


Teens & Sleep

LINKING DISCOVERY, PRACTICE, AND POLICY

Memory, Cognition and Sleep

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University of Notre Dame

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The Sleeping Brain is *Highly Active*

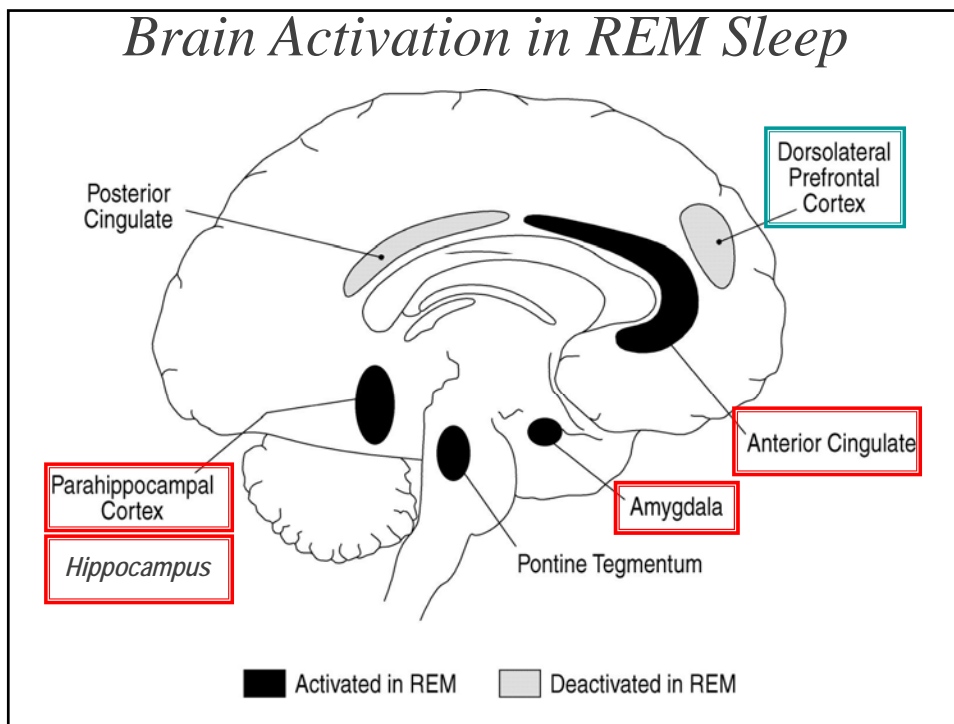


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National Conference | October 3-4, 2013



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Sleep Improves *Memory and Creative Cognition*

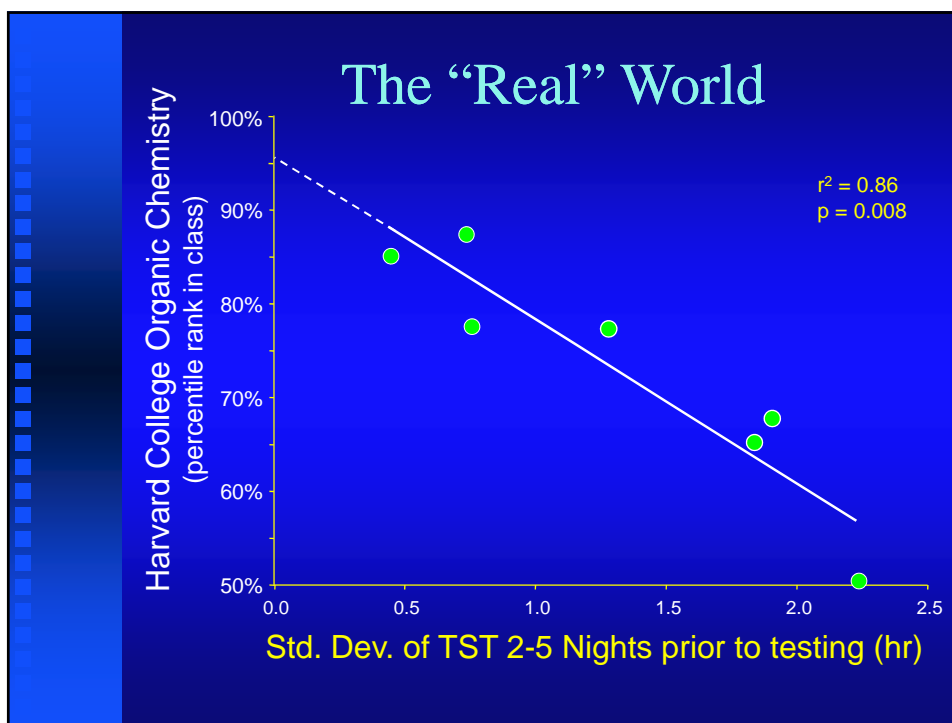


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We Remember the Gist
(The "Take Home Lesson")

Neurobiology of Learning and Memory (2009) 92, 327-334



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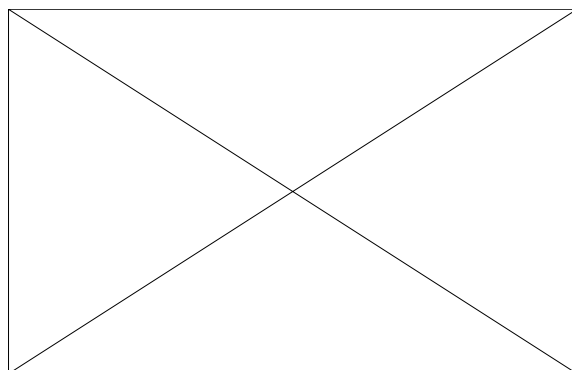
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Experiment



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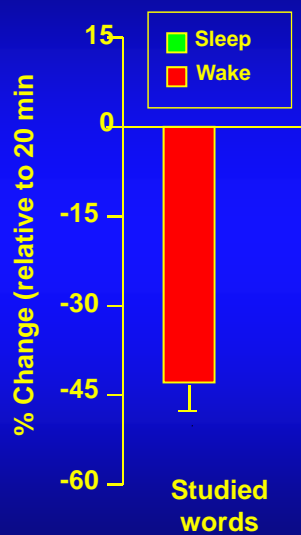
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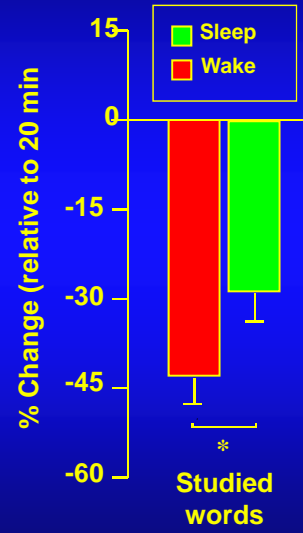
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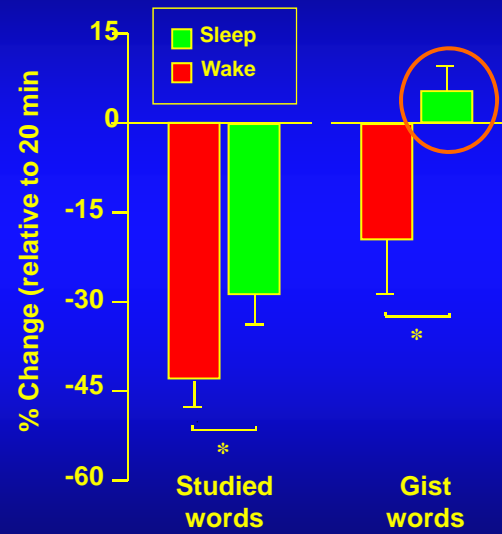
12-Hour Deterioration



12-Hour Deterioration



12-Hour Deterioration



We Remember What's *Emotional*

Psychological Science (2008) 19(8), 781-788; *Perspectives in Psychological Science* (2010) 19(5), 290-295, *Frontiers in Integrative Neuroscience* (2012) 6(108)



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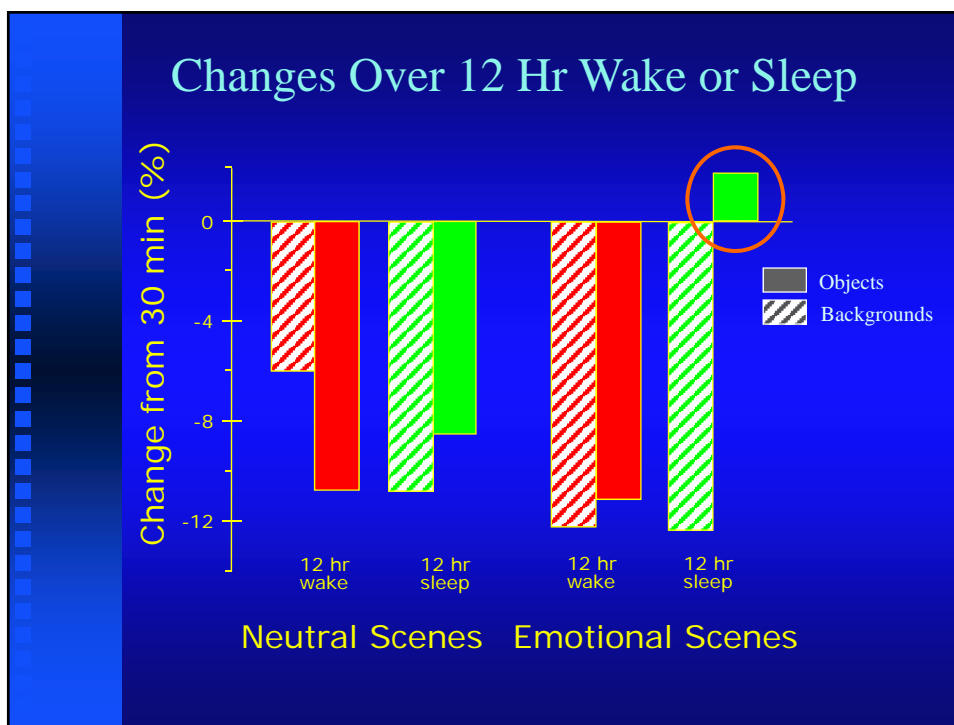
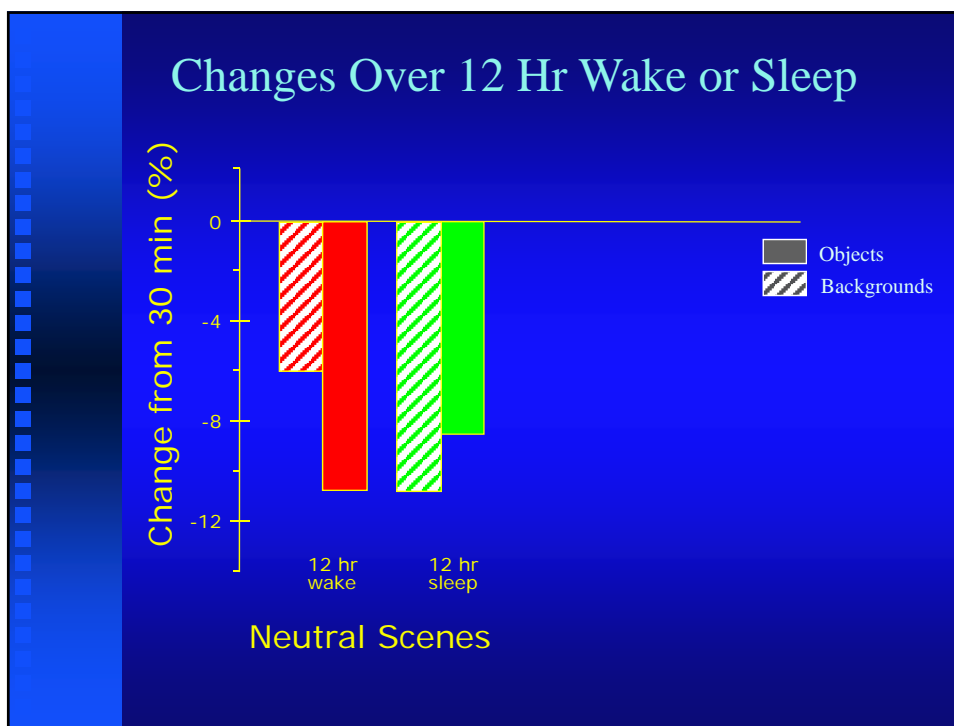


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Stimulus Design





We Put Things Together Differently and Make Creative Associations

Nature (2004) 427, 352-55, *PNAS* (2007) 104, 7723-28



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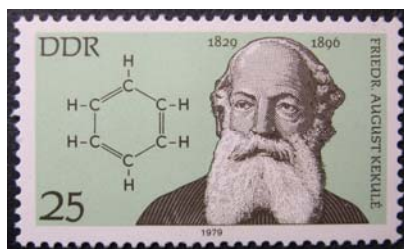
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Friedrich August Kekulé concludes that the structure of benzene is a closed, hexagonal, six-membered ring after a visionary dream.

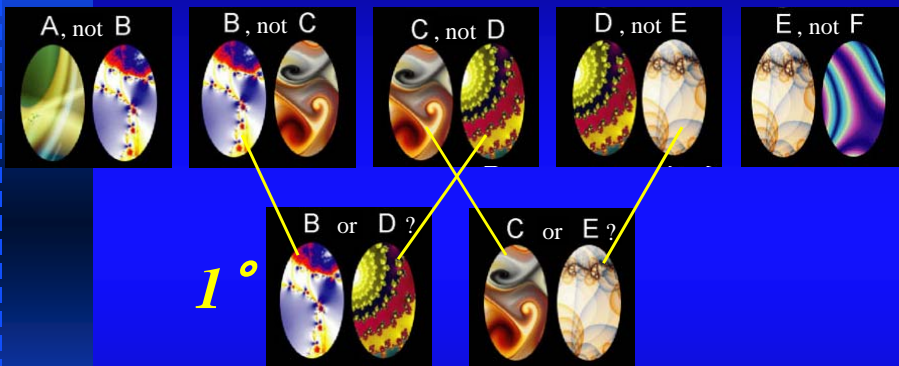


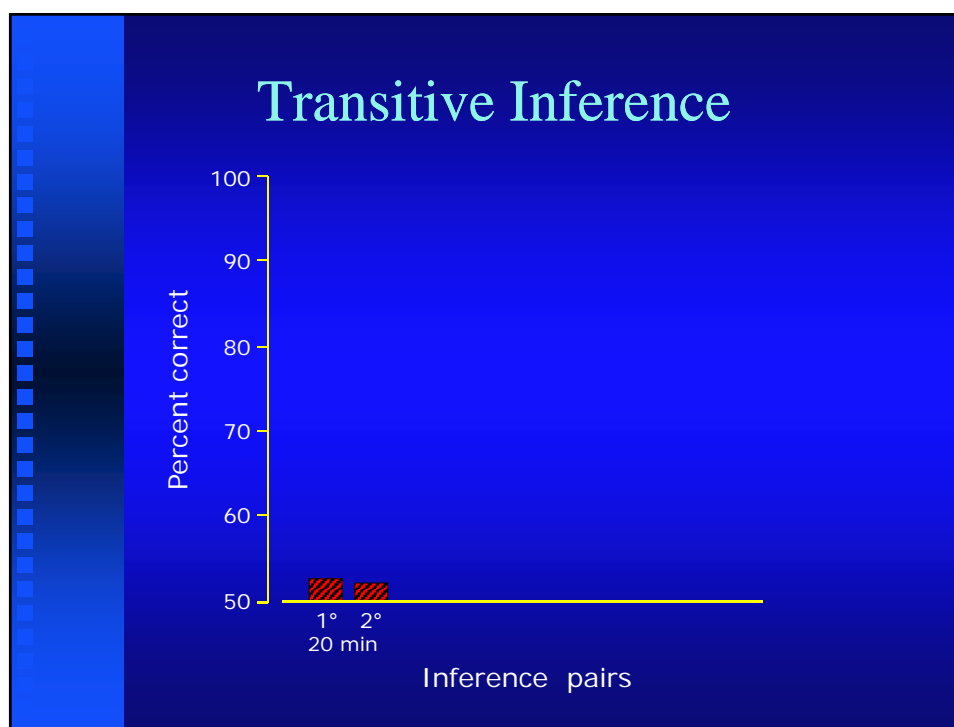
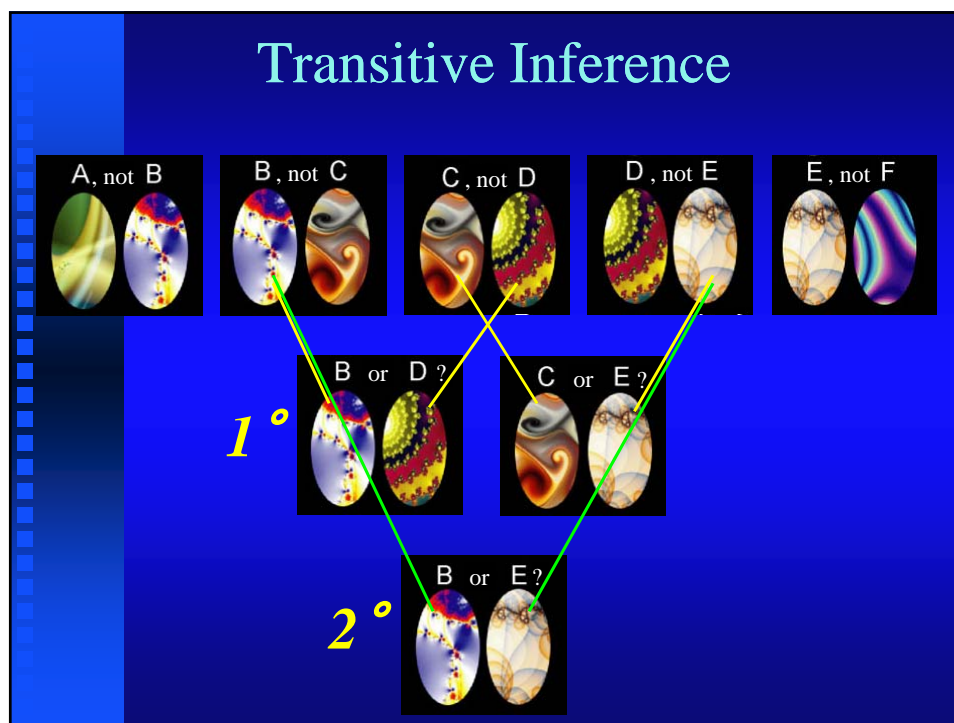
"...I was sitting writing on my textbook, but the work did not progress; my thoughts were elsewhere. I turned my chair to the fire and dozed. Again the atoms were gamboling before my eyes. This time the smaller groups kept modestly in the background. My mental eye, rendered more acute by the repeated visions of the kind, could now distinguish larger structures of manifold conformation; long rows sometimes more closely fitted together all twining and twisting in snake-like motion. But look! What was that? One of the snakes had seized hold of its own tail, and the form whirled mockingly before my eyes. As if by a flash of lightning I awoke; and this time also I spent the rest of the night in working out the consequences of the hypothesis."

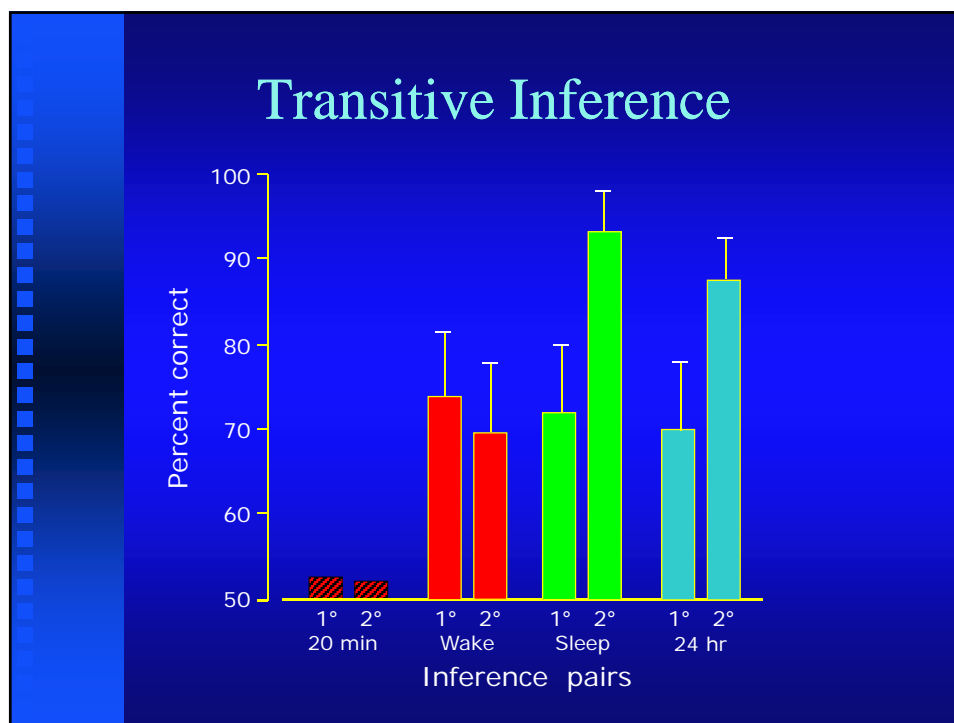
Transitive Inference



Transitive Inference







Sleep Regulates our *Emotions*

Current Biology (2007) 17, R877-R878; Journal of Cognitive Neuroscience (2011) 23(6), 1285-1297



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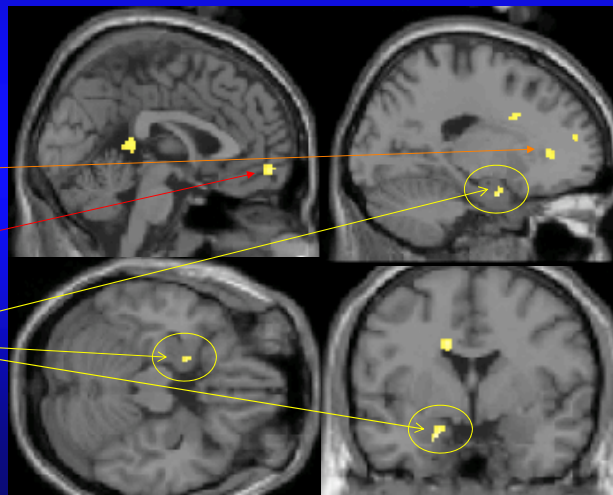
Sleep, Memory and Emotion Regulation



People recalled memories while being scanned, either after day spent awake or night of sleep

Retrieval of Negative Objects Following Sleep

Cingulate Cortex
Right Prefrontal Cortex (vmPfc)
Amygdala



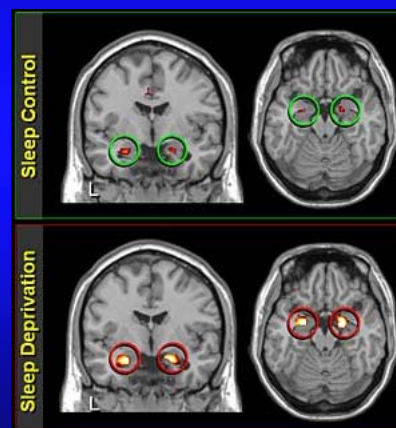
What Happens When You are Sleep Deprived?

- *After sleep deprivation, only remember negative information - not positive or neutral*

Walker et al., 2008

What Happens When You are Sleep Deprived?

- *After sleep deprivation, only remember negative information - not positive or neutral*



Walker et al., 2008

Conclusions

Sleep selectively benefits emotional memory while also helping us regulate emotion

Sleep doesn't "consolidate" existing memories by simply making them stronger

Rather, it goes beyond this, transforming memories -- integrating them, extracting generalities and emphasizing what's important

May shed light on the fact that what we remember is not always (nor typically) what we actually experience

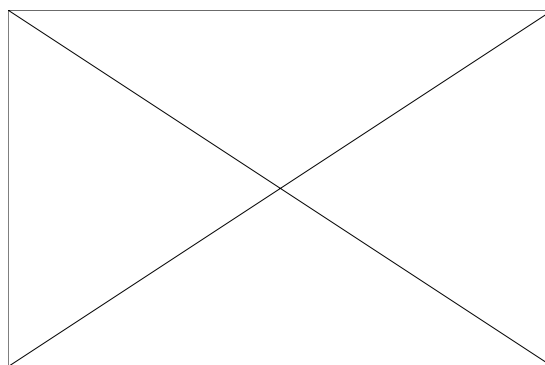
May allow errors and inaccuracies

Leads to memories that are flexible and adaptive, and allows for creativity



Magritte, The human condition, 1933, Washington DC: NGA

Q&A



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