

How to Sync Your Many Circadian Rhythms

Analysis by [Dr. Joseph Mercola](#)

July 19, 2024

STORY AT-A-GLANCE

- › Your brain's suprachiasmatic nucleus (SCN) serves as the master biological clock that regulates your body's circadian rhythms
- › Your body's central circadian clock is not alone; peripheral clocks are found in various tissues and nearly every organ throughout your body, including the liver, lungs, heart and skeletal muscles
- › Shift work, jet lag and many other factors can throw your circadian rhythm off kilter; your body relies on zeitgebers – external cues that help regulate and synchronize your circadian rhythms – to get back on track
- › Exposure to bright light, ideally from sunlight, during the day and avoiding artificial light at night is a powerful method to keep your circadian rhythms in sync
- › Meal timing also influences your circadian rhythms; it's best to avoid eating before sunrise or after sunset and to stop eating at least three hours before bedtime

The suprachiasmatic nucleus (SCN) is a small region located in your brain's hypothalamus. It serves as the master biological clock that regulates your body's circadian rhythms – the 24-hour cycles that govern various physiological and behavioral processes, including your sleep-wake cycle, hormone release and body temperature.

But your body's central circadian clock is not alone. The discovery of “peripheral clocks,” also known as peripheral oscillators, expanded our understanding of the body's circadian system beyond the central clock.

Peripheral clocks are found in various tissues and nearly every organ throughout your body, including the liver, lungs, heart and skeletal muscles. These clocks help regulate local physiological processes in coordination with the master clock in the SCN. While ambient light is a primary influence on your central clock, peripheral clocks are sensitive to other factors as well, including the timing of your meals.¹

Your Body Has Many Circadian Rhythms

While your body's peripheral clocks are synchronized with your central clock, the peripheral clocks regulate local physiological processes throughout your body. As noted by Dr. Michael Greger, founding member and Fellow of the American College of Lifestyle Medicine:²

"Our heart runs on a clock, our lungs run on one, and so do our kidneys, for instance. In fact, up to 80 percent of the genes in our liver are expressed in a circadian rhythm.³ Our entire digestive tract is, too.⁴ The rate at which our stomach empties, the secretion of digestive enzymes, and the expression of transporters in our intestinal lining for absorbing sugar and fat all cycle around the clock.

So, too, does the ability of our body fat to sop up extra calories. The way we know these cycles are driven by local clocks,⁵ rather than being controlled by our brain, is that you can take surgical biopsies of fat, put them in a petri dish, and watch them continue to rhythm away."

Your liver's circadian clock, for instance, regulates glucose metabolism, cholesterol synthesis and detoxification processes.⁶ Your pancreas' circadian clock regulates insulin secretion,⁷ while kidney function, including filtration rates and urine production, also follows a circadian rhythm,⁸ generally increasing during the day and decreasing at night.

Circadian rhythms in your heart also influence daily fluctuations in blood pressure and heart rate, which are typically lower during sleep and higher during daytime activities.⁹ As explained in a review published in *Medical Science Monitor*:¹⁰

“Circadian clocks orchestrate various critical biological processes in virtually all cardiovascular cell types and a diverse spectrum of cardiovascular physiologies undergo circadian oscillations, including blood pressure, ECG pattern, heart rate, and metabolism.

The development, progression, and outcome of various cardiovascular diseases are closely linked to aberrant circadian rhythms. Disruption of this circadian regulation has been proven to lead to malfunction in cellular or organ processes, ultimately triggering pathological conditions.”

Beyond this, even your immune system and gastrointestinal tract depend on circadian rhythms to function properly.

Your Health Depends on Keeping Your Circadian Rhythms in Sync

Researchers with the Royal Netherlands Academy of Arts and Sciences used the analogy of a child on a swing to describe what happens if your circadian rhythms fall out of sync.¹¹ Greger explains:¹²

“‘Imagine a child playing on a swing.’ Picture yourself pushing, but you become distracted by what’s going on around you in the playground and stop paying attention to the timing of the push. So, you forget to push or you push too early or too late. What happens? Out of sync, the swinging becomes erratic, slows, or even stops. That is what happens when we travel across multiple time zones or have to work the night shift.

The ‘pusher’ in this case is the light cues falling onto our eyes. Our circadian rhythm is meant to get a ‘push’ from bright light every morning at dawn, but if the sun rises at a different time or we’re exposed to bright light in the middle of the night, this can push our cycle out of sync and leave us feeling out of sorts.

That’s an example of a mismatch between the external environment and our central clock. Problems can also arise from a misalignment between the central clock in our brain and all the other organ clocks throughout our body.”

Many factors can throw your circadian rhythms off kilter, from working the night shift to a bout of jet lag. However, these rhythms rely on zeitgebers to get back on track. Zeitgebers are external cues that help regulate and synchronize your circadian rhythms. The term "zeitgeber" comes from the German words "Zeit," meaning "time," and "geber," meaning "giver" or "supplier."

Your Master Clock Relies on Signals From Light and Darkness

Since ancient times, humans have adapted to light from the sun during the day and darkness at night, save for light from the moon and stars, and the warm glow of fire. It's only been about a century since the invention of electric lights, which radically changed the way humans interact with daily light and darkness.

Soon after electric light bulbs were invented, night shift work began as humans found a way to extend "daylight" hours.¹³ With the advent of television, computers, tablets and smartphones, humans are exposed to light at night at an unprecedented level.

This disruption to circadian rhythm, which is stabilized by bright light exposure during the day and complete darkness at night, can take a toll on your health. More light exposure at night, for instance, is linked to an increased risk of several psychiatric conditions, including:¹⁴

Major depressive disorder	Generalized anxiety disorder
Post-traumatic stress disorder (PTSD)	Psychosis
Bipolar disorder	Self-harm behavior

In another study, exposure to any amount of light at night was linked detrimental effects on the health of older adults, increasing the risk of obesity, high blood pressure and diabetes.¹⁵ Further, nighttime exposure to light inhibits the secretion of melatonin, which can cause circadian disruptions that play a role in cancer.¹⁶

It's previously been shown that higher exposure to outdoor light at night may increase the risk of postmenopausal breast cancer,¹⁷ and evidence suggests light at night may increase thyroid cancer risk, too,¹⁸ as thyroid function is regulated by circadian rhythm.

“The SCN makes use of so-called zeitgebers to accomplish such resynchronization. Environmental light, especially light of high intensity, may be the most salient zeitgeber ...” the Royal Netherlands Academy of Arts and Sciences scientists explained.¹⁹

How to Harness Light Exposure to Sync Your Circadian Rhythm

Andrew Huberman, a neuroscientist and tenured professor in the department of neurobiology at Stanford University School of Medicine, recommends viewing bright light, ideally from sunlight, within the first 30 to 60 minutes after waking to stimulate wakefulness throughout the day and help you fall asleep at night.²⁰

Later in the day, there's research showing that if you view light in the early evening hours, it may help to mitigate some of the consequences of light exposure later in the evening.²¹ However, from around 6 p.m. or 7 p.m., into the hours when you get into bed and throughout the night while you're asleep, it's important to avoid bright artificial lights of any color.

This means, once the sun goes down, you should dim the lights in your environment and use as little artificial light as possible, including dimming your computer screen and avoiding overhead lights – opting for desk lamps instead. Better yet, use candlelight or moonlight after sunset.

If your bedroom is affected by light pollution, be sure to use blackout shades to keep light out and remove all sources of light from your bedroom, including a digital alarm clock or cellphone. You can also use a sleep mask and blackout shades for this purpose.

The Timing of Your Meals Can Reset Your Peripheral Clocks

Beyond light exposure, timing of food intake can reset your peripheral clocks, particularly in metabolic organs like your liver and pancreas. Eating times can influence peripheral clocks even in the absence of light cues.

“What drives our internal organ clocks that aren’t exposed to daylight? Food intake. That’s why the timing of our meals may be so important,” Greger says.²² In one study, researchers looked at how delaying meals by five hours impacted various body clocks and biological markers.²³

Ten healthy young men followed a 13-day schedule where they ate three meals (breakfast, lunch and dinner) at five-hour intervals, either starting soon after waking (early meals) or later in the day (late meals). After adjusting to early meals, the participants switched to late meals for six days.

When meals were delayed, blood glucose rhythms were also delayed by about 5.7 hours, and average glucose levels dropped, suggesting that meal timing helps synchronize peripheral circadian rhythms. Separate research also investigated if eating meals earlier in the day affects the body's heart-related circadian rhythms and blood lipid levels.

Fourteen men who typically skipped breakfast, participated in the study. One group ate meals at 8:00 a.m., 1:00 p.m., and 6:00 p.m., while another group ate five hours later, at 1:00 p.m., 6:00 p.m. and 11:00 p.m. Results showed significant decreases in triglycerides, total cholesterol and LDL cholesterol in the earlier eating group compared to the later eaters.

While high total cholesterol and/or elevated low-density lipoprotein (LDL) **cholesterol do not cause heart disease**, the study still shows the profound influence that meal timing and circadian rhythms have on cholesterol synthesis. This information is also important for those using time-restricted eating (TRE). Greger notes:²⁴

“Breakfast and morning meals play a role in syncing peripheral clocks. Skipping breakfast disrupts clock gene expression and is associated with adverse metabolic effects, which can be reversed by shifting meal times.”

If you're metabolically inflexible, short-term fasting can be useful to help resolve obesity and insulin resistance. However, once you regain your metabolic flexibility, which can take anywhere from a few weeks to a few months, you will need to increase your eating window. The reason for this is because when you deprive your body of glucose for too long, it will produce cortisol to stimulate your liver to make glucose.

This increased cortisol can contribute to chronic inflammation and cellular damage. Therefore, once you are no longer insulin resistant, it is best to vary your eating window between 12 to 18 hours, with longer hours in the winter and shorter in the summer. It is also best to avoid eating before sunrise or after sunset and stop eating at least three hours before bedtime.

Stress, Activity Levels Also Influence Your Circadian Rhythms

Synchronizing your circadian rhythms, including peripheral rhythms, is essential for maintaining overall health and well-being. Beyond optimizing light exposure and meal timing, other factors, like getting enough sleep and keep a regular sleep schedule, also influence your body's internal rhythms.

Going to bed and waking up at the same time every day, even on weekends, reinforces your circadian rhythms, for instance, while engaging in regular physical activity,²⁵ especially during daylight hours, also helps. Your circadian clock function is also closely connected to your body's stress response system,²⁶ which is why practices such as mindfulness, meditation and relaxation techniques that help manage stress can also help sync your circadian rhythms.

By aligning these elements with the natural 24-hour day, you can support optimal health, improve sleep quality and enhance joy and well-being in your life.

Sources and References

- ¹ [Prog Mol Biol Transl Sci. 2013;119:105-35](#)
- ^{2, 12, 22, 24} [NutritionFacts.org April 24, 2024](#)
- ³ [Nutr Clin Pract. 2017 Jun;32\(3\):365-377. doi: 10.1177/0884533616662995. Epub 2016 Sep 1](#)

- ⁴ Diabetes Obes Metab. 2015 Sep;17 Suppl 1:65-75. doi: 10.1111/dom.12513
- ⁵ FASEB J. 2016 Sep;30(9):3117-23. doi: 10.1096/fj.201600269RR. Epub 2016 Jun 2
- ⁶ Gastroenterology 2016;150:574–580
- ⁷ Endocrinology. 2021 Sep; 162(9): bqab089
- ⁸ Free Radic Biol Med. 2018 May 1; 119: 93–107
- ⁹ Med Sci Monit. 2023; 29: e942215-1–e942215-12
- ¹⁰ Med Sci Monit. 2023; 29: e942215-1–e942215-12, Conclusions
- ^{11, 19} Sleep Med Rev. 2007 Dec;11(6):465-84. doi: 10.1016/j.smrv.2007.07.003
- ¹³ Transl Psychiatry. 2017 Jan; 7(1): e1017
- ¹⁴ Nature Mental Health October 9, 2023
- ¹⁵ Sleep June 22, 2022
- ^{16, 18} Cancer February 8, 2021
- ¹⁷ International Journal of Cancer June 2, 2020
- ²⁰ YouTube, Andrew Huberman, Sleep Toolkit August 8, 2022
- ²¹ Scientific Reports volume 9, Article number: 16064 (2019)
- ²³ Curr Biol. 2017 Jun 19; 27(12): 1768–1775.e3
- ²⁵ Front Pharmacol. 2023; 14: 1282357
- ²⁶ J Endocrinol. 2020 Oct;247(1):R13-R25. doi: 10.1530/JOE-20-0124