

Module 9 – Neuroplasticity

Summary of Key Points

This concludes Module 9: Neuroplasticity. Before you take the quiz, let's review the key points:

- Plasticity is the process of the brain and spinal cord changing its connectivity to adapt changes, like an injury
- Structural plasticity refers to changes occurring in a neuron that increase the amount of connections to and from that neuron
 - Positive adjustments include improving motor abilities when spared axons branch and make new connections on deinnervated neurons, or when injured axons connect onto alternate targets above the level of their injury.
 - Negative adjustments include the development of neuropathic pain, autonomic dysreflexia, and spasticity caused by sensory neurons branching and making inappropriate connections within the spinal cord
- Synaptic plasticity refers to changes occurring within a neuron that allow for alterations in how effectively neurons communicate with one another at the location where two neurons make connections. These communications can be modulated by:
 - Changing the amount or frequency that neurotransmitters are being released
 - Changing the duration that neurotransmitters remain in the synaptic cleft
 - Changing the magnitude of response to neurotransmitters in the post-synaptic neuron.
- Intensive rehabilitation in the months after a spinal cord injury drives plasticity in an activity dependent manner that can lead to lasting improvements in functional abilities.
- There are several ongoing clinical research efforts which leverage neuroplasticity for functional gain. These include functional exercise / activity-based therapy (ABT) in combination with:
 - Acute Intermittent hypoxia (AIH)
 - Stem Cell Therapies
 - Inhibition of chondroitin sulfate proteoglycans (CSPGs)
 - Epidural and transcutaneous spinal cord stimulation (eSCS and tSCS)
 - Brain Interfaces
 - Vagus Nerve Stimulation (VNS)