

The Role of Sleep in Learning New Words

September 11 2009, by Lin Edwards



A child sleeping. Image: Alessandro Zangrilli, via Wikipedia.

(PhysOrg.com) -- A new study has demonstrated for the first time the importance of sleep in learning new words, and has shown the process has fast and slow components. The slow component is associated with sleep.

Professor Gareth Gaskell, Professor of [Psychology](#) at the University of York, described the study on acquiring vocabulary in a talk at the British Science Festival 2009 on 8 September 2009. He explained that when we encounter a new word, a memory representation of the word is formed immediately in the hippocampus region of the brain. This is the fast component of vocabulary acquisition.

The memory of the novel word is retained during the day, but during [sleep](#) a slow process occurs, in which the memory representation of the word is fed to the neocortex, where it is compared with other words we

know. This process integrates the word into our vocabulary and changes the memory representation, making the word more recognizable and easier to recall in future. Professor Gaskell said the integration process is likely to continue over time, possibly even over years.

Scientists have known for some time that words are recognized in a process in which they are compared with those we already know. So for example we only recognize the word cathedral when similar words (like catharsis) are ruled out. This means that when the new words are fully integrated, they slow down recognition of similar existing words, and time taken can be measured.

In the latest research, Gaskell and his team studied 64 adults, split into two groups. One group was taught the invented words at 8 am, while the second group learned them at 8 pm. They tested the groups immediately afterwards, and after 12 and 24 hours.

The results showed the group that had learned the new words at 8 pm were able to integrate them into their vocabulary better than the group who had been awake for the 12 hours before testing. After 24 hours, when both groups had slept, there was no difference. Gaskell concludes that sleep or a brain state associated with sleep is able to induce integration of new words into the vocabulary.

Another finding from the study was that the group who learned words at 8 pm had better recall of the new words after 12 hours, and improved further after 24 hours, while the group that learned words in the morning tended to have slightly worse recall 12 hours later, but improved during the night.

Professor Gaskell thinks vocabulary exists as representations of words across thousands of neurons in the [neocortex](#) of the brain. Distributed storage of words makes the system more robust to damage, and allows

the stored information to be used with flexibility, but it also makes it difficult to integrate new words into the mental lexicon quickly. An earlier study by Jay McClelland suggested the [brain](#) has a second type of memory, which is more concentrated, and can incorporate new information quickly. This form of memory is centered on the hippocampus.

Professor Gaskell said that learning a language is something everyone does, and in many countries almost everyone is fluent in more than one language. We continue to learn new words throughout our lives, so the study is relevant to all of us. The research could also have implications for people with amnesia (who usually find it difficult to learn new words), sleep disorders, or conditions such as autism that often disrupt sleep patterns.

The study suggests learning new words in the evening is more effective than learning them early in the day because our brains use the "downtime" of sleep to integrate the new words. So reading a book at bedtime may be a great idea if you want a good vocabulary.

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Citation: The Role of Sleep in Learning New Words (2009, September 11) retrieved 3 May 2024 from <https://medicalxpress.com/news/2009-09-role-words.html>

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