NEUROMUSCULAR RESPONSE OF THE TRUNK FOLLOWING INERTIAL-BASED PERTURBATIONS WITH WHOLE-BODY VIBRATION EXPOSURE

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INTRODUCTION
Low back pain/injuries due to occupational based vibration exposures can cause physical and emotional suffering as well as become a financial burden to the injured, industry and society [1]. Although there is conflicting evidence [2,3], some research has shown that vibration exposure has detrimental effects such as delayed muscular response and poor kinaesthesia [2]. Therefore, it is important to investigate if vibration exposures have negative effects on the neuromuscular system, a system that is vital for optimal muscle force coordination. The purpose of this study is to evaluate the effects of vibration exposure (below hazardous levels identified in the ISO 2631-1 standard) on the voluntary and involuntary neuromuscular responses prior to, during and following inertial-based trunk perturbations.

METHODS
Twenty healthy male subjects (18-30 years) will participate in the study. Fourteen channels of surface electromyography (sEMG) will be recorded bilaterally from the trunk utilizing the protocol outlined in Cholewicki and McGill (1996). Kinematics of the trunk, head and arms will be captured using a passive motion capture system (Vicon, Vicon Motion Systems). Subjects will be randomly assigned to one of two experimental groups: 1) control group (CG) – no vibration exposure (n=10); 2) vibration group (VG) – vibration exposure (n=10). Subjects will be seated on a backless car seat which is rigidly secured to a parallel robotic platform (R2000 Rotopod, PRScO). The VG will be exposed to stochastic tri-axial vibrations (r.m.s. = 0.55m/s²) prior to and throughout the linear perturbation protocol. All subjects will experience the same known and unknown timed linear perturbations causing rapid front, back, left and right trunk motions (total platform displacement = 60mm; peak acceleration = 15.7m/s²). All data will be windowed into four time periods based on Stokes et al. (2000): 1) baseline, from 500-450ms prior to perturbation, 2) pre-perturbation, from 50ms prior to perturbation, 3) pre-voluntary response, from 25-150ms post-perturbation and 4) voluntary responses, from 150-300ms post-perturbation. A 2x4x4 analysis of variance (ANOVA), with repeated measures, will be used to determine the influence of each of the three independent variables: vibration exposure, perturbation direction, and time period (p<.05).

EXPECTED RESULTS
We expect to find significant increases in the reflex response latencies of the muscles recorded in experimental group, compared to the control group, during both the pre-voluntary and voluntary response time periods.

REFERENCES

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