Sensory Changes Accompanying Motor Learning

Paul Gribble and Jeremy Wong

University of Western Ontario
London, Ontario, Canada

Neuroplasticity is a key focus in neuroscience, and has implications both for development and rehabilitation. What is surprising is that in perceptual and motor domains, work on plasticity has largely developed in isolation. There is a rich literature documenting plasticity in each domain, in the developing and adult nervous system, but little is known about how motor learning affects sensory function. Here we describe a series of experiments that test the hypothesis that changes in somatosensory function accompany motor learning. Sensitivity to small displacements of the hand was measured before and after 10 minutes of motor learning, during which subjects grasped the handle of a robotic arm and guided a cursor to a series of visual targets randomly located within a small workspace region. We used a novel method of assessing proprioceptive sensitivity that avoids active movement, inter-hemispheric transfer and inter-modality coordinate transformations. We found that proprioceptive acuity improved following motor learning, but only in the region of the arm?s workspace explored during learning. No proprioceptive improvement was observed when motor learning was performed in a distant location, or when subjects passively experienced limb trajectories matched to those of subjects who actively performed motor learning. Our findings support the idea that sensory changes occur in parallel with changes to motor commands during motor learning.