

SAMPLE ABSTRACT

CARDIOVASCULAR REGULATION BY EXOGENOUS PLANTAR

MICROMECHANICAL STIMULATION *Guruprasad Madhavan¹, Julian M. Stewart², and Kenneth J. McLeod¹; Clinical Sciences Research Center, Department of Bioengineering, Thomas J. Watson School of Engineering & Applied Science, State University of New York, Binghamton, NY 13902; ² Center for Hypotension, Departments of Pediatrics and Physiology, Westchester Medical Center and New York Medical College, Valhalla, NY 10595

Introduction: The modern environment (*vocational work, long-haul travel, and passive entertainment*) results in exposure to prolonged periods of immobility, usually in the seated position, yet the implications of this immobility on physiologic systems has not been well established. Here, we investigate the cardiovascular responses of adult women to the influence of extended quiet sitting and the extent to which these responses may be ameliorated by an external stimulus. **Methods:** The cardiovascular responses of twenty healthy adult women (mean age: 55.9 ± 4.45 years) were followed during 20 minutes of quiet sitting, with and without exposure to a plantar-based vibration. Beat-to-beat heart rate via EKG was acquired along with pre- and post-exposure blood pressures, from which heart rate variability (HRV) and mean arterial pressure (MAP) were determined. Seven stimulus frequencies (0, 15, 22, 44, 60, 90, and 120 Hz, all at 0.2g, *p-p*) were tested on each subject. **Results:** A distinctly bimodal cardiovascular response was observed in this population during the extended quiet sitting. One group (N=9) had an average heart rate drop of 2.8 ± 0.74 bpm, and a systolic pressure drop of 7.75 ± 1.6 mmHg after 20 minutes of sitting. A second group (N=11) exhibited an average increase of 8.3 ± 0.5 bpm in heart rate and a decline of 9.45 ± 1.8 mmHg in their systolic blood pressure as compared to their mean baselines. Plantar stimulation at 44 Hz (25 μ m, *p-p*) was able to completely reverse the effect of immobility in the group demonstrating a tachycardia response, resulting in a heart rate decline of -2.5 bpm ($p < 0.0001$) and only a 1 mmHg drop in systolic pressure ($p = 0.006$) following twenty minutes of exposure. **Conclusion:** We interpret these results to suggest that the immobility of quiet sitting has a profound effect on the cardiovascular systems of a large fraction of otherwise healthy women, perhaps due to inadequate muscle tone. Simple external stimulation of the plantar surface appears to be capable of preventing these cardiovascular stress-based responses. *Supported by grants from the Whitaker Foundation, Virginia, Smith & Nephew, Inc., Tennessee, Juvent Corporation, New Jersey, and NYSTAR (New York State Office of Science, Technology, & Academic Research), New York.*