

The effect of sleep on the brain

Now, let's move to the effect on memory.

Sleep affects the hippocampus, parietal lobe, and prefrontal cortex, three parts of our brain that are closely linked to our memory.

First, let's talk about how sleep allows our brains to retain memories.

Long-term memory formation is accomplished during sleep, a process that proceeds from strengthening memory traces to reorganizing memories, and ultimately integrating them into established knowledge networks. The part of the brain responsible for keeping memories is the hippocampus. Memories are consolidated and integrated under "communication" between the hippocampus and the rest of the brain.

According to the active system consolidation theory, the information encoded in the cortex and hippocampus during waking is continuously activated and repeated during slow wave sleep. Replaying this way can make our brain cells more closely connected, because the tightness of the connections between brain cells is a key factor in the strength of memory, so the more replaying, the more memory will be consolidated.

Then, let's talk about the effects of sleep on the brain's ability to store memories correctly. A team of researchers at Michigan State University and the University of California, Irvine, has done a study. Researchers asked participants to watch and remember a series of images, and the results showed that if a person stayed up all night, many details of the image were prone to error, and

the memory was easily distorted. This is because less sleep and insufficient sleep can damage the cognitive function of the prefrontal cortex and the processing function of the parietal lobe, so lack of sleep is prone to memory errors.

睡眠影响我们大脑的海马体、顶叶和前额叶皮质，这三个部分与我们的记忆密切相关。首先，让我们谈谈睡眠是如何让我们的大脑保留记忆的。长期记忆的形成是在睡眠过程中完成的，这是一个从加强记忆痕迹，重组记忆，并最终将其整合到已建立的知识网络的过程。大脑中负责保存记忆的部分是海马体。首先，我们学习到的新知识会成为记忆，编码进入海马体。在海马体 and 大脑其他部分的“沟通”下，记忆得到巩固和整合。根据主动系统整合理论 (active system consolidation)，清醒时编码储存在皮层和海马体中的信息，在慢波睡眠 (slow wave sleep) 时被不断第激活，重演。重演这种方式可以让我们大脑细胞之间的联系更加紧密，因为大脑细胞之间联系的紧密度是记忆力强弱的关键因素，所以重演越多，记忆就会越巩固。

接下来我们来谈谈睡眠对大脑正确存储记忆的影响。美国密西根州立大学、加州大学尔湾分校研究团队曾做过一项研究。研究人员让参与研究的人观看、记忆一系列图像，研究结果显示，一个人如果熬夜、整晚没睡，记忆图像时很多细节就容易出错，记忆很容易扭曲。这是因为少睡眠、睡眠不足会损伤前额叶皮质的认知功能和顶叶的处理功能，因此缺乏睡眠容易导致记忆出错。