A.P. BLABER, D. XU, N. GOSWAMI, K. TAVAKOLIAN. Cardio-postural assessment: a tool for an aging population. Gerontechnology 2018;17(Suppl):126s; https://doi.org/10.4017/gt.2018.17.s.122.00 **Purpose** Impairment of balance and postural control[1], and cardiovascular regulatory functions[2] with aging are considered as risk factors and major contributors to falls in seniors and associated with recurrent falls among elderly nursing home residents. We have developed an integrative cardio-postural model (Fig. 1) which allows for simultaneous assessment of these control mechanisms. Upon standing, blood pools in the lower legs. The resultant drop in blood pressure, detected by baroreceptors, is relayed to the brain where: (a) arterial baroreflex increases heart rate and vasoconstriction; and (b) leg muscles contract (skeletal muscle pump), forcing pooled venous blood back to the heart (muscle-pump baroreflex). The development of non-invasive and easy to use technology based on this model could provide an important tool in falls prevention and management in seniors' care. **Method** We conducted cardio-postural assessments on middle aged subjects pre- & post 60-days bed rest (n=9, 36±8 years), and older adults with hemorrhagic stroke (n=12, 63±5 years) and age-matched controls without stroke (n=20, 63±7 years). Data was non-invasively collected continuously at 1kHz throughout testing: systolic blood pressure (SBP) via finger photoplethysmography, calf muscle activity via surface electromyography (EMG); heart rate (HR) via 3-lead electrocardiogram, and center of pressure (COP) via a force platform. We applied techniques developed by our group to capture the interactions between cardiovascular and postural controls. Wavelet transform coherence analysis (WTC)[3] and convergent cross mapping (CCM) causality[4] methods were used to extract indices characterizing the *interaction time*, *response gain value* and *causality* among cardiovascular and postural measurements including HR, SBP, EMG, and COP. (Funded by the Canadian Space Agency, CIHR and NSERC). **Results & Discussion** We quantified arterial and muscle-pump baroreflexes. With bed rest, reductions in both arterial (6.7±0.9 to 2.7±0.5 ms/mmHg) and muscle-pump (0.75±0.13 to 0.5±0.08 uV·s/mmHg) baroreflex gain, and both arterial (0.95±0.01 to 0.88±0.03) and muscle-pump (0.85±0.01 to 0.78±0.03) baroreflex causality, were observed. The older adults with hemorrhagic stroke showed a similar reduced muscle-pump baroreflex gain (0.48±0.06 uV·s/mmHg) when compared to controls (0.85±0.11 uV·s/mmHg), but without any difference in causality or arterial baroreflex function. These data show that the skeletal muscle pump baroreflex, only observable with cardio-postural analysis, has significant deficits following stroke and long-term bed rest. We are now developing a portable cardio-postural assessment device (*Figure 1*) with a profile similar to a bathroom scale.

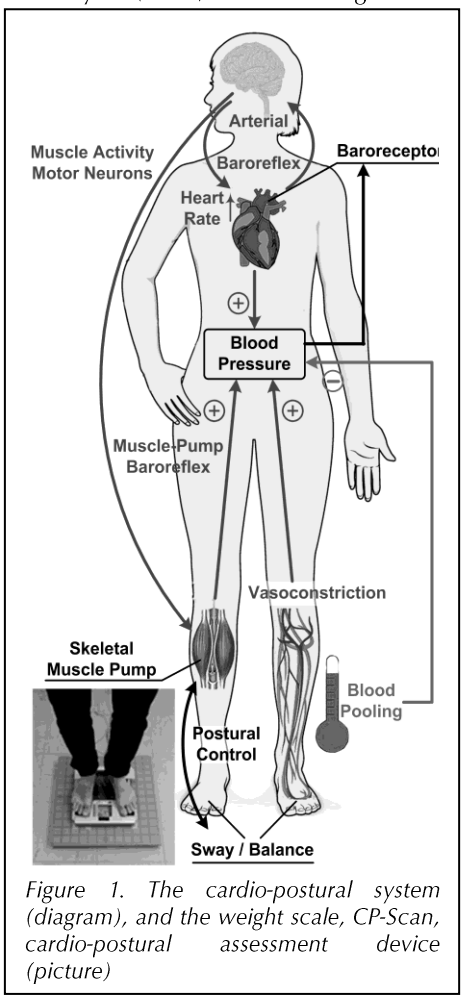

Figure 1. The cardio-postural system (diagram), and the weight scale, CP-Scan, cardio-postural assessment device (picture)

References

1. Mackey DC, Robinovitch SN. Gait Posture 2006: 23, 59–68
2. Ooi WL, Hossain M, Lipsitz LA. Am. J. Med. 2000:108, 106–111
3. Garg, A, Xu, D, Laurin A, Blaber AP. Am. J. Physiol. Heart Circ. Physiol. 2014:307,H259-64
4. Verma AK, Garg A, Xu D, Bruner M, Fazel-Rezai R, Blaber AP, Tavakolian K. Sci Rep 2017:7,45301

Keywords: assessment, cardiovascular, posture, skeletal muscle pump
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