Untangling dreams and our waking lives: Latest findings in cognitive neuroscience

April 14 2024

Credit: Mo Eid from Pexels

"Dreams are messages from the deep." (Dune Part 1) Musings about dreams abound throughout society, from movies to TV to books. But

despite being a constant source of fascination, the role of dreams in our lives still remains elusive.

As recently noted in the TV show Grey's Anatomy, "Honestly, no one knows why we dream or why we have nightmares." While true, neuroscientists are finding innovative new ways to study dreams and how they influence our cognition.

"Understanding how dreams are generated and what their function might be—if any—is one of science's biggest open questions right now," says Remington Mallett of University of Montréal, who is chairing a session today at the annual meeting of the Cognitive Neuroscience Society (CNS) in Toronto.

"Because we don't know much about dreams, it is hard to estimate their full impact on our waking lives. But current results suggest that indeed dreams influence our waking experiences."

As presented at CNS 2024, researchers are finding not only novel approaches to exploring dreams and the architecture of sleep, but also ways to engineer dreams to help people suffering from sleep disorders. In the process, scientists are seeing how perceptions of dreams and sleep quality often differ greatly from the objective measures traditionally used to evaluate them.

Perceptions versus reality

Claudia Picard-Deland posits that dreams are a window into understanding sleep quality. She and colleagues at the University of Montréal design studies that wake sleepers many times in the night to determine how the participants perceive their sleep.

"Dreams are not studied a lot in the context of sleep quality. The focus is

more often on objective measures like brain activity or sleep stage, but I think we need to look closer at dream activity and its impact on how we perceive sleep." For people who suffer from insomnia and related disorders, perception of sleep is reality, and their dreams could offer possible ways to help shape those perceptions.

In their latest, unpublished study, Picard-Deland and colleagues woke 20 "good sleepers" some 12 times in the night, representing all four classic sleep stages at three different times in the night. At each awakening, the researchers would ask whether they had been awake or asleep, how deeply they were sleeping, what was last in their minds, and how immersed they felt in their dreams.

They found that sleep misperception—feeling awake even when electrodes measured they were asleep—was common among participants, especially in the early, dreamless stages of sleep. Likewise, they found that when the participants were able to recall their dreams, they perceived their sleep as deeper.

"And when they are more immersed in their dreams, feel more physically present, or have more vivid dreams, they wake up feeling their sleep was deeper compared to when they have no, or light, dream activity," Picard-Deland says.

The researchers were surprised to see how frequently participants thought they had been awake when they were actually sleeping ("paradoxical insomnia") and in the deeper, slow-wave phase of sleep. This work builds upon similar previous findings and has important implications for how scientists understand the architecture of sleep, as well as for people who report insomnia.

As someone who has experienced insomnia her whole life, Picard-Deland thinks it is crucial for people to realize that they may be sleeping

more than they think. "It helped me to see it with my own eyes, happening in front of me, that participants were sleeping yet still felt awake."

Beyond that understanding, this work could have future applications for sleep rehabilitation based on dreams. For example, Picard-Deland would love to explore whether dream training, such as teaching people how to experience more immersive lucid dreams, could lead to better perceived sleep quality.

Lucid dreams as a tool

Lucid dreams are an important part of the work of Saba Al-Youssef whose team at Sorbonne Université leverages the ability of lucid dreamers to use facial muscles during sleep as a new tool for gathering data. "Dreams are a hidden world to which we have no direct access," she says.

"We mostly rely on dream reports no matter what study method we use. The capacity of lucid dreamers to communicate with us in real time gives us side door access to dreams, at least knowing when a specific event is happening."

In a new study with researchers at Northwestern University published in *Current Biology*, Al-Youssef and colleagues aim to better understand how the brain acts during dreams in comparison to its behavior when awake.

When people are awake and close their eyes, visual content disappears and specific electrical signals occur. Researchers therefore wondered what happens in the brain when someone closes their eyes in a dream. They hope to better understand the neural correlates of visual perception during dreams.

The researchers recruited participants who included lucid dreamers with narcolepsy. Over the course of five naps, the researchers instructed participants to close and open their "dream eyes" and signal so by sniffing once or twice. They then asked those with narcolepsy to report whether they had visual content in each condition by frowning or smiling.

"Surprisingly, we've found that closing our 'dream eyes' is not always accompanied by a loss of vision, as is the case when we're awake," Al-Youssef says. "I hope this work would help show how using lucid dreams can be helpful in studying dreams and even understanding their function."

Mallett is excited to see work like this to develop new methodology for studying dreams. "I think most scientists are skeptical that dreams can be studied, so before I tell them about what we found, I need to convince them that we can find something," Mallett says, "that we have the methods and tools to make discoveries about dreams."

Both Picard-Deland's and Al-Youssef's work open new avenues of research in manipulating dreams through new technology and with immediate clinical benefits. "You need to manipulate dreams for good experimentation, and you need to manipulate dreams to reduce nightmares," he says.

"Nightmares are incredibly frustrating for a variety of clinical populations, and there is great need for approaches to reducing them. Understanding how dreams are formed, and how to change them, is already laying paths forward for efficient nightmare reduction protocols."

Overall, the body of work presented at CNS 2024 is showing the myriad ways dreams affect our waking lives. "This is rather unsurprising when

you consider that dreams are experiences, and your prior experience is always going to impact your experiences going forward."

The work also echoes a fundamental lesson from cognitive neuroscience, that whether awake or asleep, our perceptions of the world are but imperfect creations in our minds.

More information: Karen Konkoly et al, Changes in Alpha Power and Visual Content after Closing One's Dream-Eyes in REM Sleep, *Current Biology* (2024). DOI: 10.2139/ssrn.4692171

The symposium "Into the Night: The Cognitive Neuroscience of Dreaming" is taking place at 1:30pmEDT on Sunday, April 14, as part of the CNS 2024 annual meeting from April 13-16, 2024 in Toronto, Canada.

Provided by Cognitive Neuroscience Society