# Screen time disrupts sleep by resetting internal clocks

Written by Catharine Paddock, Ph.D. on November 29, 2018 — Fact checked by Gianna D'Emilio

Recent research has uncovered how light-sensitive cells in the eye can reset the internal clock when exposed to light.

The light from our smartphones may affect our retinal cells, disrupting our circadian rhythms.

The discovery could help explain why prolonged exposure to light that is out of sync with a person's natural, or circadian, rhythm can disrupt sleep and damage health.

This can result, for example, from sustained light exposure late at night.

The researchers, from the Salk Institute for Biological Studies in La Jolla, CA, hope that their findings will lead to improvements in the treatment of insomnia, jet lag, migraines, and circadian rhythm disorders.

The team has published their findings in the journal *Cell Reports*.

**Scientists have found that circadian rhythm disorders are tied to serious health issues, including metabolic syndrome, insulin resistance, cancer, obesity, and cognitive dysfunction.**

Because we use artificial sources of light, our sleep-wake cycles are no longer tied to patterns of day and night.

Thanks to portable technologies, such as smartphones and tablets, the opportunities to become absorbed in screen time, day or night, have never been greater.

“This lifestyle,” says senior study author Prof. Satchidananda Panda, “causes disruptions to our circadian rhythms and has deleterious consequences on health.”



## Circadian rhythm and sleep

The body has an internal clock that typically follows a 24-hour day-night pattern. This is also known as the circadian rhythm or the sleep-wake cycle.

The internal clock helps regulate our feelings of wakefulness and sleepiness. Its mechanisms are complex, and they obey signals from an area of the brain that monitors ambient light.

Every cell, organ, and tissue in the body relies on this timekeeper. Getting enough sleep and going to sleep at the right time helps to keep it working well.

**Estimates from the National Heart, Lung, and Blood Institute (NHLBI) suggest that 50–70 million people in the United States have ongoing sleep disorders.**

The NHLBI also point to a Centers for Disease Control and Prevention (CDC) survey, in which 7–19 percent of adults reported not getting enough sleep or rest on a daily basis. Also, 40 percent said that they unintentionally fell asleep during the day at least once a month.



## Light-sensitive cells affect the body's clock

*The recent research focused on a group of cells in the retina, which is the light-sensitive membrane that lines the back of the inside of the eye.*
*The cells are sensitive to light, but they are not involved in relaying images to the brain. Instead, they process levels of ambient light to supply signals for biological mechanisms.*
*A protein called melanopsin in the cells helps them process ambient light. Prolonged exposure to light causes the protein to regenerate inside the cells.*

**Continual regeneration of melanopsin triggers signals to the brain that inform it about ambient light conditions. The brain then uses this information to regulate sleep, alertness, and consciousness.**

If melanopsin regeneration is prolonged, and the light is bright, it sends a signal that helps reset the biological clock. This blocks melatonin, a hormone that regulates sleep.



## Maintaining sensitivity to prolonged light exposure

To explore this process, the researchers switched on melanopsin production in mice's retinal cells.

The results indicate that when light exposure is sustained, some of the cells continue to send the triggers, while others lose sensitivity.

**Further investigation showed that certain proteins, known as arrestins, helped keep the melanopsin sensitive during prolonged exposure to light.**

Melanopsin-generating cells in mice that did not have either type of arrestin (beta-arrestin 1 or beta-arrestin 2) lost their ability to maintain sensitivity to prolonged light exposure.

The researchers concluded that the retinal cells need both arrestins to help them make melanopsin.

One protein "arrests the response," while the other "helps the melanopsin protein reload its retinal light-sensing co-factor," Prof. Panda explains.

> "When these two steps are done in quick succession, the cell appears to respond continuously to light."
>
> *– Prof. Satchidananda Panda*

He and his team plan to discover targets for treatments that will counter circadian rhythm disruption, which can result, for example, from artificial light exposure.

They also hope to use melanopsin to reset the body's internal clock, as a potential treatment for insomnia.

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