

Playing catch-up on weekends may not improve cardiovascular cost of sleep loss

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Whether it's work or play that prevents us from getting enough shut-eye during the week, assuming we can make up for it by sleeping in over the weekend is a mistake. New research led by Penn State reveals that

cardiovascular health measures, including heart rate and blood pressure, worsen over the course of the week when sleep is restricted to five hours per night, and attempting to catch up on sleep over the weekend is insufficient to return these measures to normal.

"Only 65% of adults in the U.S. regularly [sleep](#) the recommended seven hours per night, and there's a lot of evidence suggesting that this [lack of sleep](#) is associated with [cardiovascular disease](#) in the long term," said Anne-Marie Chang, associate professor of biobehavioral health and co-author of the work, published in the journal *Psychosomatic Medicine*.

"Our research reveals a potential mechanism for this longitudinal relationship, where enough successive hits to your cardiovascular health while you're young could make your heart more prone to cardiovascular disease in the future."

The team recruited 15 healthy men between the ages of 20 and 35 to participate in an 11-day inpatient sleep study. For the first three nights, the participants were allowed to sleep up to 10 hours per night to achieve a baseline sleep level. For the next five nights, the participants' sleep was restricted to five hours per night, followed by two recovery nights, in which they were again allowed to sleep up to 10 hours per night.

To evaluate the effects of this sleep regime on cardiovascular health, the researchers measured the participants' resting [heart rates](#) and blood pressure every two hours during the day.

Chang explained that the team's study is unique because it measured [heart rate](#) and blood pressure multiple times throughout the day for the duration of the study, which enabled them to account for any effects that time of day might have on heart rate and blood pressure. For example, heart rate is naturally lower upon waking than later in the day, so measuring heart rate multiple times throughout the day can account for

this difference.

The team, which included David Reichenberger, lead author and graduate student in biobehavioral health, Penn State, found that heart rate increased nearly one beat per minute (BPM) with each successive day of the study. Specifically, the average baseline heart rate was 69 BPM, while the average heart rate by the end of the study on the second day of recovery was nearly 78 BPM.

Systolic blood pressure also increased by about 0.5 millimeters of mercury (mmHg) per day. The average baseline [systolic blood pressure](#) was 116 mmHg and was nearly 119.5 mmHg by the end of the recovery period.

"Both heart rate and systolic [blood pressure](#) increased with each successive day and did not return to baseline levels by the end of the recovery period," Reichenberger said. "So, despite having additional opportunity to rest, by the end of the weekend of the study, their cardiovascular systems still had not recovered."

Chang noted that longer periods of sleep recovery may be necessary to recover from multiple, consecutive nights of sleep loss.

"Sleep is a [biological process](#), but it's also a behavioral one and one that we often have a lot of control over," Chang said. "Not only does sleep affect our [cardiovascular health](#), but it also affects our weight, our [mental health](#), our ability to focus and our ability to maintain healthy relationships with others, among many other things. As we learn more and more about the importance of sleep, and how it impacts everything in our lives, my hope is that it will become more of a focus for improving one's health."

More information: David A. Reichenberger et al, Recovery sleep

following sleep restriction is insufficient to return elevated daytime heart rate and systolic blood pressure to baseline levels, *Psychosomatic Medicine* (2023). [DOI: 10.1097/PSY.0000000000001229](https://doi.org/10.1097/PSY.0000000000001229)

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