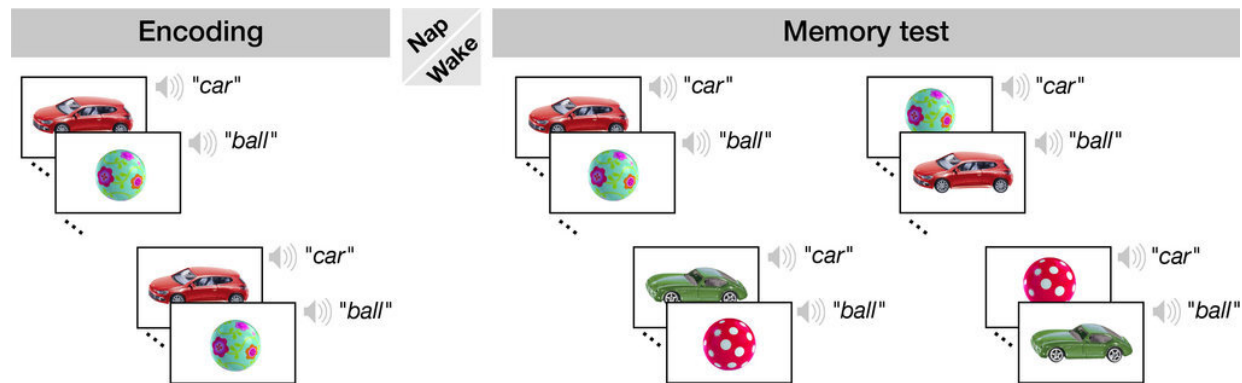


# Babies retain even detailed events during a nap

April 7 2020



Credit: Max Planck Institute for Human Cognitive and Brain Sciences

The brain is permanently exposed to new impressions. Even when sleeping, it does not rest and processes recent experiences. In very early childhood, it has been thought that sleep primarily promotes semantic memory. This includes general knowledge such as the meaning of words. However, scientists at the Max Planck Institute for Human Cognitive and Brain Sciences (MPI CBS) Leipzig and the Humboldt University (HU) Berlin, together with researchers from Lübeck and Tübingen, have now shown for the first time in their study published in *Nature Communications* that babies also build their episodic memory when they nap. This enables them to remember the details of their individual experiences after napping.

The scientists examined this relationship using a three-phase study. During the learning phase, the 14 to 17-month-old [children](#) were shown pictures of objects whose names they already knew, containing different cars, balls or dogs. They then heard the appropriate name for each picture. One group of the children spent the following one to two hours sleeping, while a second group stayed awake. In the subsequent test phase, the researchers showed the young participants different pictures again, including those that they had already seen in the learning phase as well as new cars, balls and dogs. Each object was once named correctly and once incorrectly. During all phases of the experiment, the researchers recorded the baby's [brain](#) activity using the electroencephalogram (EEG).

The analysis of the EEG activity made it clear: The brain of the children who had slept responded differently in the [memory](#) test than that of those who stayed awake—but only in certain cases. If the researchers presented the babies with a [ball](#) that they had never seen before and called it a car, the brain responses initially did not differ. In both groups, the so-called N400 component appeared, which occurs when the brain processes inappropriate meanings. The children obviously knew that a ball is not a car.

It was different, however, when the babies viewed a ball from the learning phase and it was called a car. The group that had stayed awake again showed the N400 component, while the group that had slept did not. In the children who had napped, the researchers observed a brain response that was triggered when a ball from the learning phase was again correctly named as such. However, this response did not occur when a new ball was called a ball. The researchers concluded: After sleep, the babies no longer understood the object-word pairs they had previously experienced as naming a meaning. Rather, they recognized them as individual episodes. Object and word were thus merged into a unified event in the memory.

"The results show that sleep not only enables the infant brain to generalize individual experiences, but also to preserve individual experiences in detail and to differentiate them from existing general knowledge," explains first author Manuela Friedrich, researcher at the MPI CBS and HU Berlin. She further hypothesizes: "The fact that a recognized object-word episode is not understood as referring to general knowledge means that its details can be protected from mixing with existing memory."

The results are also interesting with respect to the so-called infantile amnesia, i.e. the phenomenon of not being able to remember one's own [early childhood](#) experiences. It has often been assumed that very young children are not yet capable of forming longer-term episodic knowledge. However, the current findings clearly show that even [babies](#) can remember events in detail—and sleep contributes significantly to this.

**More information:** Manuela Friedrich et al, Sleep-dependent memory consolidation in infants protects new episodic memories from existing semantic memories, *Nature Communications* (2020). [DOI: 10.1038/s41467-020-14850-8](#)

Provided by Max Planck Society

Citation: Babies retain even detailed events during a nap (2020, April 7) retrieved 13 March 2024 from <https://medicalxpress.com/news/2020-04-babies-retain-events-nap.html>

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