

Cold air chills heart's oxygen supply

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People with heart disease may not be able to compensate for their bodies' higher demand for oxygen when inhaling cold air, according to Penn State researchers, making snow shoveling and other activities dangerous for some.

"This study can help us understand why cold air is such a trigger for coronary events," said Lawrence I. Sinoway, Distinguished Professor of Medicine and director of the [Heart](#) and Vascular Institute, Penn State College of Medicine.

Breathing cold air during exercise can cause uneven oxygen distribution throughout the heart. But a healthy body generally corrects for this problem and redistributes blood flow, making sure the heart continues to function properly. In people with heart problems -- such as [coronary artery disease](#) -- this may not be the case, said Sinoway.

"If you are doing some type of isometric work and you're breathing cold air, your heart is doing more work -- it's consuming more oxygen," said Sinoway, also director of the Clinical and Translational Science Institute at Penn State.

Isometric work includes such activities as shoveling snow and carrying a briefcase or laptop bag. The heart works harder when exerted in [cold temperatures](#) and the number of deaths due to cardiac arrest peaks during the winter.

"There are two different things going on here -- demand and supply,"

said Matthew D. Muller, [postdoctoral fellow](#) at the Heart and Vascular Institute, Penn State College of Medicine. "We thought that oxygen demand in the heart would be higher with cold-air breathing and we also thought that [oxygen supply](#) would be a little bit impaired. And that's generally what we found."

Sinoway, Muller and colleagues reported their results in a recent issue of the [Journal of Applied Physiology](#) and in the current issue of the [American Journal of Physiology, Heart and Circulatory Physiology](#).

The researchers first studied healthy young adults in their 20s and then studied a group of healthy [older adults](#) in their 60s so that they could learn how the heart functions in people without disease. Each subject was monitored for lung function and heart functions during the trials.

In order to measure heart function during exercise, the participants performed an isometric, or static, handgrip, which is a maneuver known to increase blood pressure. Subjects squeezed the handgrip device and held it still for two minutes, providing a consistent workload on the heart for the researchers to measure. Muller and Sinoway found that there was a supply-demand mismatch in the left ventricle -- where the heart receives oxygenated blood -- yet the heart was able to continue functioning appropriately.

These findings "suggest that healthy humans can adequately redistribute blood to the subendocardium (the blood vessels entering the heart) during the combined stimulus of cold-air inhalation and handgrip exercise," the researchers stated.

Provided by Pennsylvania State University

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