The Effects of Sleep Deprivation on Memory Recall of a Neuronal System Model

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It has previously been determined that humans function best under a sufficient amount of sleep. Due to workplace pressures and familial issues, sleep deprivation has become more common, negatively affecting mood, memory, and concentration in sleep-deprived individuals. As such, it has been discovered that sleep (and the lack thereof) affects the electrical signals passed in the brain. This experiment was designed to model the effects of sleep deprivation on a neuronal system by changing the weights of the excitatory inputs. This was quantified by the percent of correctly recalled patterns that were stored in the system’s memory. Using a network model, the neurons were stimulated by excitatory or inhibitory cells and told to recall a pattern. The extent to which excitatory and inhibitory inputs are affected by a lack of sleep are not known; however, the results of this experiment provide a general trend that shows the relationship between hours of sleep and memory recall. This experiment modeled the performance of the neuronal system under 2, 4, 6, 8 and 10 (control) hours of sleep. To mimic the effects of sleep deprivation on mammalian neurons, the intensity of the excitatory inputs to the neurons were decreased by 20% for 2 hours of sleep lost. After 2 hours of sleep, the system was only able to remember 12.4% of the patterns recalled during the control. Likewise, the system recalled 34.5%, 52.98%, and 69.23% of the control patterns after 4, 6, and 8 hours of sleep, respectively. As demonstrated by the data, the computer model functions as expected, with strong positive correlation between sleep and memory recall.