

Promoting Neural Adaptation using Adaptive Technology

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Neural systems often adapt in response to the patterns of activity across the network of neurons. This type of adaptation, or activity-dependent plasticity, is likely to be the primary process involved as a child learns how to ride a bike or as a spinal cord injured person re-learns how to walk. Several rehabilitation technologies are designed to promote adaptation in neural systems and recovery of function by tapping into these processes of activity-dependent plasticity. 'Neuromorphic' is a term used to describe technology that is designed to function in a manner that is similar to neural systems. This talk will describe the use of neuromorphic technologies to promote adaptation in a rehabilitation setting. We have designed and developed a system to control movements using electrical stimulation of paralyzed muscles that is based on a model of the spinal cord circuitry responsible for controlling locomotion. The rationale for this approach is that neuromorphic technology that operates like a nervous system may be readily integrated with the biological system and may be highly effective in promoting adaptation. Results will be presented from evaluations of this technology in computer simulation studies, in a rat model of spinal cord injury, and in studies on people with spinal cord injury.