Effects of Spinal Deviations From Frontpack or Backpack Loading

Thomas Baalmann,* Taylor Barbour, Sarah Loesing, Leslie Rausch, Sam Smith
Faculty: Lisa Garcia,1 Dr. Nils Hakansson2
1Department of Physical Therapy, College of Health Professions
2Department of Biomedical Engineering, College of Engineering

INTRODUCTION: Humans use backpacks in everyday life for reasons including carrying school supplies, military or work-related uses. Carrying loads on the back can cause changes in posture and muscle activation resulting in pain or long-term spinal deviations. Awareness of the effect of frontpack loading compared to backpack loading is important to understand the effect they have on spinal deviations in college-aged individuals.

PURPOSE: The purpose of this study was to investigate the effect that backpacks cause on spinal deviations and compare it to frontpack loading in college-aged (students who are 18-30 years old) individuals.

METHODS: A randomized controlled trial (RCT) using a sample of convenience was conducted to determine the influence of spinal deviations due to backpack loading compared to frontpack loading among 24 healthy college-aged individuals. A timed trial of the subjects walking on a treadmill with frontpack and backpack loading was completed using the Owl Digital RealTime System which records and calibrates motions of the subjects in real time. Data regarding spinal deviations was captured by digital cameras with 640 x 480 resolution recording reflective markers placed on the subjects. In addition to spinal deviations, muscle activity was also recorded during the study using a 16-channel electromyography (Trigno™ Wireless EMG System Delsys, Inc., in Natick, MA.).

RESULTS: There was no significant difference found between spinal deviations of cervical angles during controlled frontpack and backpack ambulation. A significant difference in spinal deviations was however found between thoracic angles during controlled frontpack and backpack ambulation. While a difference of 9 degrees in thoracic spinal angle variance was observed, a 9 degree difference is not clinically relevant.

CONCLUSION: While no clinical difference was observed between spinal angles of the thoracic spine during loaded ambulation, further research should be done to investigate the effect heavier loads would have, given the spinal angles.