Emotion & Memory

Psychology of Emotion
Lecture 11
Professor David Pizarro

What about...

- Memory for highly emotional personal events? (e.g., first kiss)
- or...
- Memory for traumatic events? (e.g., getting mugged)
  - Implications: Eyewitness testimony, sexual abuse, autobiographical accuracy...

Question: How do emotions affect memory?

- Competing claims:
  - Emotions make our memory *indelible*
  - Emotions simply *enhance* our memory
  - Emotions *distort* our memory
  - Emotions have no *special* effect on memory

General Accuracy in Memories

- For the question of emotional memory to be interesting, it can't be the case that memories are always accurate.
- Large body of evidence showing that memory is easily distorted.
- This is one reason for initial interest dealing with whether emotions improve memory.

Memory is easily distorted

- Memory is NOT like a camera.
- Errors and biases can introduce themselves into all stages of the memory process.
- For example...

Loftus & Palmer (1974)

- Showed participants a videotape of a car accident and asked participants:

"How fast were the cars going when they **hit** each other?"

-or-

"How fast were the cars going when they **smashed** into each other?"

Results

- Average speed estimates for different verbs
  - “smashed” 40.8 mph
  - “collided” 39.3 mph
  - “bumped” 38.1 mph
  - “hit” 34.0 mph
  - “contacted” 31.8 mph

Word-List Study

snooze
rest
tired
dream
awake
slumber
night
doze
eat
bed
comfort
snore
wake
pillow
nap
sound

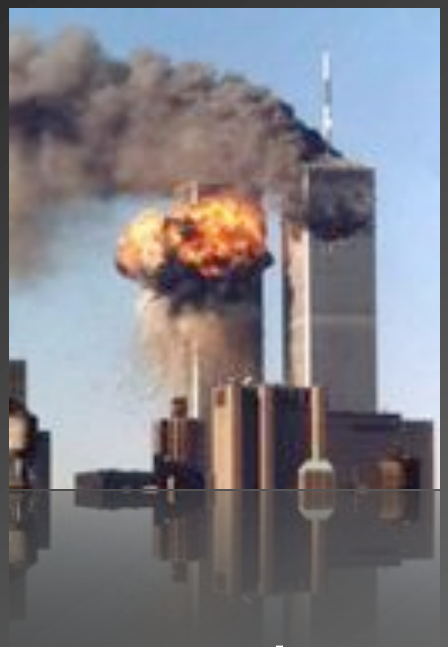
Which words were on the list?

- Dream
- Truck
- Sound
- Sleep

I. Are Emotional Memories Indelible?

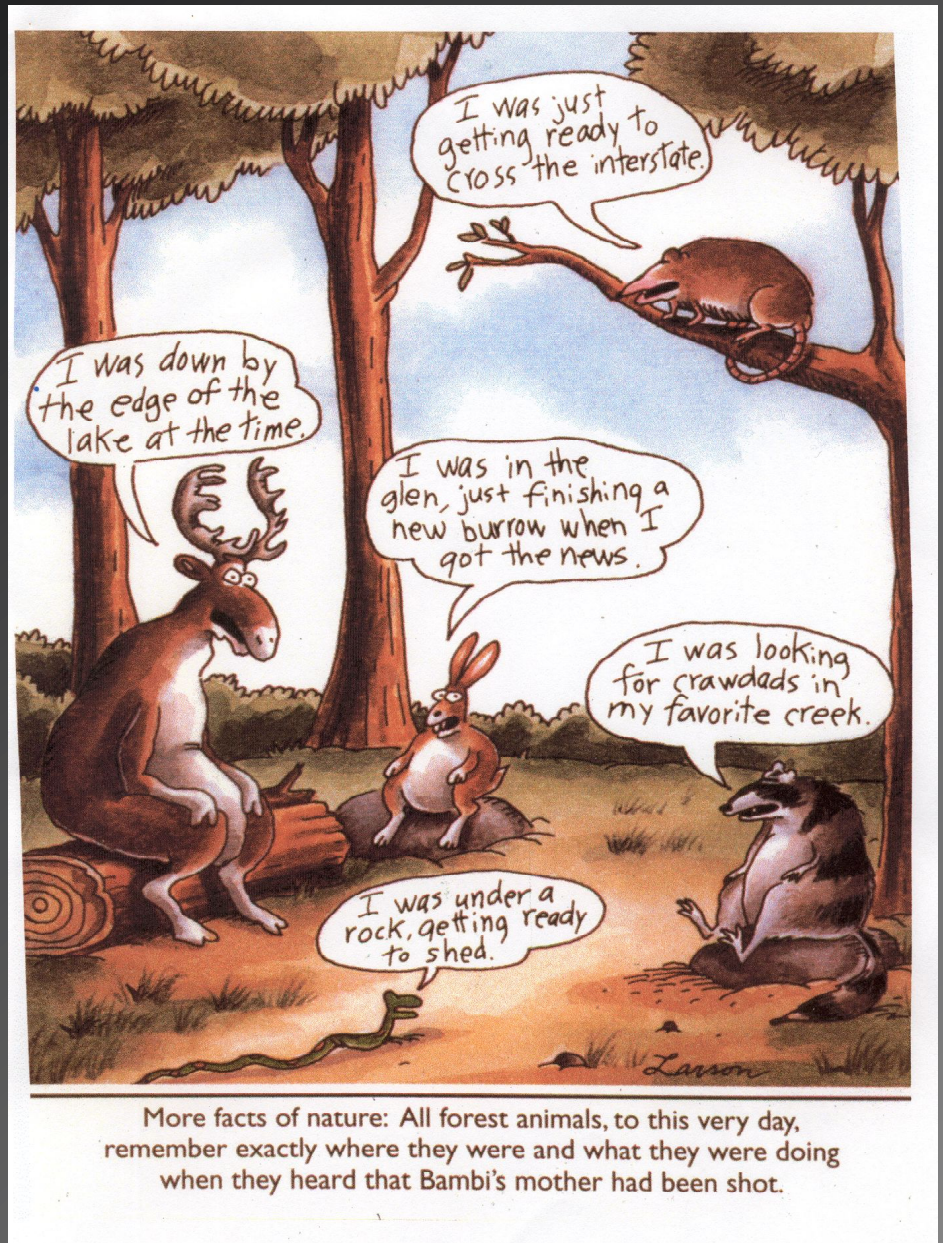
William James (1890)

"An impression may be so exciting emotionally as to leave a scar upon cerebral tissues..."



“Each of us will remember what happened that day and to whom it happened. We will remember the moment the news came, where we were and what we were doing.”

--President Bush's televised address to Congress, September 20, 2001.



More facts of nature: All forest animals, to this very day, remember exactly where they were and what they were doing when they heard that Bambi's mother had been shot.

"More facts of nature: All forest animals, to this very day, remember exactly where they were and what they were doing when they heard that Bambi's mother had been shot."

"Special Mechanism" argument

- Surprising and consequential events are recorded with great accuracy.
- Survival value--brain mechanism dedicated to remembering biologically crucial but unexpected with high **accuracy**.
  - Example: If a leopard jumped out from behind a certain rock outcropping, it would be a really good idea to remember that event and that place, if you want to survive.

Flash-Bulb Memories (Brown & Kulik, 1977)

- Asked Individuals to report highly emotional events (80 participants).
- People reported having vivid, detailed memories of surprising and important events.
- They typically remember:
  - where they were
  - what was going on at the time
  - who told them the news
  - how others felt
  - how they felt
  - what happened next

Problem:

- Critical to the “special mechanism” argument from the flashbulb memory study was that these memories be ACCURATE
- Original Brown & Kulik study did not have a way to assess accuracy...

Memory for the Space-Shuttle Disaster (Neisser & Harsch, 1992)

- Method:
  - 106 students recall shuttle disaster the morning after it occurred and again 2 ½ years later
- Results:
  - High confidence for memories
  - But low accuracy (cognitive cues didn't even improve this).
- Self-reported emotions did NOT correlate with accuracy.

Memory for the Space-Shuttle Disaster (Neisser & Harsch, 1992)

- But...
  - Emotional impact not measured well in terms of intensity or type of emotion.
  - Event may not have had personal impact for the college students.
  - There was no comparison with a neutral event

Memory for 9/11 (Talarico & Reuben)

- Compared people's memory of first hearing about the September 11, 2001 terrorist attacks with their memory of an everyday event.
  - The more intense their emotions, the more their confidence in their accuracy.
  - Nonetheless, this was unrelated to real accuracy.
  - In fact, memory for these events declines at a similar rate as other information.

What about memory FOR emotions?

(Safer, Levine, & Drapalski)

Method:

- Students rated anxiety level before midterm.

- Recalled anxiety level 1 wk. later, *before* or *after* learning grade.

What about memory FOR emotions?

(Safer, Levine, & Drapalski)

- Compared to students who hadn't yet learned their grade, those who learned that they *did well* underestimated pre-test anxiety.
- Students who did *poorly* over-estimated their anxiety.
- Info learned *after-the-fact* distorted memory for emotions.

Memory for 9/11 Emotions

- Same researchers asked parents and teens to recall emotions during the events of 9/11 3 months after it occurred and 8 months after it occurred.
- Also asked *appraisals* (e.g., how consequential were these attacks) at time 1 and time 2.
  - Parents recalled increased distress over time
  - Adolescents recalled decreased distress.
- This was predicted by shift in appraisals (teens saw events as less consequential)

Emotional Memories Indelible?

- Evidence converging that memories for emotional events is NOT perfect.
  - Vivid and confident recollections can be wrong
- Emotional memories are clearly subject to distortion and forgetting over time.
- “Given that [emotional] memories may not be all that good, and the performance expected from ordinary memory mechanisms may not be all that bad, motivation for postulating a special memory mechanism may not be easy to come by."

Step back: Do emotions at least *enhance* memory?

- Perhaps they don't "seal" memory in a special way, but do emotional states *improve* memory?

Gordon Bower's Network Theory

- Concepts or "nodes" are organized in a network of associations.
- Similar nodes are "closer" to each other, or "stronger" in activation.
- Emotions are "nodes" in this sense--when feeling "happy", all concepts/nodes related to "happy" are activated.

Leads to 2 predictions about memory enhancement

1. State Dependent Memory
2. Mood Congruent Memory

State-Dependent Memory

- Claim: People remember information better if they learn it and recall it in the same emotional state.
- More likely to recall information when similar memory “cues” are present (in this case, an emotional state).

Charlie Chaplin Example

- In an old Charlie Chaplin movie, Chaplin plays a tramp who saves a drunken millionaire's life. The two spend the rest of the night together drinking and carousing.
- The next day, when sober, the millionaire doesn't recognize the tramp.
- Later when the millionaire is drunk again, he sees Charlie and treats him like a long lost friend.
- For Bower, emotions (or any physical state) should act the same way...

Bower SDM Study

- Made people happy or sad (through hypnosis) and had them learn a list of words.
- Hypnotized subjects again and put them in a happy or sad mood. Had them recall the word list.

SDM Findings

- Recall performance was best when subjects learned and recalled the words in the same mood.

- Recall was worst when they learned and recalled list in different moods.

State dependence works (kind of)

- Memory *does* seem enhanced when individual is in consistent mood-state.
  - Content of recalled material is irrelevant.
  - Not specific to emotion (drugs, alcohol, underwater).
  - Not very reliable (emotional states aren't very good for this).

II. Mood Congruent Memory

- Claim: People remember information better if the information is congruent with (matches) their current mood.

Mood Congruent Memory example:

- Subjects read a story about two guys playing tennis: Andre is happy—all is going well for him. Jack is sad—nothing going well.
- Q: Recall the story. Who do you think is the central character?
- Happy readers: remembered more statements about happy character & thought story was about him (and vice-versa).
- Again this effect can be explained in terms of schemas and spreading activation. Feeling happy in the present activates material in memory that is associated with happiness and makes that material more accessible.

Mood Congruency

- Like SDM, this effect can be explained in terms of schemas and spreading activation.
- Feeling happy in the present activates material in memory that is associated with happiness and makes that material more accessible.

Summary: SDM & MCM

- Emotions as functioning like nodes in an associative network of information.
- When you are feeling an emotion, the node is activated, and activation spreads to other nodes in the network that are associated with it, such as past experiences, concepts, and emotional behaviors.
- This related information becomes more accessible as a result.

Summary, cont'd

- This was the first serious attempt at grounding emotion/memory into prevailing cognitive models.
- BUT, some findings can't be explained.
  - e.g., emotion-congruency stronger for positive than negative emotions
  - sometimes mood-incongruency better remembered.
- Associative Network is an incomplete explanation

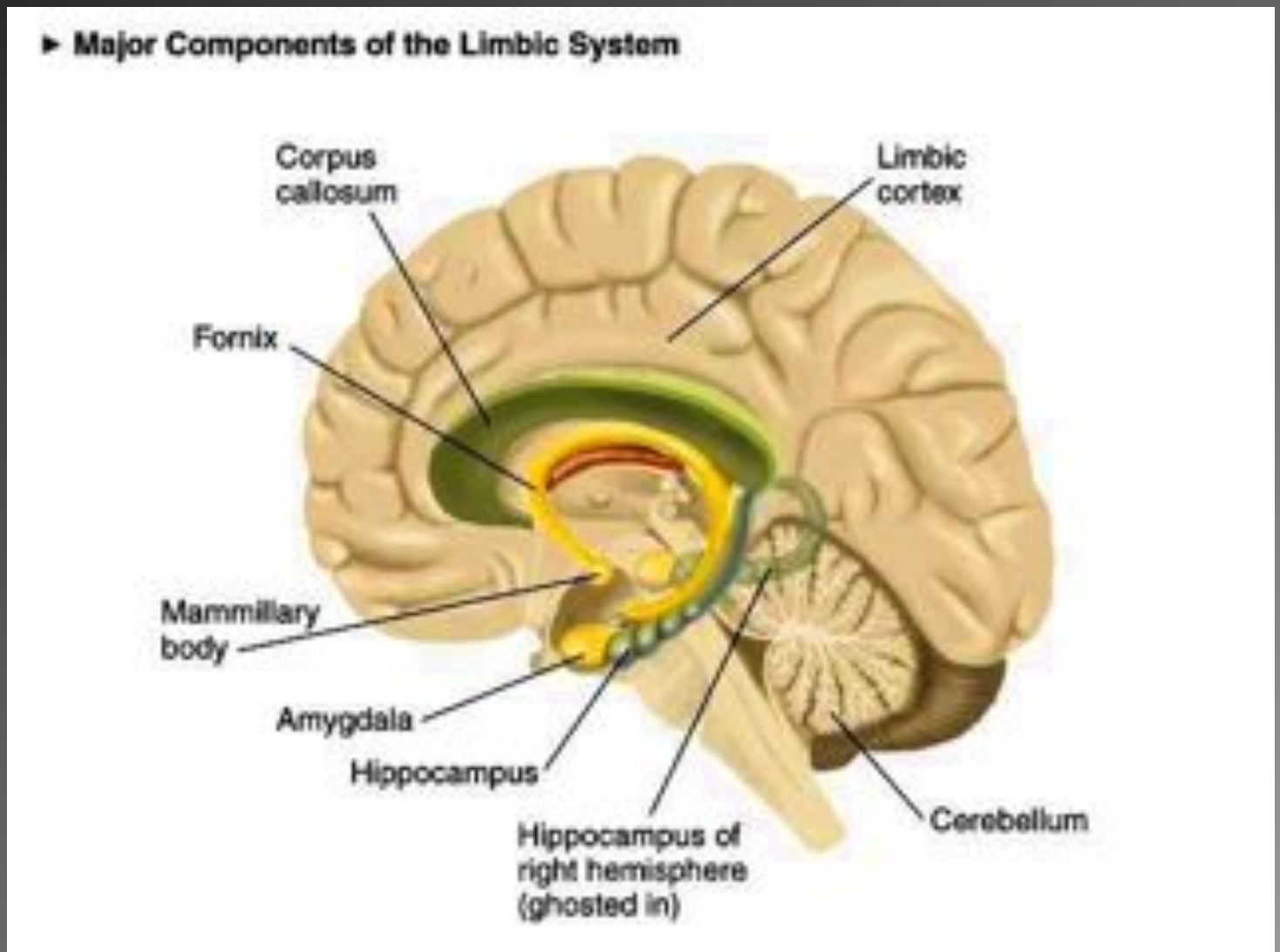
"No Special Mechanism" View

- To the extent that emotions are related to memory improvements, this can be wholly explained by other features of emotional events, such as that they tend to be:
  - distinctive
  - interesting
  - unexpected
  - well-rehearsed

Emotional Enhancement of Memory

- Those who argue that emotional memories are not "special" in any way also have to contend with another set of findings demonstrating the special role of emotions:
  - Amygdala & Memory
  - Specific emotions & Memory

Amygdala


Major Components of the Limbic System
Corpus callosum
Limbic cortex
Fornix
Mammillary body
Amygdala
Hippocampus
Hippocampus of right hemisphere (ghosted in)
Cerebellum

Canli (2000) fMRI Study

- Method
  - Participants saw neutral and negative pictures and rated them for emotion
  - A separate fMRI response was recorded in the amygdala as they rated each picture.
  - 3 weeks later: Surprise recognition test.

Canli (2000) Results

- Pictures rated as more emotional more activation in the amygdala
- For the most emotional pictures, the greater the amygdala activation, the more likely participants were to clearly remember the pictures
- So, activation of the amygdala is associated with better memory for emotional experiences.
- But what about “distinctiveness hypothesis”?

Hamann (1999) PET study

- Method:
- Participants rate 4 types of pictures for emotional intensity:
  - Positive
  - Negative
  - Distinctive
  - Neutral
- PET scans as pictures were rated
- Memory test 1 month later

Hamann (1999) PET study (cont'd)

- Both emotional & distinctive pictures were remembered better than neutral pictures.
- Greater amygdala activity and better memory for emotional pictures.
- No association between amygdala activity and memory for distinctive pictures.

Special Mechanism?

- Emotions may not make Memories PERFECT, and they may even introduce errors.
- But plenty of evidence that emotions aid the recollection of SOME kind of information (e.g., central vs. peripheral).