

Evaluation of hand-arm vibration (HAV) transmission: Laboratory simulation of grass trimmer operations



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Abstract

Introduction

Long-term, excessive exposure to hand-arm vibration (HAV) can induce vascular, neurological, and musculoskeletal disorders, collectively known as hand-arm vibration syndrome (HAVS). However, there are no current OSHA regulations to protect workers who use power tools from HAV exposure. In this study, vibration transmission from a power tool to the user's hand-arm system and blood flow level at the user's fingertips were evaluated to better understand the vibration magnitude caused by the power tool and health effects on the vascular component of HAVS.

Methods

A commercial-grade grass trimmer was used in this study. Two subjects were asked to simulate idling and cutting operations for five minutes each. To measure tri-axial acceleration (i.e., vibration total value of frequency-weighted r.m.s. acceleration, a_{hv}) from the source to subject, accelerometers were mounted on the grass trimmer, and vibration dosimeters were placed on the subject's both hands, respectively. Percent reduction was

calculated to determine the changes in acceleration values from the tool to the subject's hands. Peripheral perfusion index (PI) was measured before and after the exposure of HAV for five minutes using an oximeter. The experiment was triplicate and results averaged.

Results/Conclusion

Vibration total value (a_{hv}) was decreased when vibration transmitted from the grass trimmer to subject's hand. For subject 1, the percent reduction was 35.7 and 2.54 measured on the left hand and right hand, respectively. For subject 2, it was 38.8 and -0.952 measured on the left hand and right hand, respectively. Change in finger fusion index (PI) of subject 1 before and after tool operations ranged from 7 to 130 % while subject 2 ranged from -99 to 17 %. Long-term investigations are needed to thoroughly estimate the dose-response relationship between HAV magnitude and vascular effects.

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