Signals and Stories

Evaluate evidence about emotion and memory in the brain

HAP.5.d "Obtain, evaluate, and summarize scientific findings regarding the biological origin of emotions and memories in distinct regions of the brain."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline one scientific finding about each of these regions: the amygdala, the hippocampus, and the prefrontal cortex. Circle two statements that limit what the findings can prove.

What Happens When a Memory Feels Frightening?

1. Imagine smelling smoke while studying in a library. Your pulse quickens, and you remember a kitchen fire from years ago. These reactions involve different brain regions working together, not a single emotion center. In brain imaging studies, the amygdala often becomes more active when people see threatening images. This finding links the amygdala to detecting emotional significance, but an image of activity alone cannot prove that it caused fear. Imaging measures changes in blood flow, which are indirect signs of neural activity. Researchers compare such findings with studies of people who have damage to particular regions.

2. In one set of studies, people with damage to both amygdalae failed to develop a typical bodily fear response when a neutral cue repeatedly preceded an unpleasant event. Some could still explain which cue predicted the event. This contrast suggests that the amygdala helps form learned emotional responses, rather than storing every fact about a frightening experience. Meanwhile, people with extensive damage to the hippocampus often struggle to form new memories of events they personally experienced, although they may still learn certain skills. Damage studies offer stronger evidence about whether a region is necessary than imaging does, but injuries can affect connected areas too.

3. In another study, participants viewed upsetting pictures and then tried to reinterpret them in less alarming ways. Imaging showed increased activity in parts of the prefrontal cortex and reduced amygdala activity during reinterpretation. Participants also reported feeling less upset. These results support a role for prefrontal regions in regulating emotion, but the activity pattern does not show that those regions act alone or prove exactly how they change feelings. Together, the findings suggest a working network: the hippocampus supports memories of events, the amygdala helps link cues with emotional responses, and prefrontal regions help adjust reactions.

2 ANSWER WITH EVIDENCE

Use the passage

1. How do the imaging and damage findings together support a role for the amygdala in emotional responses?

2. What does the contrast between event memories and skill learning suggest about the hippocampus?

3. Summarize the two brain-activity changes observed during reinterpretation. How do they relate to what participants reported?

4. A student claims that the reinterpretation study proves the prefrontal cortex acts alone to stop fear. Which finding supports part of this claim, and why does the full claim go too far?

3 YOUR TURN

Your own words

Invent an everyday situation, different from the passage examples, that triggers an emotion and a specific personal memory. In four to six sentences, explain how the amygdala, hippocampus, and prefrontal cortex might contribute, and state one limit of the evidence behind your explanation.

Signals and Stories

PART 1 · READ AND MARK

Underline one scientific finding about each of these regions: the amygdala, the hippocampus, and the prefrontal cortex. Circle two statements that limit what the findings can prove. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How do the imaging and damage findings together support a role for the amygdala in emotional responses?	**Imaging links amygdala activity with threatening images, while damage to both amygdalae can prevent a typical learned bodily fear response. The damage finding gives stronger evidence that the region is needed for that response.**
2	What does the contrast between event memories and skill learning suggest about the hippocampus?	**The hippocampus is important for forming new memories of personally experienced events, but some skill learning can occur despite extensive hippocampal damage.**
3	Summarize the two brain-activity changes observed during reinterpretation. How do they relate to what participants reported?	**Prefrontal activity increased and amygdala activity decreased. Participants also reported feeling less upset.**
4	A student claims that the reinterpretation study proves the prefrontal cortex acts alone to stop fear. Which finding supports part of this claim, and why does the full claim go too far?	**Increased prefrontal activity occurred when participants reinterpreted upsetting pictures and felt less upset. Imaging cannot prove that this region caused the change or acted alone.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

At a school concert, a drumbeat reminds me of a storm that interrupted last year's performance, and I feel uneasy. My hippocampus could help me recall that particular concert. My amygdala could help link the drumbeat to a learned emotional response. I could use prefrontal regions to reinterpret the sound as part of today's safe performance and feel calmer. These are plausible roles, not proof that any one region acted alone in this moment.

Accept explanations that connect each region to the role supported by the passage without treating a region as the sole source of an emotion or memory. For Part 3, the evidence limit may address indirect imaging measures, connected brain regions, or the inability to prove what happened in the invented situation.