

Sleep-deprived people make risky decisions based on too much optimism

March 8 2011

The powers that be in Las Vegas figured out something long before neuroscientists at two Duke University medical schools confirmed their ideas this week: Trying to make decisions while sleep-deprived can lead to a case of optimism.

The scientists showed, using a functional MRI, that a night of [sleep deprivation](#) leads to increased [brain activity](#) in [brain regions](#) that assess positive outcomes, while at the same time this deprivation leads to decreased activation in the [brain areas](#) that process negative outcomes.

Sleep-deprived individuals in the study tended to make choices that emphasized monetary gain, and were less likely to make choices that reduced loss. While this wasn't true for all of the subjects, the findings are worth heeding.

It has been shown that lack of adequate sleep impairs our ability to make decisions, but this has often been attributed to sleep deprivation's effects on attention and memory, and the inability to integrate feedback in an effective manner.

This is the first study to show that sleep deprivation can change the way the brain assesses economic value, independent of its effects on vigilant attention.

The study also demonstrates that sleep deprivation increases sensitivity to positive rewards while diminishing sensitivity to negative

consequences.

The researchers tested 29 healthy adult volunteers with an average age of 22 years to learn how sleep deprivation might affect decision making, separately from its effects on vigilance.

The subjects had to perform a series of economic decision-making tasks twice, once at 8 a.m. after a normal night of sleep and once at 6 a.m. after a night of sleep deprivation. To evaluate neural sensitivity to rewards, participants passively watched as gambling outcomes were sorted as positive or negative. They also performed an out-of-scanner task in the morning test session and also hourly throughout the sleep-deprivation night to assess vigilance.

The study was published by the [Journal of Neuroscience](#) on March 8.

"Even if someone makes very sound, risky financial decisions after a normal night of sleep, there is no guarantee that this same person will not expose you to untoward risk if sleep deprived," said co-author Michael Chee, M.D., senior author and professor at the Neurobehavioral Disorders Program at Duke-NUS in Singapore.

Chee explained, for example, that there is empirical evidence that long work hours for medical residents lead to an increased number of accidents. "I think it's critical that society as a whole grapple with the data generated about the detrimental effects of sleep deprivation and consider whether to continue doing things the old way," Chee said. "Old habits die hard, but maybe some of them should die."

Co-author Scott Huettel noted that casinos often take steps to encourage risk-seeking behavior -- providing free alcohol, flashy lights and sounds, and converting money into abstractions like chips or electronic credits. "Sleep deprivation surely makes gambling even more tempting for many

people," said Huettel, who is an associate professor of psychology and neuroscience and director of the Duke Center for Interdisciplinary Decision Science in North Carolina.

"Late-night gamblers are fighting more than just the unfavorable odds of gambling machines; they are fighting a sleep-deprived brain's tendency to implicitly seek gains while discounting the impact of potential losses," said Vinod Venkatraman, the lead author and graduate student in Psychology and Neuroscience at Duke. "Countermeasures that combat fatigue and improve alertness may be inadequate for overcoming these decision biases."

Provided by Duke University Medical Center

Citation: Sleep-deprived people make risky decisions based on too much optimism (2011, March 8) retrieved 18 July 2023 from

<https://medicalxpress.com/news/2011-03-sleep-deprived-people-risky-decisions-based.html>

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