INTRODUCTION
Approximately 4 to 7 percent of workers are exposed to potentially harmful levels of WBV in Canada, the United States, and some European countries [1]. Exposure to vibration is known to cause certain physiological responses. However, there is still a lack of understanding on how these responses tax the neuromuscular system. The objective was to investigate whether exposure to vibration along with exercise induced a phenomenon of fatigue revealed by physiological, mechanical, and muscular parameters in the lower-limb muscles, and to determine the origin (central vs. peripheral) of the fatigue of the knee-extensor muscles.

METHODS
A series of neuromuscular tests including electrically evoked voluntary contractions were performed before and immediately after 4 exercise protocols (Standing [control], Standing/Vibration, Squatting and Squatting/Vibration) (3.5 Hz) in 11 healthy subjects. Subjects participated in 4 testing sessions in random order on separate days. The testing sessions were composed of a standing session (ST), a vibration session (VT), a fatigue task session (SQT) and a fatigue task with vibration session (VSQT) for which PRE and POST fatigue neuromuscular tests were performed.

RESULTS
Mean maximum voluntary contraction (MVC) torque produced during extension decreased significantly POST Squatting Trial (SQT) (-17.8 %; P < 0.001) and Vibration Squatting Trial (VSQT) (-22.4 %; P < 0.001). Similarly, mean MVC torque during flexion significantly decreased POST SQT (-10.9 %; P = 0.016) and VSQT (-24.9%; P = 0.011). Raw electromyography root mean square (EMG RMS) dropped significantly POST VSQT for the rectus femoris (-39.33 %; P < 0.05). Twitch contraction-time (CT) decreased (-13.2 %; P =.004), twitch half-relaxation time (HRT) decreased (-21.9%; P=.000) and twitch peak torque (PT) (-26.4 %; P =.002) for the squatting trial. Twitch PT decreased significantly (-28.29 %; P=.038) for the squatting vibration trials. Doublet PT of the Squatting trials decreased (-22.7%; P =.002), doublet HRT during Squatting Vibration trials decreased (-28.8%; P =.004).

DISCUSSION & CONCLUSIONS
The key findings were overall significant decreases in MVC torque POST SQT and VSQT for extensor and flexor muscles. The MVC torque reduction was accompanied by a decrease in twitch and doublet peak torque PT. We demonstrated that VSQT induced a significant reduction in the torque produced during MVC, but it was not significantly different from the SQT trials. The significant extensor MVC torque reduction observed POST SQT was accompanied by decreased voluntary activation of the rectus femoris, as attested to by the normalized EMG. Central drive, as indicated by raw EMG RMS, dropped significantly, POST Squatting with Vibration, for the rectus femoris. The peripheral adaptations were very similar for both protocols (squatting vs. squatting with vibration). Although this study failed to demonstrate substantial central modifications for the squatting vibration protocol, the contribution to overall fatigue should not be excluded. It has been established [2] that exhaustive vibration exercise could alter central motor control patterns. In conclusion, the vibration exercise performed in this study induced a phenomenon of fatigue at the peripheral level. However, the central contribution to the fatigued state in relation to low-frequency vibration exercise cannot be excluded at this point.

REFERENCES