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Cognition and Emotion

Lecture 9: Emotion and Disorders II: Memory

DR KATE WILLIAMS

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Lecture Overview

- Mood Congruity
- Methods to investigate emotion & memory
- Research evidence
- The Encoding-specificity principle
- Mood-state-dependent memory
- Role of the amygdala
- Evidence from patients with brain damage

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Background

- Affect influences memory in several ways.
- Imagine you are in a happy mood because you have just won a prize:



What memories might come to mind?



Background

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- ▶ When asked to recall memories, people tend to remember negative memories when in a negative mood.



- ▶ In contrast they recall happy memories when in a positive mood.



- ▶ Known as Mood Congruity (Bower, 1981).

Mood Congruity

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- ▶ We learn and retrieve information better when the affective value of the material matches our mood state.
- ▶ This explains why negative mood states can last a long time:
 - ▶ The negative mood makes it easier to learn and remember negative information.

Methods to investigate emotion and memory

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Typical set-up of memory research

Study
Phase

Distractor
Task

Test
Phase

Methods to investigate emotion and memory

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Study phase:

- ▶ Induce Ps into mood state/record current mood via questionnaires
- ▶ Ask them to learn/study certain material
 - ▶ Visual (e.g., faces, words, pictures, film clip, etc.)
 - ▶ Auditory (e.g., voice, tones, etc.)

Distractor task:

- ▶ To stop Ps from practicing items
 - ▶ Puzzle or similar task that does not interfere with main study materials
 - ▶ Amount of time should be standardised for all

Test phase:

- ▶ Test memory for materials presented in study phase

Methods to investigate emotion and memory

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- ▶ Memory for stimuli presented in study phase examined through two methods:

Recall

- Bringing fact back to their own mind

Recognition

- Identifying information from a choice

Study Phase: DOG, TABLE, CAR, RAIN, PEN, KITCHEN, METAL...

Test Phase

Recall

List as many words as you can from the study phase

Recognition

Known as either "An old/new" or "A yes/no" recognition task

Target

RAIN
Was this in the study phase?

Distractor

HAMMER
Was this in the study phase?

Research Evidence...

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- ▶ **Hills et al. (2011):**
- ▶ **Aim:** To address whether mood affects face recognition accuracy.
 - ▶ Also, to examine whether it is moderated by type of learning – incidental or intentional.
- ▶ **Method:** Used an old/new recognition memory paradigm in three experiments using the same basic procedure....

Hills et al. (2011): Study Designs

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Experiment 1

- Conditions:
 - Happy induction
 - Sad induction
 - Neutral induction
 - No induction
- Types of face:
 - Neutral expression
- Type of learning:
 - Incidental



Experiment 2

- Conditions:
 - Happy induction
 - Sad induction
 - Neutral induction
- Types of face:
 - Happy expression
 - Sad expression
 - Neutral expression
- Type of learning:
 - Incidental
 - Remember/know procedure

Experiment 3

- Conditions:
 - Happy induction
 - Sad induction
 - Neutral induction
- Types of face:
 - Happy expression
 - Sad expression
 - Neutral expression
- Type of learning:
 - Intentional
 - Remember/know procedure

Hills et al. (2011): Study Procedure

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- Mood induction
 - Using the autobiographical memory task and emotional music

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- Learning phase
 - 32 faces presented sequentially (3 expressions)

3

- Distractor phase
 - Questions about current and average mood

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- Recognition phase
 - 64 faces presented sequentially (3 expressions)

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- Debriefing
 - Mood repair (happy mood induction)

Hills et al. (2011): Key Findings

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- ▶ **Exp. 1:** Happy-induced Ps were less accurate at face recognition than sad-induced Ps.
- ▶ **Exp. 2:** Sad-induced Ps had more conscious recollections of faces than happy-induced Ps
 - ▶ Also, sad-induced Ps recognised all faces accurately, while happy and neutral mood induced Ps recognised happy faces more accurately than sad faces.
- ▶ **Exp. 3:** None of these effects were seen when Ps were specifically instructed to intentionally learn the faces, rather than simply view them incidentally as previous.

Hills et al. (2011): Conclusions

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- ▶ Negative mood does not always lead to detriment in performance.
- ▶ Those in sad mood condition encode information more elaborately than those in happy condition.
- ▶ Manner (incidental vs. intentional) in which information is learned could impact subsequent memory ability.

Evaluation

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- ▶ Holland and Kensinger (2010): reviewed existing research on mood and autobiographical memory.
- ▶ Found clear evidence of mood congruity when people were in a positive mood
 - ▶ However, mood congruity effect was not seen as often when people were in a negative mood.

Why?

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- ▶ On the whole people aim to remove themselves out of negative mood states.
- ▶ This emotion regulation reduces the negative mood state – great!
- ▶ However, in doing so, it also reduces the accessibility to negative memories.



Research evidence

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- ▶ Rusting and DeHart (2000):
 - ▶ Ps presented with positive, negative, and neutral words. E.g.,
Joy | Crying | Table
 - ▶ Then induced into a negative mood through Vignettes where they had to imagine experiencing negative events.

Research evidence

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- ▶ Rusting and DeHart (2000):
 - ▶ Then placed into different mood-regulation conditions:
 - ▶ Positive reappraisal
 - ▶ Continued negative focus
 - ▶ Control group (could choose direction of thought focus)
- ▶ Findings: Ps who claimed to be good at successfully removing themselves from negative moods showed less evidence of mood congruity.

How do we explain mood-congruity?

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- ▶ Through Tulving's (1979):
Encoding-specificity principle.



- ▶ Memory depends on overlap between information available when we retrieve a memory and information that was available in the original memory trace.

Encoding-specificity principle

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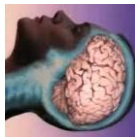
- ▶ When we store information about an event, we also store information about the context of the event.
- ▶ Thus, memory is better when the retrieval context is the same as it was during learning context.
- ▶ Context can be external (environment) or internal (e.g., emotional state)

Encoding-specificity principle

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- ▶ Danker and Anderson (2010, P. 87) extend this to brain states:

"Remembering an episode involves literally returning to the brain state present during that episode."



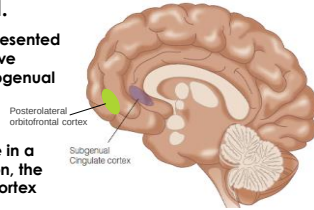
Research Evidence

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- ▶ **Lewis et al. (2005):** Ps learnt positive & negative words, then had a recognition-memory test in a happy or sad mood.

- When positive words were presented and when Ps were in a positive mood at recognition, the subgenual cingulate became active.

- When negative words were presented and when Ps were in a negative mood at recognition, the posterolateral orbitofrontal cortex became active.



Mood-state dependant memory

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- ▶ This suggests that the encoding-specificity principle also encompasses mood.
- ▶ Memory is better when mood state at retrieval matches the same mood state at learning.
 - ▶ This effect is more pronounced when in a positive mood compared to a negative mood (Ucross, 1989).
 - ▶ Most likely due to people being motivated to change their mood to a positive one.

Research Evidence

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- ▶ **Kenealy (1997):** Ps induced into happy or sad mood states via music.

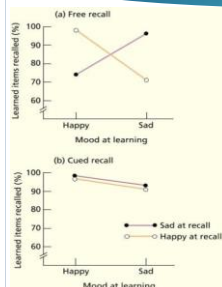


- ▶ Then asked to study maps and learn a list of instructions regarding a defined route.



- Then return the next day and tested on the route under free recall and cued recall conditions.

Kenealy: Findings



Mood-state-dependent memory found in free recall but not cued recall.

Why?

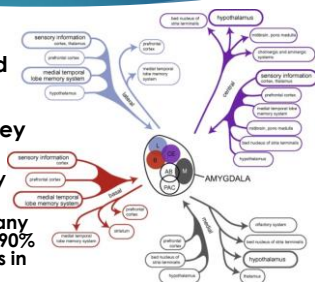
Eich (1995): mood state is not influential when crucial information is presented explicitly: As if the case with cued recall.

Role of the amygdala

► Many brain regions process/deal with memories influenced by emotion.

► Amygdala plays a key role:

- Associated with many emotions
- Acts as a *hub* with many connections to up to 90% of other cortical areas in the brain.



Role of the amygdala

► Murty et al. (2010): meta-analysis:

Higher levels of amygdala activation when learning is associated with the greater probability of emotional items being remembered.



Studies on patients with damage to the amygdala also suggest it plays an important role in emotional memories.....

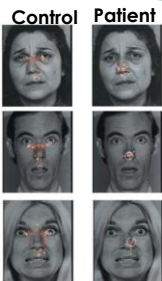
Evidence from brain-damage patients 28

- ▶ Adolphs et al. (2005): Examined memory for the gist and specific details of scenes between healthy and amygdala damaged participants.
- ▶ Pictures of sparsely revealed faces were viewed under two encoding conditions: Neutral or emotionally charged.

Adolphs et al. Findings 29

- ▶ Healthy Ps showed enhanced memory for the gist when encoding context was emotional rather than neutral.
- ▶ However, amygdala damaged patients did not show this pattern.
- ▶ Also, when eye tracking examined where participants looked when the stimuli was presented there were differences in viewing locations....

Adolphs et al. Findings 30



- ▶ When compared to healthy controls, patients with amygdala damage tend not to look at the eyes of faces.
- ▶ The eyes usually provide vital information for understanding facial expressions.

Adolphs et al. Conclusion

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- ▶ Data support a model whereby the amygdala focuses its processing on the gist of information.
- ▶ The amygdala is required for focused attention on important information.
- ▶ This may possibly account for features of traumatic memories and eyewitness testimony in real life.

Evidence from patients with Urbach-Wiethe disease

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- ▶ For those experiencing Urbach-Wiethe disease, the amygdala and surrounding areas are destroyed.
- ▶ Recollection of emotional events is poor compared to neutral (Cahill et al., 1995).
- ▶ Greater impairment for emotional pictures compared to neutral ones (Siebert et al., 2003)

Role of the amygdala

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- ▶ Important for enhancing memory of emotional content due to its connectivity to brain regions involved in memory processes.
 - ▶ E.g., hippocampus
- However, activation is not the only key aspect to influence memory for emotional information:
- Cognitive processes should also be considered, as emotional events recruit other cognitive resources (e.g., attention) to commit stimuli to memory.



Lecture Summary

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- ▶ Mood states influence memory through mood congruity and mood-state-dependent memory.
- ▶ Effects are consistent with encoding-specificity principle.
- ▶ Effects are stronger with positive rather than negative mood states.
- ▶ Research on brain-damaged patients shows importance of the amygdala on influencing effects of emotion on memory.
