

# Backpack straps can decrease blood flow in the shoulder and arm

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More than 92 percent of the children in the U.S. carry backpacks. Typically the backpacks are loaded with almost one-fourth of the child's body weight (22 percent) and worn with only one strap. Last year, a team of physician researchers examined the effect heavy-loaded backpack straps can have on children. They found the straps can significantly increase pressure when the load is ten percent or more. They also found that strap pressures with loads as small as ten percent of bodyweight can obstruct localized blood flow and contribute to shoulder fatigue.

This year the team has examined pack straps and adults. In some professions, such as the military, firefighting and mountain rescue, the packs may equal as much as 60 percent of adult body weight. The findings of the most recent study indicate that even light loads of 26 pounds can decrease upper extremity blood flow, and may result in a loss of fine motor control and increased fatigue.

The studies were conducted by Timothy Neuschwander, Brandon Macias and Alan Hargens, all of the Department of Orthopaedic Surgery, University of California–San Diego. Dr. Neuschwander will present the team's findings, Backpack Straps Decrease Upper Extremity Blood Flow, at the 121st Annual Meeting of the American Physiological Society, part of the Experimental Biology 2008 scientific conference.

Backpack straps typically rest on an area of the body where they may compress the axillary vein which causes abnormally high blood pressure inside the veins and a subsequent decrease of blood flow in the shoulders and arms. The researchers speculated that blood flow of the large and small vessels of the upper extremity area would decrease in an individual while wearing a backpack.

To test their theory, they examined eight healthy volunteers, six men and two women between the

ages of 18-30. The right brachial artery was measured using ultrasound and the index finger pulp microvascular flow was measured using the photoplethysmography method. Baseline flows were measured immediately before and ten minutes after donning a 26 pound backpack. A ten minute testing period was chosen because people typically wear a backpack for at least ten minutes. This amount of time is also sufficient to measure blood flow.

After wearing the pack for ten minutes, brachial artery blood flow decreased from  $2.66 \pm 0.36$  to  $1.52 \pm 0.27$  mL/s (p

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