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Scientists work on why we sleep

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People have been trying to figure out why we sleep for almost as long as we have been conscious of being awake, tossing and turning in the dark.

After a few restless nights, most of us can't even think straight. We are less able to make sense of problems, make competent moral judgments or retain what we learn, even though studies show our brain cells fire more frenetically to overcome the lack of sleep. Lose too much sleep and we become reckless, emotionally fragile, and more vulnerable to infections and to diabetes, heart disease and obesity, recent research suggests.

Yet scientists probing the purpose of sleep are still largely in the dark. "Why we sleep at all is a strange bastion of the unknown," said sleep psychologist Matthew Walker at the University of California-Berkeley.

One vital function of sleep, researchers argue, may be to help our brains sort, store and consolidate new memories, etching experiences more indelibly into the brain's biochemical archives.

Even a 90-minute nap can significantly improve our ability to master new motor skills and strengthen our memories of what we learn, researchers at the University of Haifa in Israel reported last month in *Nature Neuroscience*. "Napping is as effective as a night's sleep," said psychologist Sara Mednick at the University of California-San Diego.

Moreover, slumber seems to boost our ability to make sense of new knowledge by allowing the brain to detect connections between things we learn.

In research published last April in the *Proceedings of the National Academy of Sciences*, Walker and his collaborators at the Harvard Medical School tested 56 college students and found that their ability to discern the big picture in disparate pieces of information improved measurably after the brain could, during a night's sleep, mull things over.

It is these patterns of meaning - the distilled essence of knowledge - that we remember so well. "Sleep helps stabilize memory," said neurologist Jeffrey Ellenbogen, director of the sleep medicine program at Massachusetts General Hospital.

The erratic biorhythms of sleep and behavior are intertwined everywhere in nature. Socially active fruit flies need more sleep than loner flies, and even zebra fish can get insomnia.

Sleep is controlled partly by our genes. The difference between those of us who naturally wake at dawn and night owls who are wide-eyed at midnight may be partly due to variations in a gene named *Period3*, which affects our biological clock. Variations in that gene also make some people especially sensitive to sleep deprivation, scientists at the U.K.'s University of Surrey recently reported.

For many of us, though, sleeplessness is a self-inflicted epidemic in which lifestyle overrides basic biology. "In this odd, Western 24-hour-MTV-fast-food generation we have created, we all feel the need to achieve more and more. The one thing that takes a hit is sleep," Walker said. On average, most people sleep 75 minutes less each night than people did a century ago, sleep surveys record.

Yet, rarely have so many millions of drowsy people been trying so hard to secure some shut-eye, spending billions on sleep aids. By one estimate, pharmacists filled 49 million prescriptions for sleep drugs last year. Even so, we think we sleep more than we actually do, according to Arizona State University scientists. They recorded how long 2,100 volunteers actually slept each night and compared that with how long the people reported they had slept. Most people overestimated their sleep by about 18 minutes, the scientists found.

The consequences of too little sleep can be dire. Almost half of all heavy-truck accidents can be traced to driver fatigue, while decisions leading to the Challenger space-shuttle disaster, the Chernobyl nuclear-reactor meltdown and the Exxon Valdez oil spill can be partly linked to people drained of rest by round-the-clock work schedules. Weary doctors make more serious medical errors, while sleepy airport baggage screeners make more security mistakes, researchers reported at the Associated Professional Sleep Societies.

All told, the frayed tempers, short attention spans and fuzzy thinking caused by sleep deprivation may cost \$15 billion a year in reduced productivity, the National Commission on Sleep Disorders Research estimated.

The expectation of a nap, however, is by itself enough to measurably lower our blood pressure, researchers at the Liverpool John Moores University in England reported in October in the *Journal of Applied Physiology*.

Indeed, regular nappers - working men who took a siesta for 30 minutes or more at least three times a week - had a 64 percent lower risk of heart-related death, researchers at the University of Athens reported last February in the *Archives of Internal Medicine*.

"All of the things we are proving about sleep and the brain are things that your mother already knew decades ago," Walker said. "We are putting the science and the hard facts behind it."

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