Optimizing Sensorimotor Control After Peripheral Nerve Injury

Susan V Duff, EdD, PT, OTR/L, CHT

I. Skilled Prehension
   A. Features
   B. Motor Control Concepts 1-4
      1. Managing redundancy
      2. Role of sensory information in anticipatory and feedback control
      3. Motor lateralization / handedness
      4. Minimizing cost / optimization

II. Neural Changes after PNI 5,6
    A. Peripheral and Central
       1. Wallerian degeneration 7
       2. Neural representation 8-10
       3. Alterations in sensorimotor control 2,11-16
          a. Degrees of freedom altered
          b. Influences on manipulative skill
    B. Physiologic recovery 17,18
       1. Microsurgery
       2. Essential ingredients for axon regeneration
       3. Common problems

III. Assessment 2,3,11-13,19-23
    A. Impairments
    B. Motor strategies
       1. Adaptability
       2. Consistency
       3. Efficiency
    C. Function / Participation

IV. Intervention: expanding boundaries of recovery
    A. Enhancing resources
       1. Electrical stimulation to augment regeneration 24
          a. Animal model
             i. Implanted daily e-stim elevates intramuscular mRNA 25
             ii. One-hour e-stim at time of nerve repair promotes axon regeneration 26,27
          b. Human model
             i. Brief e-stim after carpal tunnel release surgery 28
             ii. Augment sensory nerve regeneration/functional recovery 29
          c. Implementation
    B. Activity-based treatment / Exercise 7, 33, 37
       1. Sensory discrimination training 35
       2. Contingent reinforcement 36
       3. Combination paradigms 37
    C. Maximizing function

V. Summary
References


