

次の文章を読んで、問1～3に答えなさい。

For many years, people believed that the brain, like the body, rested during sleep. After all, we are rendered unconscious by sleep. Perhaps, it was thought, the brain just needs to stop thinking for a few hours every day. Wrong. During sleep, our brain---the organ that directs us to sleep---is itself extraordinarily active. And much of that activity helps the brain to learn, to remember and to make connections.

It wasn't so long ago that the rueful joke in research circles was that everyone knew sleep had something to do with memory---except for the people who study sleep and the people who study memory. Then, in 1994, Israeli researchers reported that the average performance for a group of people on a memory test improved when the test was repeated after a break of many hours---during which some subjects slept and others did not. In 2000, a Harvard team demonstrated that this improvement occurred only during sleep.

There are several different types of memory and researchers have designed ways to test each of them. In almost every case, whether the test involves remembering pairs of words, tapping numbered keys in a certain order or figuring out the rules in a weather-prediction game, "sleeping on it" after first learning the task improves performance. It's as if our brains squeeze in some extra practice time while we're asleep.

(1)This isn't to say that we can't form memories when we're awake. If someone tells you his name, you don't need to fall asleep to remember it. But sleep will make it more likely that you do. Sleep-deprivation experiments have shown that a tired brain has a difficult time capturing memories of all sorts. (2)Interestingly, sleep deprivation is more likely to cause us to forget information associated with positive emotion than information linked to negative emotion. This could explain, at least in part, why sleep deprivation can trigger depression in some people: memories tainted with negative emotions are more likely than positive ones to "stick" in the sleep-deprived brain.

Sleep also seems to be the time when the brain's two memory systems---the hippocampus and the neocortex---"talk" with one other. Experiences that become memories are laid down first in the hippocampus, obliterating whatever is underneath. If a memory is to be retained, it must be shipped from the hippocampus to a place where it will (A)---the neocortex, the wrinkled outer layer of the brain where higher thinking takes place. Unlike the hippocampus, the neocortex is a master at weaving the old with the new. And partly because it keeps incoming information at bay, sleep is the best time for the "undistracted" hippocampus to shuttle memories to the neocortex, and for the neocortex to (B) them to related memories.

How sleep helps us consolidate memories is still largely a mystery. A recent study from the University of Lubeck, in Germany, offers one clue. Subjects were given a list of 46 word pairs to (C), just before sleep. Shortly after they fell asleep, as they reached the deepest stages of sleep, electrical currents were sent through electrodes on their heads to induce very slow brain waves. Such slow waves were induced at random in the brains of one group of subjects, but not another. The next morning, the slow-wave group had better recall of the words. Other types of memory were not improved, and inducing the slow waves later in the night did not have the same effect. Why and how the slow waves improved memory is not yet (D), but they are thought to alter the strengths of chemical connections, or synapses, between specific pairs of nerve cells in the brain. Memories are "stored" in these synapses: changing the strength of the synapses (E) the strength of the memories they store.(以下省略)[Newsweek, April 18, 2009]

注 hippocampus 海馬 (大脳の一部) neocortex (大脳の) 新皮質 electrode(s)電極
synapse(s)シナプス (神経細胞接続部)

問1 第二パラグラフの内容に基づき、イスラエルとハーヴァードの両研究チームの実験が明らかにしたことを、それぞれ35字以内で書きなさい。ただし、句読点も一字に数えます。

問2 下線部(1)、(2)を日本語に訳しなさい。

問3 空所(A)～(E)に入る最も適切な動詞を下から選び、必要とあれば適切な形にして記入しなさい。ただし、それぞれの語は一度しか使えません。

endure increase link memorize understand