

## Guest Editorial

---

# Human Vibration

Vibration enters the body at points in contact with a vibrating surface including the hands, feet, or buttocks and back in the case of a seated person. Much of the vibration entering the body does not cause ill effects, however, depending on the frequency content and entry point, some vibrations may be at the resonant frequency for a specific body portion. In this case, the vibration is considered to be harmful and may lead to injuries such as vibration white finger in the case of vibrations entering the hands or vibration white toe in the case of vibrations entering the feet. Health effects resulting from whole-body vibration (WBV) in which the primary entry points are the buttocks and back can include a myriad of ailments including low-back pain, spinal degeneration, neck pain and headaches to name a few. The conference in Guelph, Ontario, Canada from June 10–13 in 2014 entitled the “5th American Conference on Human Vibration” dealt with precisely these topics and we invited three of the contributors to expand upon their papers and contribute to this Special Issue on Human Vibration (DeShaw and Rahmatalla, Welcome et al. and Goggins et al.). To round out the Special Issue, and to highlight the diversity of human vibration research, a further two papers were solicited (Oliver et al. and Leduc et al.).

The papers are presented in this Special Issue in a logical progression according to the topical content. The first paper by DeShaw and Rahmatalla investigated the effects of various back supports on head motion, discomfort and vibration transmissibility when participants were exposed to multiple axis WBV in a laboratory environment. Their results indicated that the lumbar supports combined the advantages of lower head motion and lower discomfort than a flat backrest by helping keep the natural lumbar spine shape thus helping to minimise the adoption of awkward trunk postures. The second paper by Oliver et al. represented the final phase of a three phase study designed to inform companies how to retrofit heavy mobile machines with seats that were more likely to minimise WBV exposure. While WBV levels were reduced, the exposure risk was not completely eliminated thus highlighting the fact that seat designers should be continuing to alter their designs to improve WBV attenuation.

The third paper by Welcome et al. provides a comprehensive look at the effectiveness of vibration-reducing (AV) gloves designed to minimise hand transmitted vibration. Similar to suggestions made by Oliver et al. that seats need to be matched to attenuate the specific vibrations machine operators will be exposed to, Welcome et al. concluded that better matching between specific gloves and tools is required to provide optimal protection. The fourth paper by Leduc et al. investigated health and safety training received by construction industry workers regarding hand arm vibration syndrome (HAVS) and the use of AV gloves. Few participants had received HAVS or AV glove specific training, however, at a two month follow-up visit, they observed a more than ten-fold increase in self-reported AV glove use thus highlighting the importance of education and training.

The fifth and final paper by Goggins et al. provides one of the first reports in the literature concerning foot-transmitted vibration (FTV). The paper provided the first quantification of frequencies at which resonance occurs in the metatarsal and ankle. By knowing the resonant frequencies, future FTV mitigation strategies can be focused on reducing transmission of those specific vibration frequencies.

This Special Issue has provided a platform to show that the study of human vibration requires a multi-faceted approach to minimise the deleterious effects of vibration on human health. The papers contained in this issue provide important information on which to base future studies to develop better human vibration mitigation strategies. The guest editors wish to acknowledge the financial support received from the Canadian Institutes of Health Research to host the 5th American Conference on Human Vibration.

*Guest Editors*

Michele Oliver  
*School of Engineering,  
University of Guelph,  
Guelph, Ontario, Canada  
E-mail: moliver@uoguelph.ca*

Tammy Eger  
*Center for Research in Occupational Safety and Health,  
Laurentian University,  
Sudbury, Ontario, Canada  
E-mail: teger@laurentian.ca*