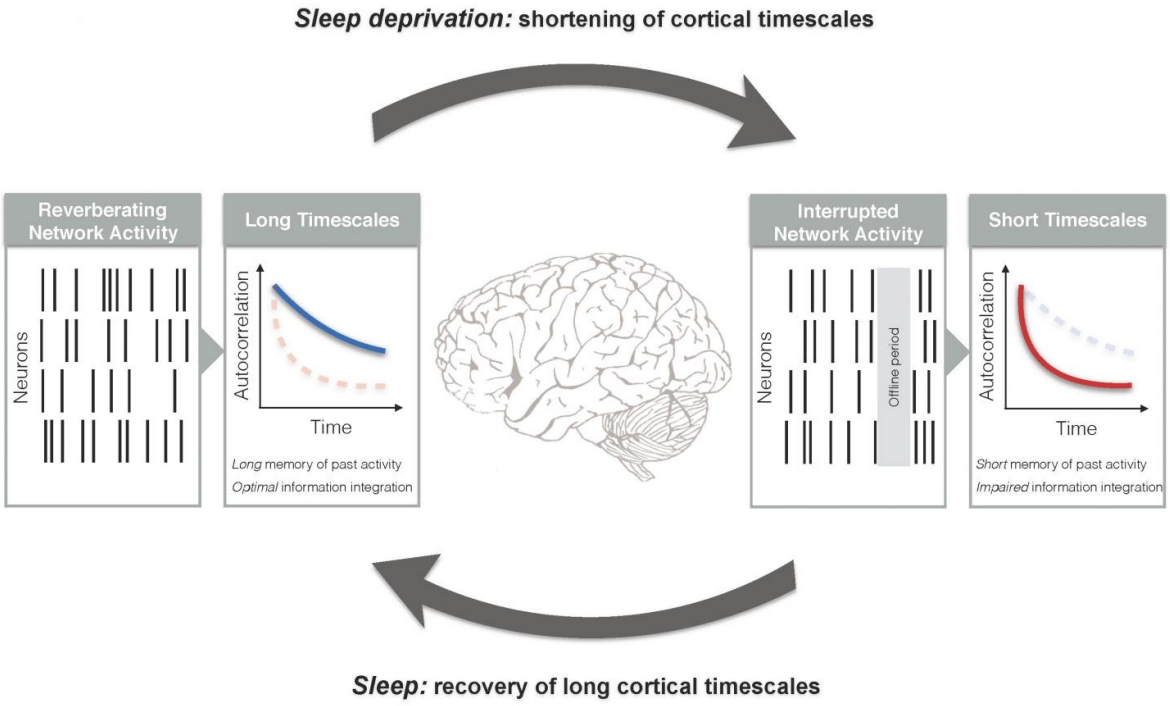
Information processing breakdown in sleep-deprived rats

September 25 2017



Sleep-deprived rats exhibited rapid transitions between wake- and sleep-like states associated with brief pauses in individual neuron firing. These 'offline' periods led to a progressive disruption of the ongoing activity traces and their long timescales. Long timescales in network activity were restored after a consecutive recovery sleep period. Credit: Christian Meisel

Sleep deprivation may disrupt the brain's ability to integrate information over time, potentially contributing to the decline in cognitive

performance observed during extended time awake, suggests a study in rats published in the *Journal of Neuroscience*.

Information processing is thought to depend on reverberating brain that supports the integration of information over extended time periods and across different brain regions. In their study of male rats, Christian Meisel and colleagues found that the long timescales characterizing persistent activity of neural networks while awake breaks down during sleep.

Sleep-deprived rats, which the researchers kept awake by providing them with novel objects like blocks and balls, exhibited rapid transitions between wake- and sleep-like states associated with brief pauses in individual neuron firing. These "offline" periods led to a progressive disruption of the ongoing activity traces and their long timescales. Long timescales in network activity were restored after a consecutive recovery sleep period.

These findings suggest that different vigilance states exhibit varying degrees of information integration capabilities and that one function of sleep may be to reset the activity of neural networks to support optimal information processing while awake.

More information: The interplay between long- and short-range temporal correlations shapes cortex dynamics across vigilance states, DOI: 10.1523/JNEUROSCI.0448-17.2017

Provided by Society for Neuroscience