

# Cutting back on sleep harms blood vessel function and breathing control

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With work and entertainment operating around the clock in our modern society, sleep is often a casualty. A bevy of research has shown a link between sleep deprivation and cardiovascular disease, metabolic disorders, and obesity. However, it's been unclear why sleep loss might lead to these effects. Several studies have tested the effects of total sleep deprivation, but this model isn't a good fit for the way most people lose sleep, with a few hours here and there. In a new study by Keith Pugh, Shahrhad Taheri, and George Balanos, all of the University of Birmingham in the United Kingdom, researchers test the effects of partial sleep deprivation on blood vessels and breathing control. They find that reducing sleep length over two consecutive nights leads to less healthy vascular function and impaired breathing control.

The team will discuss the abstract of their study entitled, "[Sleep](#) Restriction on the Respiratory and Vascular Control," at the [Experimental Biology](#) 2013 meeting, being held April 20-24, 2013 at the Boston Convention and Exhibition Center, Boston, Mass. The poster presentation is sponsored by the [American Physiological Society](#) (APS), a co-sponsor of the event. As the findings are being presented at a scientific conference, they should be considered preliminary, as they have not undergone the peer review process that is conducted prior to the data being published in a scientific journal.

## Cutting Sleep in Half

The researchers have worked with eight healthy adult volunteers between the ages of 20 to 35 to date. For the first two nights of the study, the researchers had these volunteers sleep a normal night of eight hours. Then, rather than restrict their sleep completely, the researchers instead had them sleep only four hours during each of three consecutive nights.

Each of these volunteers underwent tests to see how well their [blood vessels](#) accommodate an increase in blood flow, a test of healthy blood vessel, or vascular, function. Following the first two nights of restricted sleep, the researchers found a significant reduction in vascular function compared to following the nights of normal sleep. However, after the third night of sleep restriction, vascular function returned to baseline, possibly an adaptive response to acute [sleep loss](#), study leader Pugh explains.

In other tests, the researchers exposed subjects to moderately high levels of carbon dioxide, which normally increases the depth and rate of breathing. However, breathing control was substantially reduced after the volunteers lost sleep.

The researchers later had these volunteers sleep 10 hours a night for five nights. After completing the same tests, results showed that vascular function and breathing control had improved.

## **A Mechanism for Cardiovascular Harm**

Pugh notes that the results could suggest a mechanism behind the connection between sleep loss and cardiovascular disease. "If acute sleep loss occurs repetitively over a long period of time, then vascular health could be compromised further and eventually mediate the development of cardiovascular disease," he explains.

Similarly, the loss of breathing control that the researchers observed

could play a role in the development of sleep apnea, which has also been linked with cardiovascular disease.

Pugh adds that some populations who tend to report sleeping shorter periods, such as the elderly, could be at an even higher risk of these adverse health effects.

He and his colleagues plan to continue studying these effects in more subjects to strengthen their results. Eventually, Pugh says, they hope to discover a mechanism to explain why restricting sleep harms [vascular function](#) and breathing control.

Provided by American Physiological Society

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