BRAIN & BODY

Nighttime Noise: Stealth Memory Sapper?

Get some 'slow-wave' sleep for optimal memory.

By Michele Solis for MSN Health & Fitness

Falling asleep in front of the TV may give you more than a sore neck. According to a recent report, it might give you a bad memory too.

Though we seem to adapt readily to the noisy world we live in—humming electronics everywhere, airplanes overhead, and sirens a few streets over—that background din can reach our brains even as we sleep, and erode our ability to make new memories.

That's because the hippocampus, a part of the brain famous for laying down new memories, is sensitive to the type of sleep we get, scientists in the Netherlands have found.

That is, sleep quality—not just quantity—matters. While it's been clear for some time that sleep deprivation is bad for memory (note how the factoids you feverishly memorized during an all-nighter never really stuck with you after the exam), this study showed that a particular kind of sleep, called "slow-wave sleep," also counts.

This study chips away at sleep's mysterious nature: we spend fully one third of our lives asleep–and without it we'll die–but scientists are just starting to figure out why we sleep.

Shallow sleep, shoddy memory

Though we usually think of sleep as a restful, dormant period, the brain is plenty active while we slumber. The electrical signals flowing between neurons, the cells in the brain, become synchronized and rhythmic. These rhythms slow down as we descend into deeper stages of sleep, bottoming out at slow-wave sleep. It is hardest to rouse people in slow-wave sleep, and we need this kind of sleep to feel rested the next morning.

We don't spend the rest of the night in slow-wave sleep, however. After an hour or so, our brain activity climbs out of this deepest level of sleep to lighter stages. Several times a night our brains cycle between these different stages.

The beauty of this study is that the researchers were able to reduce slow-wave sleep in people without shortchanging them on their total amount of sleep. To do this, study participants wore a specialized cap while they slept that detects brain waves emanating through the skull. Whenever slow-wave activity began, this triggered a computer underneath the bed to start beeping, but the beeps were not loud enough to wake the person. The sound was enough though, to prod the brain waves out of slow-wave sleep and bumped the sleepers into a higher sleep stage.

This all transpired in a sleeping lab set up in an apartment, to make "a reasonably friendly and homey environment," says Ysbrand Van Der Werf, Ph.D., a sleep scientist at the Netherlands Institute for Neurosciences in Amsterdam.

The procedure resulted in what Van Der Werf refers to as "shallow but intact sleep:" the people slept as long, but not as deeply as usual. Would this leave the brain forgetful the next day?

To look at this, the researchers put the study participants in a brain scanner the next day and tracked activity in the hippocampus—a memory center in the brain—while the subjects looked at 50 new pictures. After a night of shallow sleeping, hippocampal activity was not as robust as normal.

And sure enough, this translated into some memory stumbles the next day. When presented with 100 pictures, 50 of which they had seen the day before and 50 of which were new, study participants remembered less and forgot more. On average, they correctly remembered five fewer pictures, and incorrectly reported five pictures as new after a shallow sleep episode.

Boosting deep sleep

Making mistakes on 10% of all the images shows that the brain was not firing on all cylinders the day after shallow sleep, particularly in a phase of memory formation called encoding.

Encoding is the process by which the brain captures an experience into memory; after that, a second process called consolidation shores up the encoded memory and helps it last. Putting a handprint into fresh cement is like encoding; letting it dry is like consolidation.

Previous studies have implicated slow-wave sleep in consolidation, but this is the first to link it to encoding. Without it, the brain wasn't as fresh and accepting of the new material.

Beyond keeping things quiet at bedtime, boosting slow-wave sleep—and memory—may be as easy as getting under an extra blanket. The same group of researchers recently reported that warming skin temperature by a little less than one degree Fahrenheit increases slow-wave sleep. Though the study participants wore a specialized "thermosuit" to precisely control skin temperature while they slept, Van Der Werf suggests that the same effect might be achieved through exercise or hot baths. They found that a half hour spent in vigorous physical activity or in a piping hot bath of 102 F two hours before bedtime enhances brain activity and cognitive performance the next day.

So, to keep your memory sharp, stay warm and keep your bedroom as quiet as possible.

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After spending 15 years in the lab doing her own neuroscience research, Michele Solis is now putting her Ph.D. to work as a science writer. Her work covers a variety of topics including autism, linguistics, and animal communication. She contributes regularly to the Autism Speaks, Simons Foundation, and Crosscut Web sites.