

Sleepy heads

Researchers say an afternoon nap prepares the brain to learn.

MAD dogs and Englishmen, so the song has it, go out in the midday sun. And the business practices of England's lineal descendant, America, will have you in the office from nine in the morning to five in the evening, if not longer. Much of the world, though, prefers to take a siesta. And research presented to the AAAS meeting in San Diego suggests it may be right to do so. It has already been established that those who siesta are less likely to die of heart disease. Now, Matthew Walker and his colleagues at the University of California, Berkeley, have found that they probably have better memory, too. A post-prandial snooze, Dr Walker has discovered, sets the brain up for learning.

The role of sleep in consolidating memories that have already been created has been understood for some time. Dr Walker has been trying to extend this understanding by looking at sleep's role in preparing the brain for the formation of memories in the first place. He was particularly interested in a type of memory called episodic memory, which relates to specific events, places and times. This contrasts with procedural memory, of the skills required to perform some sort of mechanical task, such as driving. The theory he and his team wanted to test was that the ability to form new episodic memories deteriorates with accrued wakefulness, and that sleep thus restores the brain's capacity for efficient learning.

They asked a group of 39 people to take part in two learning sessions, one at noon and one at 6pm. On each occasion the participants tried to memorise and recall 100 combinations of pictures and names. After the first session they were assigned randomly to either a control group, which remained awake, or a nap group, which had 100 minutes of monitored sleep.

Those who remained awake throughout the day became worse at learning. Those who napped, by contrast, actually improved their capacity to learn, doing better in the evening than they had at noon. These findings suggest that sleep is clearing the brain's short-term memory and making way for new information.

It is already well known that fact-based memories are stored temporarily in an area called the hippocampus, a structure in the centre of the brain. But they do not stay there long. Instead, they are sent to the prefrontal cortex for longer-term storage. Electroencephalograms, which measure electrical activity in the brain, have shown that this memory-refreshing capacity is related to a specific type of sleep called Stage 2 non-REM sleep.

The ideal nap, then, follows a cycle of between 90 and 100 minutes. The first 30 minutes is a light sleep that helps improve motor performance. Then comes 30 minutes of stage 2 sleep, which refreshes the hippocampus. After this, between 60 and 90 minutes into the nap, comes rapid-eye-movement, or REM, sleep, during which dreaming happens. This, research suggests, is the time when the brain makes connections between the new memories that have just been "downloaded" from the hippocampus and those that already exist—thus making new experiences relevant in a wider context.

The benefits to memory of a nap, says Dr Walker, are so great that they can equal an entire night's sleep. He warns, however, that napping must not be done too late in the day or it will interfere with night-time sleep. Moreover, not everyone awakens refreshed from a siesta.

The grogginess that results from an unrefreshing siesta is termed "sleep inertia". This happens when the brain is woken from a deep sleep with its cells still firing at a slow rhythm and its temperature and blood flow decreased. Sara Mednick, from the University of California, San Diego, suggests that non-habitual nappers suffer from this more often than those who siesta

regularly. It may be that those who have a tendency to wake up groggy are choosing not to siesta in the first place. Perhaps, though, as in so many things, it is practice that makes perfect.

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