

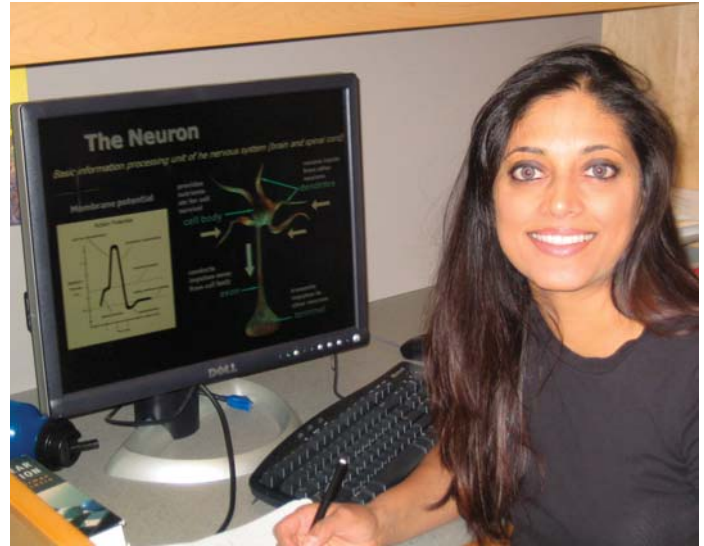
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Monday, September 14, 2009 at 1:30

Homewood Campus, Rome Room, Clark110
Video-Teleconferenced to Talbot Library, Traylor 709

Light lunch will be provided



To Cue or Not to Cue: Reframing the Question for Parkinson's Disease Patients

Cues are believed to modulate motor function in Parkinson's disease (PD) through activation of corticostriatal pathways that suppresses pathological basal ganglia activity such as 10-30 Hz beta oscillations. We set out to evaluate the association between external cues and downstream neuromodulatory effects in basal ganglia in PD patients. We compared the effects of anticipated and unanticipated cues upon behavior and subthalamic nucleus (STN) neurophysiology in seven PD patients executing a center-out task. In anticipated trials, patients knew the "go cue" would appear at the start of the trial, and moved in response to the visual cue. In unanticipated trials the "go cue" appeared 50% of the time, and were designated visually-guided when presented and self-initiated otherwise. At the start of each unanticipated trial, patients could not anticipate the cue and therefore could not plan for a specific type of movement.

We analyzed spiking activity in the STN by constructing point process models from spike trains generated by each neuron. A point process model describes the spiking propensity of a given neuron as a function of extrinsic factors (eg. cues, movement), intrinsic factors (eg. neuron's spiking history, local activity), and time. Using our models, we then computed the percentage of STN neurons that exhibit, in a statistically significant sense, 30-100Hz gamma oscillations, 10-30 Hz beta oscillations, and directional tuning for each trial type.

We found that during anticipated (+cue) trials and self-initiated trials (-cue), neuromodulation occurred: beta oscillations decreased while directional tuning increased in the STN, with decreased reaction and movement times. During visually-guided (+cue) trials, the beta oscillations and directional tuning in the STN did not modulate and behavior times increased. These results suggest that external cues may not be critical to motor facilitation in PD. Rather the activation of previously formulated motor plans, via either external or internal cues, may be the mechanism in "cue-related" motor modulation. Interestingly, physiological modulation occurred earlier during the anticipated (+cue) trials versus self-initiated trials, supporting this viewpoint.

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