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[Authors]. [Abstract Title]. Program No. XXX.XX. 2015 Neuroscience Meeting Planner. Washington, DC: Society for Neuroscience, 2015. Online.

Abstract: Spatial-temporal Functional Reorganization of Somatosensory Area 3b and Area 1 of Squirrel Monkeys After Spinal Cord Injury Ruiqi Wu, Langting Su, Pai-Feng Yang, Li Min Chen **Keywords:** optical imaging; hand; touch; primates; dorsal column **Abstract:** Somatosensory cortices of adult primates reorganize after sensory loss such as that caused by disruptions of dorsal column afferents. Correlated cortical reorganization and behavioral recovery led to the hypothesis that cortical reactivation and reorganization mediate functional and behavioral recovery after spinal cord injury (SCI). However, since parallel reorganizations have been observed in multiple somatic areas, it is not clear how different cortical areas work together to restore or compensate for the loss of function. As a first step to address this question, with the high spatial and temporal resolution afforded by the optical imaging of intrinsic signals (OIS), we quantified the spatial-temporal features of the cortical responses in areas 3b and 1 several weeks after a unilateral dorsal column lesion. Three adult squirrel monkeys were included in this study and were imaged under light anesthesia before and after SCI. Specifically, we measured the areas, magnitudes and temporal profiles of OIS responses to 8Hz vibrotactile stimulation (in 3.5 seconds duration) of individual digits. We found that the magnitudes of OIS signals obtained several weeks after the lesion were significantly decreased in both areas 3b and 1. OIS signals also peaked significantly earlier than those obtained prelesion. The size of activation in area 3b was larger, indicating more diffused responses to stimuli. A similar activation size increase was observed in area 1, but statistically the increase was not significant. Together, these results demonstrated that contralateral area 3b and area 1 underwent similar spatial and temporal reorganization after lesion, which were characterized as weaker, shorter and more diffused responses. These altered response properties may be responsible for the partial recovery of the loss of sensory functions.

Disclosures: **L. Chen:** None. **R. Wu:** None. **L. Su:** None. **P. Yang:** None.

Poster

240. Somatosensory Functional Organization

Location: Hall A

Time: Sunday, October 18, 2015, 1:00 PM - 5:00 PM

Program#/Poster#: 240.22/N15

Topic: D.09. Tactile/Somatosensory Systems

Support: NSF IIS-1016998

Title: Thermal Pattern Identification on the Hand

Authors: *L. A. JONES, A. SINGHAL;
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Abstract: Changes in skin temperature are encoded in the responses of cold and warm thermoreceptors at a rate that depends on the baseline temperature of the skin and the rate at

which the temperature is changing. In contrast to the wealth of sensations that are evoked by tactile stimulation of the skin, in response to thermal stimulation there is perceptible warming or cooling and this can be quantified in terms of the intensity and duration of the thermal stimulus. The spatial properties of the thermal stimulus such as its area, shape and location are poorly resolved due to the pervasive effects of spatial summation. With the exception of studies on the effect of the rate of temperature change on thermal thresholds, the temporal aspects of thermal stimulation have not been extensively studied. Previous research has demonstrated that the time to process thermal stimuli within the innocuous range is relatively slow in comparison to other sensory modalities. The objective of the present experiments was to determine whether thermal patterns created by varying the direction, magnitude and rate of temperature change could be reliably identified when presented on either the thenar eminence or the index finger. Three thermal profiles (square wave, step and ramp) were used, each of which had two values to give a total of six patterns. A thermal display based on a Peltier device was used to present the stimuli and the temperature of the display and hand were measured continuously using thermal sensors. Each thermal pattern was presented 8 times to 10 participants who had to identify the stimulus using a visual template of the change in skin temperature. The temperature of the skin tracked that of the thermal display but did not reach the minimum and maximum intensities of the display within the presentation time. Preliminary experiments on the response of the skin to various types of thermal inputs indicated that waveforms such as square waves, sinusoids and triangular waves resulted in very similar changes in skin temperature and so were unlikely to be perceptually distinguishable. The three profiles selected did produce distinct changes in temperature as reflected in the participants' performance. The individual mean scores associated with the six thermal stimuli ranged from 80% to 98% on the thenar eminence and from 81% to 88% on the index finger with overall means of 91% and 84% respectively. The information transfer values for the thenar eminence averaged 2.26 bits and for the finger 1.86 bits. These findings demonstrate that with sufficiently long presentation times, the information processing capabilities of the thermal sensory system may rival those achieved with vibrotactile inputs.

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Poster

240. Somatosensory Functional Organization

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Topic: D.09. Tactile/Somatosensory Systems

Support: ESRC Grant R10568

Title: Functional, acoustic and articulatory outcomes of speech training: a multi-modal investigation of native and non-native imitation