

Monitoring Memories by Using Brain Imaging

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Abstract : The course of daily human life calls for the need for memories and remembering the time and place for certain events. Recalling memories takes up a substantial amount of time for an individual. Unfortunately, scientists lack the proper technology to fully understand and observe different brain regions that interact to form or retrieve memories. The hippocampus, a complex brain structure located in the temporal lobe, plays a crucial role in memory. The hippocampus forms memories as well as allows the brain to retrieve them by ensuring that neurons fire together. This process is called “neural synchronization.” Sadly, the hippocampus is known to deteriorate often with age. Proteins and hormones, which repair and protect cells in the brain, typically decline as the age of an individual increase. With the deterioration of the hippocampus, an individual becomes more prone to memory loss. Many memory loss starts off as mild but may evolve into serious medical conditions such as dementia and Alzheimer’s disease. In their quest to fully comprehend how memories work, scientists have created many different kinds of technology that are used to examine the brain and neural pathways. For instance, Magnetic Resonance Imaging - or MRI- is used to collect detailed images of an individual's brain anatomy. In order to monitor and analyze brain functions, a different version of this machine called Functional Magnetic Resonance Imaging - or fMRI- is used. The fMRI is a neuroimaging procedure that is conducted when the target brain regions are active. It measures brain activity by detecting changes in blood flow associated with neural activity. Neurons need more oxygen when they are active. The fMRI measures the change in magnetization between blood which is oxygen-rich and oxygen-poor. This way, there is a detectable difference across brain regions, and scientists can monitor them. Electroencephalography - or EEG - is also a significant way to monitor the human brain. The EEG is more versatile and cost-efficient than an fMRI. An EEG measures electrical activity which has been generated by the numerous cortical layers of the brain. EEG allows scientists to be able to record brain processes that occur after external stimuli. EEGs have a very high temporal resolution. This quality makes it possible to measure synchronized neural activity and almost precisely track the contents of short-term memory. Science has come a long way in monitoring memories using these kinds of devices, which have resulted in the inspections of neurons and neural pathways becoming more intense and detailed.

Keywords : brain, EEG, fMRI, hippocampus, memories, neural pathways, neurons

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