

Heavy Backpack Load Carriage Affects the Median Nerve

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ABSTRACT

First responder and military personal often carry heavy backpacks of over 30% body weight when loaded with equipment. Use of the hands may be impaired by the compression of backpack straps on the nerves of the upper limb. **PURPOSE:** The aim of the study is to characterize the effects of walking with backpack load on upper limb function by examining changes in nerve conduction resulting from compression of the brachial plexus by backpack straps. We hypothesized that nerve conduction would be decreased in amplitude of the action potential and timing would be delayed after walking while carrying a 30% body weight load in a backpack. **METHODS:** 27 participants (12 female, 15 male; mean \pm SD of 23.0 \pm 4.8 yrs, 174.1 \pm 10.5 cm height; 78.1 \pm 14.9 kg mass, 27 right handed) were measured for motor and sensory nerve conduction using a Natus Neurodiagnostic System to stimulate and record median nerve conduction for the dominant upper limb. The median nerve was stimulated at the wrist for the sensory measures and at the elbow and axilla for motor nerve measurements. Participants walked on a treadmill for 20 minutes at 1.1 m/s while carrying a load of 30% bodyweight in a military-style external frame backpack with hip belt. Measurements were taken before participants donned the backpack (PRE) and immediately after walking while participants were still wearing the backpack (POST). Amplitude and latency of action potentials were recorded. Paired t tests were used to compare PRE and POST values of nerve conduction. **RESULTS:** Sensory nerve conduction showed significant changes ($p=0.040$) with a decrease in baseline-to-peak amplitude from 46.6 \pm 16.2 μ V PRE to 40.8 \pm 13.2 μ V POST. Latency of the motor nerve action potential was significantly increased ($p=0.013$) from a mean of 7.46 \pm 0.71ms PRE to 7.60 \pm 0.86 ms POST when stimulated at the elbow. Stimulation at the axilla also demonstrated significantly increased motor latency ($p=0.037$) from a mean of 9.36 \pm 0.91 ms PRE to 9.49 \pm 1.04 ms POST. **CONCLUSION:** Walking for 20 minutes while carrying a backpack loaded to 30% body weight affected nerve conduction for the median nerve. The increase in latency and decrease in amplitude of nerve conduction after a short bout of walking could potentially affect use of the hand and finger muscles and consequently affect manual task performance.