

Sleep or Die

If physical energy is the foundation of all dimensions of energy, sleep is the foundation of physical energy. The circadian rhythm refers to the biological processes that occur over a twenty-four-hour cycle. We're genetically programmed to be awake during the day and to sleep at night. We operate best—physically, mentally, emotionally, and spiritually—when we align with that rhythm. For example, the hormone melatonin, which tends to induce sleep, is almost nonexistent in our bodies during daytime hours and reaches its peak between 11 P.M. and 3 A.M. The same is true for our core body temperature, which reaches its lowest level in the middle of the night and its highest level during the morning.

We challenge our circadian rhythms at our peril—whether we do so by working during the night, traveling across time zones, or failing to sleep sufficiently. The consequences include extreme fatigue, compromised cognitive capacity, emotional instability, lower productivity, and greater susceptibility to illness.

No single behavior, we've come to believe, more fundamentally influences our effectiveness in waking life than sleep. In a famous series of experiments, the researcher Alan Rechtschaffen and his colleagues at the University of Chicago put a series of rats through the equivalent of hell by systematically depriving them of sleep. Within days, the rats began to eat significantly more than usual, perhaps as a way to get more energy to compensate for their lack of sleep. In less than a week, the rats lost control of their body temperature, began losing their hair, and developed lesions on their bodies that wouldn't heal. Within seventeen to twenty days, they were dead. William Dement, the widely acknowledged dean of sleep researchers, argues that sleep may well be more critical to our well-being than diet, exercise, and even heredity.

Among human beings, the record for continuous sleeplessness is just under nineteen days, during a rocking chair marathon. For the winner, outlasting his rivals proved to be a decidedly mixed blessing. By the end, he was suffering from slurred speech, blurred vision, significant lapses in memory and concentration, hallucinations, and paranoia. Amnesty International lists prolonged sleep deprivation as a form of torture, and it has been widely used as an interrogation tactic, including in the Iraq and Afghanistan wars. In his memoir *White Nights*, the late Israeli prime minister Menachem Begin vividly captured the experience of sleep deprivation when he was an inmate in a KGB prison: "In the head of the interrogated prisoner, a haze begins to form. His spirit is wearied to death, his legs are unsteady, and he has one sole desire: to sleep. . . . Anyone who has experienced this desire knows that not even hunger and thirst are comparable with it."

Nonetheless, sleep is also one of the first behaviors many of us are willing to sacrifice, on the mistaken assumption that doing so will allow us to be more productive. "We all think we have to stay awake to get more done," says Matthew Walker, the director of the sleep and neuroimaging lab at UC Berkeley. "I think that's simply not true. In fact, if you have a good night of sleep, what you'll find is that you can get more done than if you simply stay awake."

So how much sleep do we need? The National Sleep Foundation recommends between seven and nine hours. When researchers test subjects in environments without clocks or windows and ask them to sleep whenever they feel tired, approximately 95 percent of them sleep between seven and eight hours out of every twenty-four. Precious few of us can function well on much less. As Thomas Roth of the Henry Ford Sleep Disorders and Research Center says, "The percentage of the population who need less than five hours of sleep per night, rounded to a whole number, is zero."

Based on their own estimates, Americans average 6½ hours of sleep a night. Even that may be overstated. In a study led by Diane Lauderdale at the University of Chicago, 669 middle-aged adults reported that they slept an average of 7.5 hours a night. But they also wore wrist monitors that allowed the researchers to determine precisely when they actually fell asleep. The average turned out to be 6.1 hours.

In our own experience, working mostly with upper-level leaders and managers, a substantial percentage tell us they get six or fewer

hours of sleep a night, and the majority of those say they simply don't need any more. The research strongly suggests otherwise. One explanation is that people who are sleep-deprived often don't recognize their own limitations. "It's convenient to say, 'I've learned to live without sleep,' " explains David Dinges, a sleep researcher at the University of Pennsylvania. "But you bring them into the laboratory and we don't see this adaptation." Charles Czeisler, another renowned sleep researcher and chronobiologist at Harvard Medical School, puts it more bluntly: "Like a drunk, a person who is sleep-deprived has no idea how functionally impaired he or she truly is. Most of us have forgotten what it really feels like to be awake." Thomas Wehr, the chief of the Section on Biological Rhythms at the NIH, takes it a step further. "Perhaps," he says, "we modern humans have never really known what it is to be fully awake."

Numerous studies of great performers suggest they sleep more than the rest of us, not less. That's true of the top violinists in Anders Ericsson's study, who slept an hour a night more than their less accomplished counterparts. As Berkeley's Matthew Walker puts it, "Practice does not quite make perfect. It's practice with a night of sleep that makes perfect." Two recent studies of athletes at Stanford University suggest a powerful correlation between sleep time and performance. In one study, members of the swim team maintained their usual sleep-waking pattern for two weeks and then increased to ten hours of sleep a day for six to seven weeks. Once they were sleeping longer hours, they began to report higher energy and improved mood. They also significantly improved their quickness off the starting block, as well as their turn times, sprint times, and kick-stroke rate.

"While this study focused specifically on collegiate swimmers," reported the lead author, Cherie Mah, of the Stanford Sleep Disorders Clinic and Research Laboratory, "it agrees with data from my other studies of different sports and suggests that athletes across all sports can greatly benefit from extra sleep." In an earlier study that Mah conducted among six players on the Stanford men's basketball team, more sleep led to improvements in alertness and mood, as well as in sprint times and free-throw accuracy. Mah and her colleagues have seen comparable gains among athletes on Stanford's football, tennis, golf, cross-country, and track and field teams.

FATTER, DUMBER, AND MORE DANGEROUS

Overwhelming evidence suggests that sleep deprivation takes a toll in nearly every aspect of our lives, including performance. In *Dream On: Sleep in the 24/7 Society*, Charles Leadbeater summed up the costs this way: "Lack of sleep makes us more inefficient at work and more dangerous behind the wheel of a car. It undermines the quality of our lives and makes us more vulnerable to illness. It is also responsible for making us less able to respond creatively to problems and opportunities, and less original, flexible and divergent in our thinking and thus less likely to generate new ideas."

At the most basic level, prolonged sleep deprivation has a negative impact on our health. Several studies have shown that immune response drops significantly among people who sleep less than seven to eight hours a night. Eve Van Cauter, a University of Chicago sleep researcher, found that subjects who slept four hours a night for six consecutive nights demonstrated not only a lower immune response but also diminished ability to regulate blood sugar, a risk factor for diabetes, and unusually high levels of circulating cortisol, a risk factor for high blood pressure. Among Van Cauter's most significant findings was that significant sleep deprivation dramatically lowers levels of leptin, the hormone that signals satiety, and helps us control how much we eat.

Subjects sleeping four hours a night for six nights produced 18 percent less leptin than those sleeping seven to eight hours. This finding, Van Cauter and others believe, goes a long way toward explaining the connection between obesity and sleep patterns. For example, a study of nearly 10,000 people found that subjects who slept five or fewer hours a night were 60 percent more likely to be obese than those who slept seven hours or more.

The Harvard Nurses' Health Study, which followed nearly 80,000 nurses over twenty-five years, uncovered a strong link between chronic sleep deprivation and increased risk of a range of diseases, including breast cancer, colon cancer, and coronary heart disease. Nurses who averaged five hours of sleep a night, for example, were significantly more likely to develop heart disease than those who got six hours.

They, in turn, were at greater risk than those who slept seven hours a night.

Nurses in the same study who regularly worked the night shift over many years were an astonishing 60 percent more likely to develop breast cancer. Numerous other studies have confirmed this link between shift work and breast cancer. The explanation, researchers have speculated, is that working during the night precludes exposure to the highest levels of the hormone melatonin, which is believed to restrain tumor growth.

At the cognitive level, we don't think well when we're tired. David Dinges found that subjects who slept less than six hours a night over a two-week period demonstrated a decrease in performance that was equivalent to that experienced after forty-eight continuous hours of sleep deprivation. More striking still, Harvard's Charles Czeisler found that averaging four hours of sleep for five consecutive nights has an impact on our memory, attention, and speed of thinking that is equivalent to being legally intoxicated.

Sleep is not simply cognitively restorative but also a time during which considerable learning occurs. Although the acquisition of knowledge occurs only during waking life, there is evidence that we process, consolidate, and stabilize memory during sleep. In one clever and fascinating study, subjects were asked to transform a string of eight digits into a different string by applying two simple rules. The more comfortable they got with the sequence, the faster they became.

None of the participants was told about a third hidden rule, which had the potential to provide a shortcut to the answer. Two groups were trained for the task in the evening. One went to sleep for the eight hours following the training. A second remained awake through the night. A third group was trained the morning of the next day and then remained awake for the next eight hours before being tested again. The group that went to sleep directly after the training demonstrated more than twice the likelihood of gaining insight into the hidden rule than either of the two groups that remained awake after the training.

Different kinds of learning occur during different stages of sleep. We sleep in five stages, which progress from lighter to deeper as our brain wave activity slows progressively and then speeds back up nearly

to waking over the course of approximately ninety minutes. William Dement and Nathaniel Kleitman made this discovery in 1957, and Kleitman named it the “basic rest activity cycle” (BRAC).

It is during slow-wave sleep (SWS), the deepest of the five cycles, that we appear to process and consolidate fact-based information, such as a new language or the capitals of states. The processing and acquisition of more complex and emotionally charged information more commonly occurs in rapid eye movement (REM) sleep, the lightest stage of the cycle. REM sleep also appears to play a key role in remembering how to do an activity, such as typing or driving a car. Motor learning is consolidated during the middle stages of sleep. Visual learning is processed in both slow-wave and REM sleep. The practical implication of these findings is that uninterrupted ninety-minute cycles of sleep are essential not just for their restorative value but also to maximize our acquisition of knowledge.

The impact of sleep deprivation is also pernicious on the job, both because it prompts cognitive deficits and because it negatively influences our mood, a combination that undermines our judgment, especially under pressure. Many of the most devastating human-caused disasters during the past fifty years have taken place in the middle of the night or were connected to insufficient sleep or both. When the assistant captain at the helm of the *Exxon Valdez* ran his ship into a reef shortly after midnight on March 24, 1989, he had slept less than six hours during the previous forty-eight. Eleven million gallons of crude oil spilled into the sea. NASA officials in charge of the space shuttle *Challenger* had worked twenty-four consecutive hours before the shuttle launch that resulted in its explosion on January 28, 1986. On April 26 of the same year, a reactor exploded at the Chernobyl nuclear power plant in Ukraine at 1:23 A.M., releasing massive amounts of radiation. At the nuclear power plant on Three Mile Island, Pennsylvania, plant operators working under high stress in the middle of the night made a series of mistakes and poor judgment calls that prompted the core reactor’s meltdown beginning at 4 A.M. on March 28, 1979.

Similar, if less broadly catastrophic accidents, occur in hospitals with frightening regularity every night. A 2004 Work Hours, Health and Safety Group study at Harvard, overseen by Charles Czeisler and his research team, found that medical interns working twenty-four-

hour shifts made 36 percent more medical errors than those working sixteen-hour shifts and five times the number of diagnostic errors. Interns working twenty-four-hour shifts also had a 61 percent greater risk of stabbing themselves with a needle or scalpel almost twice the risk of crashing their cars when they drove home, and five times the risk of a near-miss accident.

None of this should come as a great surprise. Study after study shows that people who work night shifts make more errors, suffer more injuries and health problems, and perform at lower levels than those who work normal daytime hours. So powerful are the body's natural rhythms that it's virtually impossible to fully adjust to working at night and sleeping during the day. "Ours is the only species," writes Jennifer Ackerman in *Sex Eat Sleep Drink Dream*, "that lights up its biological night, that overrides its own rhythms, crosses time zones, and works and sleeps at times that run counter to its internal clocks. We ignore what our clocks remember at our own peril." As just one example, shift workers who have no choice but to sleep in the daytime get an average of three to four hours a day less sleep than the rest of us and sleep less deeply.

THE SIMPLEST SOLUTION

Awareness is half the battle when it comes to sleep, both because most of us underestimate the costs of getting too little and because of the extraordinary value of getting enough. This recognition is the first step in making more sleep a priority.

If you're not getting enough sleep, you almost certainly need to go to bed earlier, given that you likely don't have the option of waking up later than you already do. The key to sleep is to be relaxed, something that is increasingly difficult to achieve given the pressure of our daily lives. One obvious alternative is to use sleep aids. Every form of sleep medication has its drawbacks, from limited hours of effectiveness, to leaving us feeling groggy in the morning, to being addictive. Alcohol, the most common form of self-medication when it comes to sleep, is likewise a double-edged sword. Because it acts initially as a sedative, it does induce asleep, and nearly 30 percent of insomniacs use alcohol at least occasionally to help them fall asleep. But alcohol is also me-

tabolized rapidly by the body, which can lead to physiological withdrawal symptoms in the middle of the night, including frequent awakenings, shallow sleep, and less overall sleep time. In simple terms, the less alcohol you drink and the earlier you drink it, the more deeply you're likely to sleep through the night.

The best way to fall asleep naturally is to begin quieting down at least thirty to sixty minutes before you turn out the lights. That means avoiding anything stimulating as you get closer to your bedtime—e-mailing and the Internet, mystery novels, highly charged conversations—in favor of whatever you find relaxing: drinking a glass of milk or herbal tea, taking a bath or a shower, listening to music, or even reading a dull book.

Because feeling relaxed is so critical to sleep, it can also be helpful to intentionally “park” your anxieties before you turn out the lights. This simple technique involves writing down what you're worrying about in a notebook or on a piece of paper. For many of our clients, this strategy has proven to be a surprisingly powerful means of temporarily setting aside concerns that otherwise keep them awake. By writing down what's on your mind, you effectively give your brain permission to release it from conscious awareness. The same technique can be used when you wake up in the middle of the night, begin to ruminate, and have trouble getting back to sleep.

Setting a specific bedtime is especially critical, because without one, we tend to default back quickly to whatever time we're used to going to sleep or to simply stay up until we feel tired. Once the lights are out, one effective way to relax is deep breathing and progressive relaxation—tightening and releasing muscles throughout your body, starting with your toes and working your way up. For obvious reasons, we sleep better in environments that are dark and quiet. It also helps to sleep in a cool room, which allows the body temperature to drop, as it's meant to do during sleep. If you have any doubt about the value of a cool room, think about what it's like to try to sleep on a hot summer night.

Peter Goettler, who headed investment banking at Barclays Capital until 2008, spent most of his working life feeling sleep-deprived. When that's the case, it's nearly always where we begin our work with clients. Goettler went to sleep most nights between 11 P.M. and midnight and awoke around 5 A.M., scarcely an unusual sleep pattern for

many of our clients. When he got out of bed, Goettler had the first of several cups of coffee to jack himself up. During the day, he often yo-yoed between feeling jittery and feeling tired, especially in the late afternoons.

After working with us, Goettler decided to build a ritual in which he went to bed at 10 P.M., got up a half hour later in the morning, and stopped drinking coffee altogether. Almost immediately, he was successful at going to bed earlier. At first, he reported that he found himself waking up earlier and therefore sleeping the same number of hours he always had. It's a pattern we've often seen: the body can become deeply habituated even to sleeping patterns that leave us feeling tired.

We suggested that when he woke up, Goettler simply lie quietly in bed, relaxing as best he could and effectively giving his body permission to sleep longer. Even if it didn't work immediately, he'd be getting more rest. After a week or so, he did begin sleeping longer. The extended sleep was transformative for him. "I was more rested, I felt better, I thought more clearly, I got less tired as the day wore on, and I had more energy when I got home," he told us. "I never would have believed an hour more of sleep could make such a difference." Adequate sleep, we're convinced, sets the stage for taking more control of every other part of our lives.

CHAPTER FIVE ACTION STEPS

- Take a few moments to create a sleep log to determine how much sleep you are actually getting. (To download a template, go to www.theenergyproject.com/sleeplog.)
- How many hours of sleep have you averaged during the past week? Ninety-five percent of us require at least seven to eight hours of sleep a night to be fully rested. If you're not getting that much, you're probably working at a suboptimal level.
- Reflect on the activities you engage in during the hour prior to going to bed. The best way to fall asleep quickly and easily is to begin to quiet down at least thirty to sixty minutes before you turn out the lights. Choose activities that are relaxing rather than stimulating or demanding.
- If you wake up in the middle of the night and then struggle to fall back asleep because you're ruminating, put a pad of paper and a pen beside your bed. Before you go to sleep, write down anything you're feeling worried about. You can do the same thing if you tend to wake up in the middle of the night. It's called "parking your anxieties," and it is a powerful way to calm your mind and get a better night's sleep.