Effectiveness of cold therapy depends on water temperature, muscle position

May 22 2020

Credit: CC0 Public Domain

A new study finds that cold water therapy affects blood flow to individual muscles of the leg differently and is dependent on the temperature of the water. The first-of-its-kind study is published ahead

of print in the *Journal of Applied Physiology*.

Cold therapy is often used to treat soft tissue injuries—particularly in athletes—as it is thought to limit the activity of inflammatory cells that can lead to restricted oxygen and possible damage to the muscles. Understanding how blood flow to the muscles changes in response to cold therapy is important to proving appropriate treatment. Positron emission tomography (PET)—an imaging tool that uses an injected radioactive drug tracer to show tissue and organ function—is routinely used to directly measure blood flow in response to heat therapy. PET may provide the same benefits for cold therapy.

The effects of cold therapy on different muscles in the same body region, such as individual muscles in the leg, has not been well-studied.

Male volunteers with an average age of 33 were randomly assigned to cold water treatments of either 46, 59 or 71 degrees F. The volunteers sat in the cooling bath, immersed to the navel, for 10 minutes. The researchers measured the men's heart rate, as well as the temperature of their core, quadriceps muscles and skin throughout the immersion. After the cold water treatment, the volunteers underwent a PET scan, where blood flow to the calf and thigh was recorded.

The researchers saw an increase in blood flow in the deep muscles of the thigh—located closest to the femur bone—with exposure to the coldest water temperature tested (46 degrees F). Superficial muscles closer to the skin showed a decrease in blood flow with exposure to 59 degree water. The heat production that comes from shivering may explain why the coldest temperature led to an increased blood flow in the deeper muscles. In theory, a decrease in blood flow is beneficial to healing, "given [that] the effects of cold water immersion are partly based on reducing tissue swelling," explained Warren Gregson, Ph.D., corresponding author of the study. "As such, less noxious (more

tolerable) cooling may be more effective by reducing superficial flow and minimizing increases in flow in the deeper tissue," Gregson added.

"These data have important implications for the selection of [cold water immersion] approaches used in the treatment of soft tissue injury, while also increasing our understanding of the potential mechanisms underpinning [cold water immersion]," the researchers wrote. "A less noxious water temperature [59 degrees F] may be considered a viable option as a treatment for soft tissue injury."

"Changes in quadriceps femoris muscle perfusion following different degrees of cold-water immersion" is published ahead of print in the *Journal of Applied Physiology*.

More information: Chris Mawhinney et al. Changes in quadriceps femoris muscle perfusion following different degrees of cold-water immersion, *Journal of Applied Physiology* (2020). DOI: 10.1152/japplphysiol.00833.2019

Provided by American Physiological Society