Rogers, L.M., L. J. Welty, S. E. D'Andrea, P. K. Batchu, D. A. Brown (2006). "Effect of stochastic resonance applied to proximal leg muscles during cycling on soleus h-reflexes in persons with post-stroke hemiparesis", Abstract and Poster, Society for Neuroscience 2006, Manuscript in Preparation.

BACKGROUND: Common to 75% of stroke-survivors are sensorimotor deficits such as hemi-paresis and proprioceptive losses with resulting change to both muscle activation and reflex modulation during movement. Important to combating these sensorimotor losses, enriching signal content from tactile and proprioceptive neurons with methods such as stochastic resonance (SR) can encourage neuroplastic change characteristic of improved efficiency. Our purpose was to determine the effect of electrical SR on soleus (SOL) H-reflex modulation during cycling post-stroke, to determine if enhancing the content of sensory signals from key thigh muscles can impact locomotor neural circuits. SUBJECTS: 16 subjects (13 males, age 54.8 ± 7.1 years) with lower limb hemiparesis post-stroke (time post-stroke 9.3 ± 4.4 years). METHODS: While pedaling a motorized cycle ergometer, SOL H-reflexes were recorded alone (N) or during SR stimulation to either the Hamstrings (H) or Quadriceps (Q) of the ipsilateral paretic limb. Electrical SR stimulation, in the form of sub-sensation Gaussian white noise, was delivered to the target muscle via surface electrodes. In each condition 20 H-reflexes were recorded at four equally spaced points in the locomotor cycle relative to maximum knee flexion. Responses were elicited in a blocked design according to stimulus condition, randomized by angle, and balanced across subjects according to angle order and SR muscle order. RESULTS: For SR stimulation to either the quadriceps (Q) or Hamstrings (H) we found a significant change between the mean normalized SOL H-reflex amplitudes (HREF) relative to the N condition ($p<0.01$ for both) with an increase in HREF with SR. In addition, the change in mean normalized SOL H-reflex between the H and N condition was significantly different across angle ($p<0.01$). DISCUSSION: Overall for subjects with chronic hemiparesis post-stroke, SR applied to either the Q or H of the paretic limb served to alter H-reflex excitability in the homonymous SOL. Thus in a system with sensorimotor losses, influencing the information content of signals from muscles with known impact on locomotor circuitry can affact a functionally relevant reflex pathway. These results support SR as a potential method for eliciting functional neuroplastic change post-stroke.