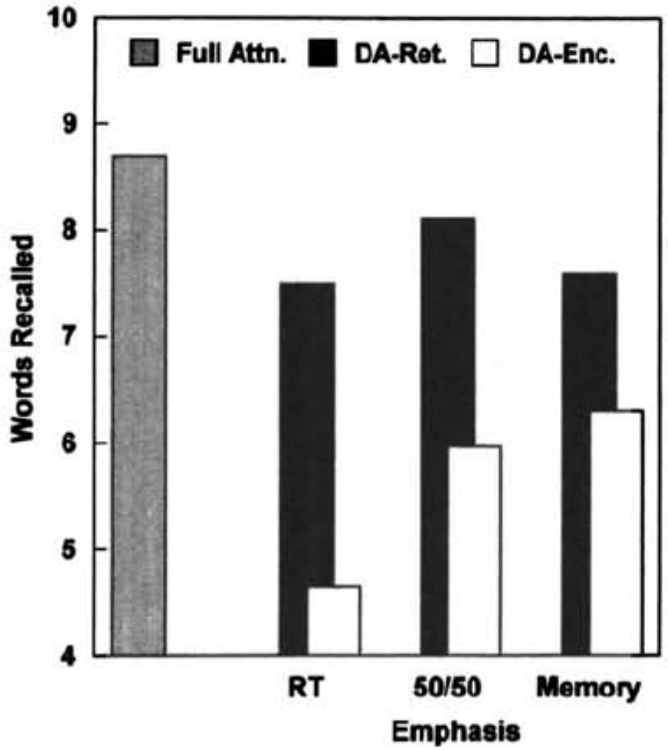
- How is information encoded in episodic memory?
- How is information stored in episodic memory?
  - Called consolidation

Today

- *How is information retrieved in episodic memory*
- *How/why episodic memory fails?*

Retrieval

- Some key features of retrieval:
  - Retrieval is less affected by divided attention than encoding. Suggests an automatic component to memory retrieval.



Retrieval

- Recall more affected than recognition in Korsakoff amnesia (Korsakoff amnesia associated with frontal lesions).
- Korsakoff patients (and patients with frontal lesions) sometimes suffer from confabulation as well.

Quote from patient with frontal damage.

HW: I'm 40, 42, pardon me, 62.
HM: Are you married or single?
HW: Married.
HM: How long have you been married?
HW: About 4 months.
HM: What's your wife's name?
HW: Martha.
HM: How many children do you have?
HW: Four. (He laughs.) Not bad for 4 months.
HM: How old are your children?
HW: The eldest is 32, his name is Bob, and the youngest is 22, his name is Joe.
HM: (He laughs again.) How did you get these children in 4 months?
HW: They're adopted.
HM: Who adopted them?
HW: Martha and I.
HM: Immediately after you got married you wanted to adopt these older children?
HW: Before we were married we adopted one of them, two of them. The eldest girl Brenda and Bob, and Joe and Dina since we were married.
HM: Does it all sound a little strange to you, what you are saying?
HW: (He laughs.) I think it is a little strange.
HM: I think when I looked at your record it said that you've been married for over 30 years. Does that sound more reasonable to you if I told you that?
HW: No.
HM: Do you really believe that you have been married for 4 months?
HW: Yes.
HM: You have been married for a long time to the same woman, for over 30 years. Do you find that strange?
HW: Very strange.

Moscovitch, M. (1989).Confabulation and the Frontal Systems: Strategic versus Associated Retrieval in Neuropsychological Theories of Memory. In Varieties of memory and consciousness: Essays in Honour of Endel Tulving. (pp. 133-160).

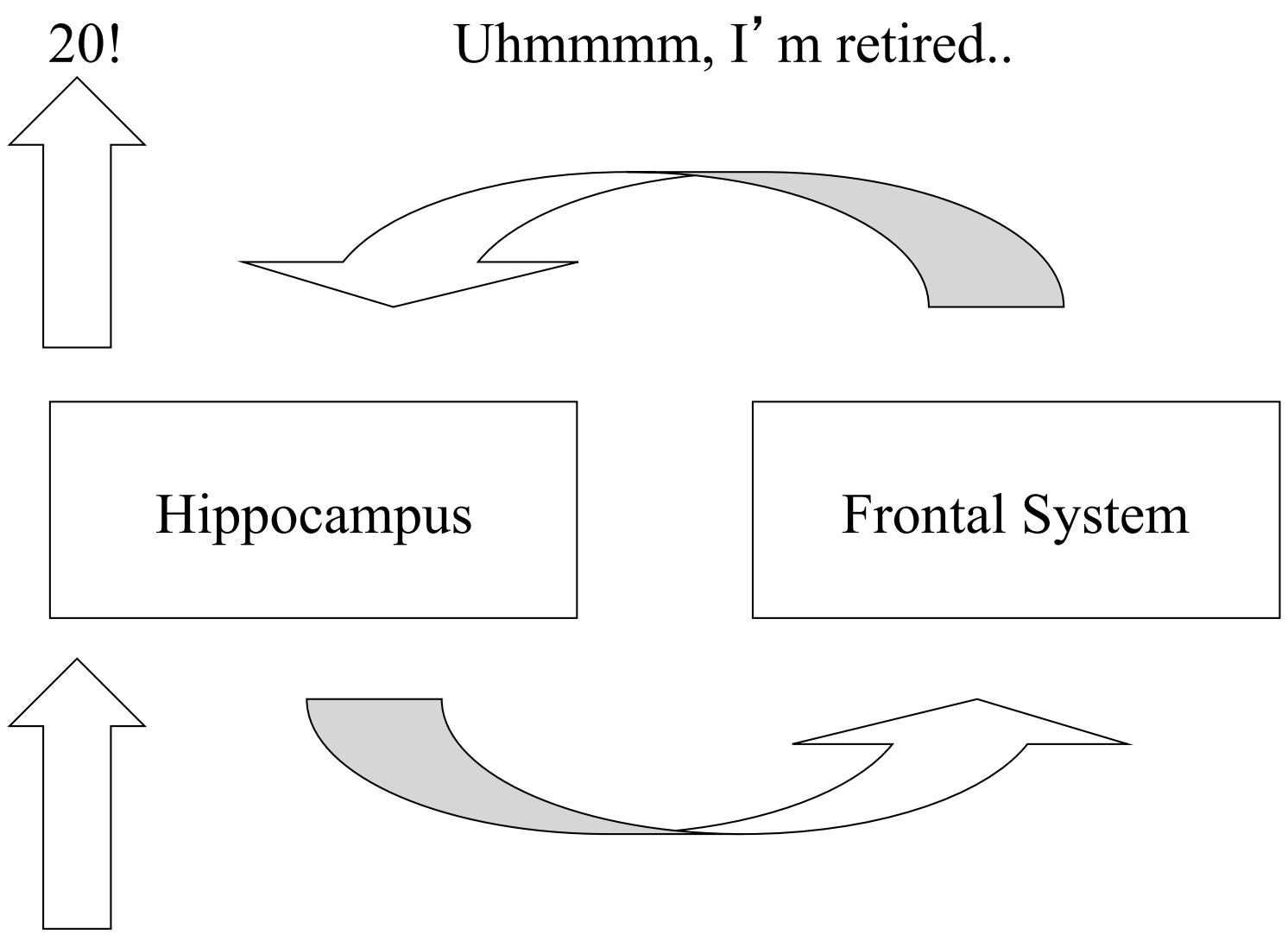
Together, these findings suggests two different ways of retrieving information in episodic memory.

Automatic Retrieval:

- Hippocampus can retrieve information relatively automatically with strong retrieval cues:
  - In recognition task the study word itself is presented at test (allows Korsakoff patients to remember some items)
  - In cued recall task part of the study items are represented at test (allowing retrieval under divided attention).
- Memory associations within the hippocampus "pop out" in memory (sometimes correct, sometimes not, and hippocampus cannot correct itself). Need another system to correct for false memories.
  - False memories are the confabulations.

Effortful Retrieval:

- If you are not given a strong retrieval cue (as in free recall), then hippocampus cannot retrieve memories very well. Need to use frontal system.
- The frontal system generates better retrieval cues that the hippocampus can use to generate a memory.
- Frontal systems can also monitor and eliminate errors in memory retrieval.



“How old are you?”

To summarize the two types of retrieval:

- Automatic retrieval in hippocampus:
  - Allows memory retrieval under divided conditions
  - Supports recognition memory better than free recall, consistent with memory of Korsakoff patients.
- Strategic retrieval initiated in frontal cortex:
  - Required for free recall, again consistent with memory deficits of Korsakoff patients.
  - Helps prevent false (confabulated) memories

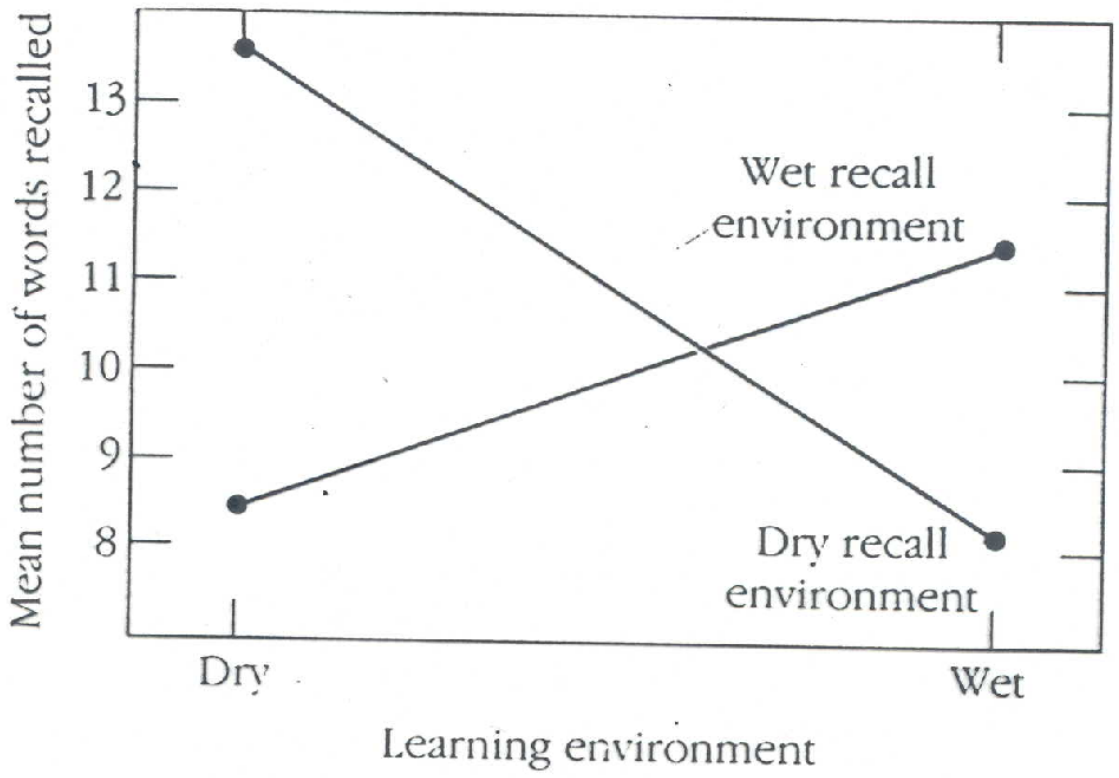
- The frontal system is the "boss" of the hippocampal memory system
  - Control the information that is presented to the hippocampus at encoding (by directing attention)
  - Initiate and guide retrieval
  - Monitor information that is retrieved from hippocampus.
- Analogous to the "central executive" in working memory.

Moscovitch, M., & Winocur, G. (2002). The frontal cortex and working with memory. *Principles of frontal lobe function*, 188-209.
Moscovitch, M. (1992). Memory and working-with-memory: A component process model based on modules and central systems. *Journal of cognitive neuroscience*, *4*(3), 257-267.

Retrieval and Encoding Specificity

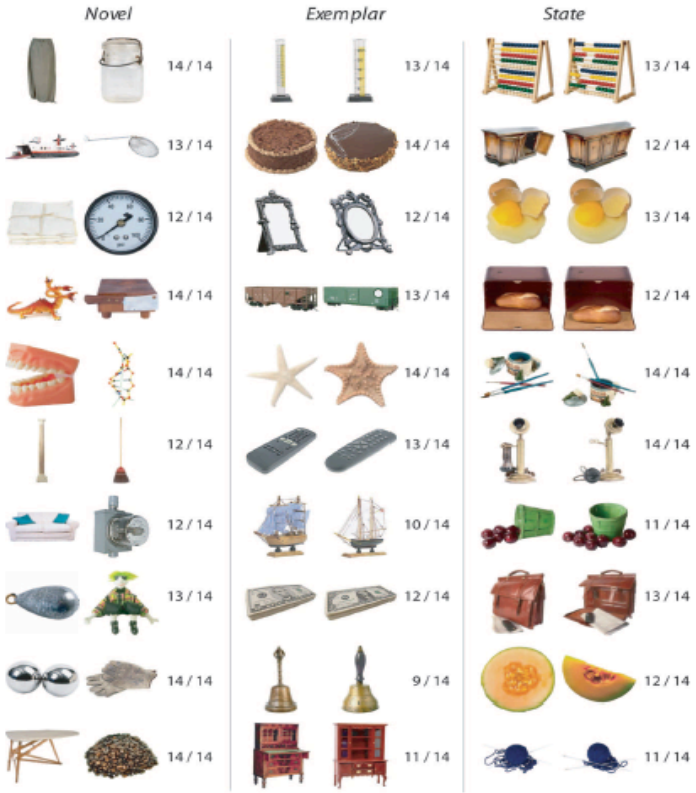
- Definition: The effectiveness of a retrieval cue depends on how well it relates to initial encoding.
  - That is, the way we perceive and think about events at encoding determines what cues will later elicit episodic memories.
- Explains state dependent and mood dependent memory.

Participants learned words either on land or under water, and were tested on land or under water



From Godden and Baddeley (1975)

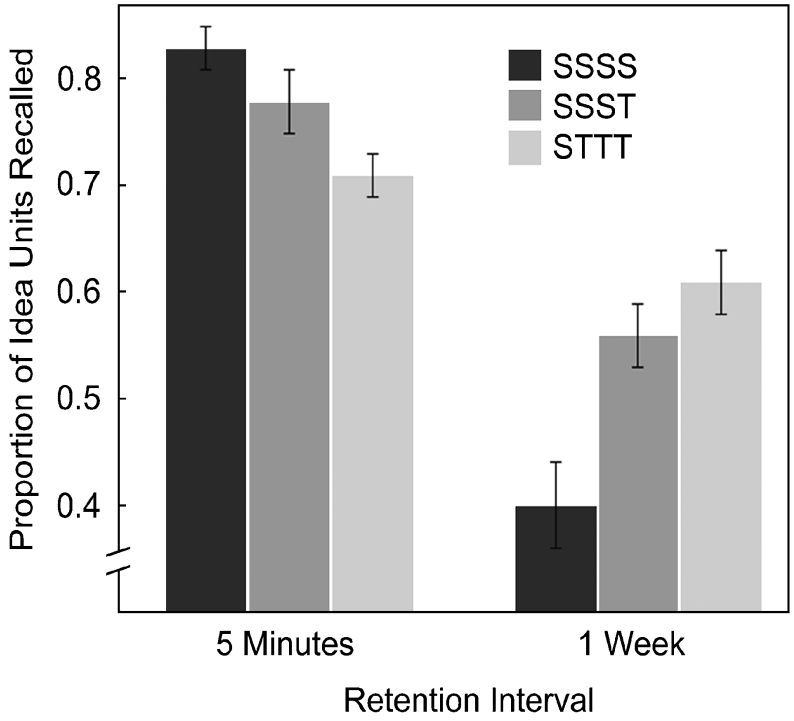
- May help explain exceptional visual long-term memory when same identical images are repeated at study and test.
  - Participants studied 2,500 objects over the course of 5.5 h then given 2AFC task.



Brady, T. F., Konkle, T., Alvarez, G. A., & Oliva, A. (2008). Visual long-term memory has a massive storage capacity for object details. *Proceedings of the National Academy of Sciences*, *105*(38), 14325-14329.

- Encoding Specificity may also explain childhood amnesia.
  - Why don't you remember your first years of life? A child of 3 remembers what happened days/ months before, so it is not that episodic memory has not formed yet.
  - Why is smell a good retrieval cue for childhood memories?

- Encoding specificity can help explain why it is good to practice retrieval during study.
  - The “testing effect” dramatically improves memory.



Karpicke, J. D., & Roediger, H. L. (2008). The critical importance of retrieval for learning. *science*, *319*(5865), 966-968.

- Encoding specificity might even explain the amnesia between personalities in multiple personality!
    - Schacter et al. (1989). Journal of Abnormal Psychology, 98, 508-514.

Memories fail in two general ways:

- (1) Memories forgotten, due to:
  - Poorly encoded in the first place
  - Poor retrieval cue
  - Loss of storage (the acquisition of new memories can interfere with previously stored memories) ** look up “retroactive interference”.

  But also:

- (2) False memories remembered.
  - Due to errors in encoding
  - Due to errors in retrieval

Memory distortion at Encoding:

- Various studies have shown that episodic memory for faces is better for own-race than cross-race (and own-gender, own-age, etc.).

  -Obviously this is relevant for eye-witness testimony.

  -Why does this happen? Perhaps it occurs during the perceptual encoding of faces.

Meissner, C. A., & Brigham, J. C. (2001). Thirty years of investigating the own-race bias in memory for faces: A meta-analytic review. *Psychology, Public Policy, and Law*, *7*(1), 3.

Encoding is better for faces you are more familiar with:

•Each trial consisted in the display of a target face at the center of the screen (for either 250 ms or 120 ms), and after 1 second delay two faces presented side by side.
•Participants pressed one of two response buttons to indicate
which picture matched the target.

Results:

-white bars Asian faces, black bars Caucasian faces

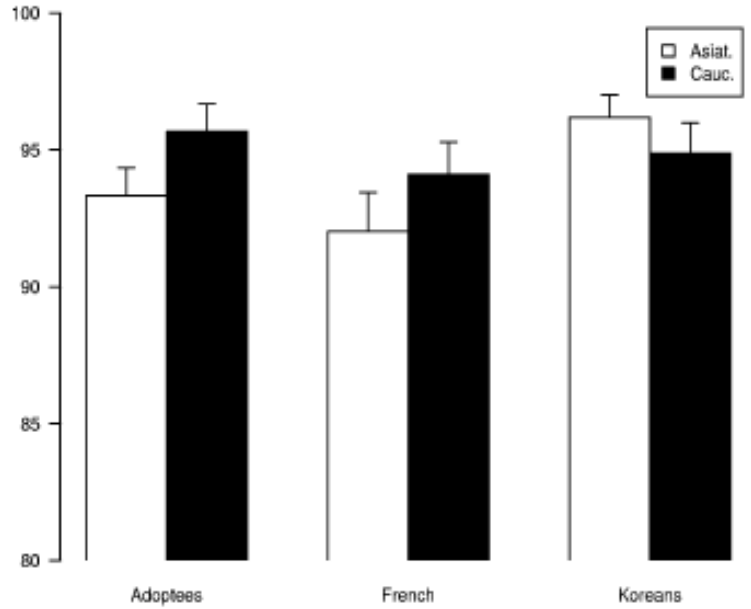
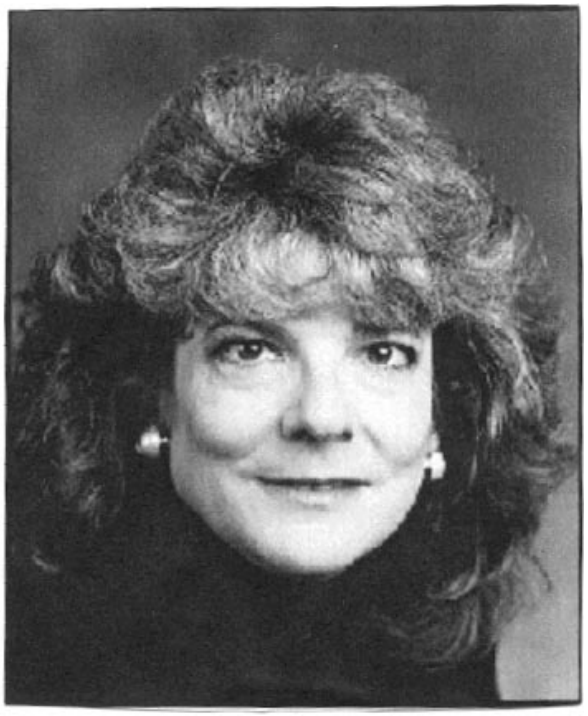


Figure 2. Rates of recognition as function of Group (Adoptees, French, and Koreans) and Face Race (Caucasian vs. Asiatic) .

Sangrigoli, S., Pallier, C., Argenti, A. M., Ventureyra, V. A. G., & De Schonen, S. (2005). Reversibility of the other-race effect in face recognition during childhood. *Psychological Science*, *16*(6), 440-444.

Memory distortions at retrieval:

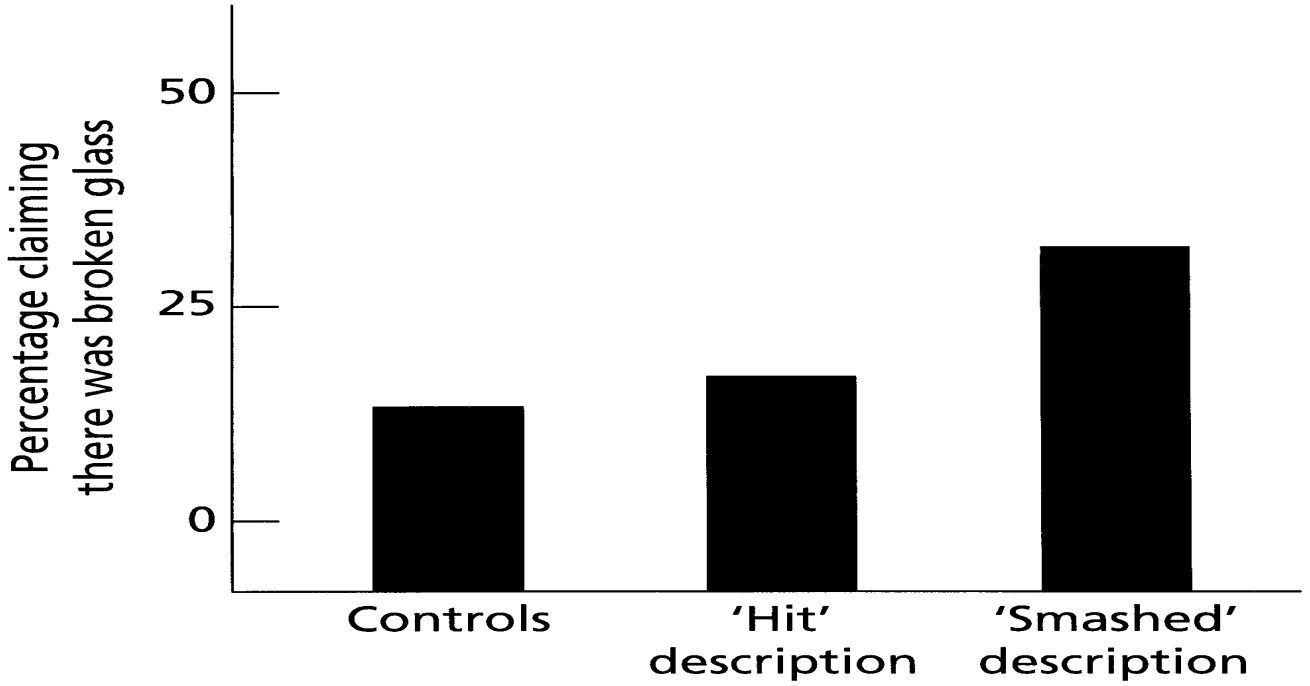
- Loftus and Palmer (1974) showed a film of a car accident.
- Questioned participants **one week later**.



- **Group One** was asked "How fast were the cars going when they ***smashed*** each other?"
- **Group Two** was asked "How fast were the cars going when they ***hit*** each other?"

- **Group 1** (41mph) > **Group 2** (34mph).
- **Group 1** were also more likely than **Group 2** ***to report seeing broken glass.***

Results from Loftus and Palmer's (1974) study showing how the verb used in the initial description of a car accident affected recall of the incident after one week



Often, difficult to tell whether false memories are the produce of encoding, retrieval, or both

- Class demonstration: “The hungry python…”.

- The paratrooper…
- The safecracker…
- The clumsy chemist…
- The narcotics officer….
- The hungry python….
- The angry rioter….
- The absent-minded professor….
- Dennis the Menace….
- The flimsy shelf….
- The fireman….

False memories from from the Deese-Roediger-McDermott paradigm could also reflect distortions at encoding or retrieval (or both)

Participants asked remember lists of words like the following:

mad	white
fear	dark
hate	cat
rage	charred
temper	night
fury	funeral
ire	colour
wrath	grief
happy	blue
fight	death
hatred	ink
mean	bottom
calm	coal
emotion	brown
enrage	gray

Roediger, H. L., & McDermott, K. B. (1995). Creating false memories: Remembering words not presented in lists. *Journal of experimental psychology: Learning, Memory, and Cognition*, *21*(4), 803-814.

In each list, all the words are related to a critical lure:

mad	white
fear	dark
hate	cat
rage	charred
temper	night
fury	funeral
ire	colour
wrath	grief
happy	blue
fight	death
hatred	ink
mean	bottom
calm	coal
emotion	brown
enrage	gray

ANGER **BLACK (critical lures: associated with all the words on the list)**

In Roediger and McDermott (1995) Results:

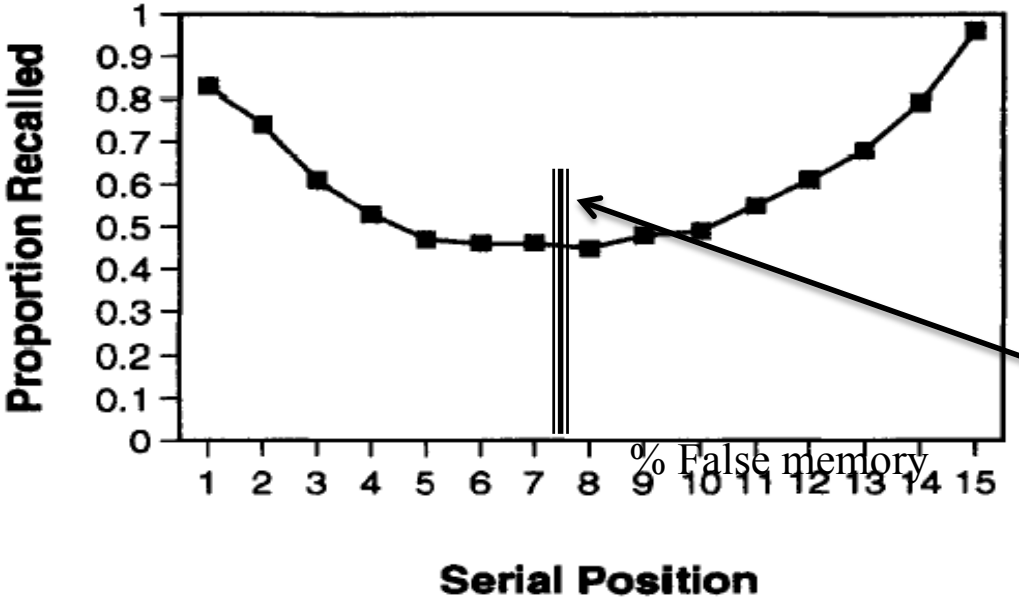


Figure 3. Probability of correct recall in Experiment 2 as a function of serial position. Probability of recall of the studied words was .62, and probability of recall of the critical nonpresented item was .55.

People also give high confidence ratings to the lures!

% False memory

% false recall can be higher than correct recall!

•Some debate as to whether this distortion is at encoding or retrieval

Meade, M. L., Watson, J. M., Balota, D. A., & Roediger III, H. L. (2007). The roles of spreading activation and retrieval mode in producing false recognition in the DRM paradigm. *Journal of Memory and Language*, *56*(3), 305-320.

Conclusion from errors:

- Episodic memory is not like a video recorder:
  - Memories can be distorted in various ways at both encoding and retrieval.
- The vary same processes that make memory good (semantic encoding of knowledge at study; relating to pre-existing knowledge) contribute to errors.

Overview of long-term memory: