Chapter 7

Biofeedback

Objectives

Define biofeedback and identify its use in the clinical setting

Discuss the process by which electrical activity generated by a muscle is processed and converted to meaningful information by a biofeedback device

Outline the equipment set-up and clinical applications for biofeedback

Biofeedback Defined

Info provided by some measurement instrument about a specific biologic function

Provides patients with feedback that enables them to make adjustments in movement or function

Clinical Application

Useful in helping patients regain function of a muscle

Muscle re-education

- overcome VMO inhibition
- isolate and train scapular stabilizers

Muscle relaxation

- Upper trapezius
- Muscle guarding secondary to injury

Biofeedback Instrumentation

Peripheral skin temperature

- Vasoconstriction & vasodilation

Finger phototransmission

- Vasoconstriction & vasodilation

Skin conductance activity

- Sweat gland activity
- Lie detector testing

Electromyographic (EMG) activity

- Electrical activity within a muscle

Mirror

- Visual feedback for movement patterns

Electromyographic (EMG) Feedback

Measures or monitors the electrical activity associated with muscle contraction

- surface electrodes
- indwelling electrodes

Does NOT measure the force produced by the contraction
Electromyographic (EMG) Feedback

- Processing the signal
  - Raw signal is recorded as an alternating voltage wave

Electromyographic (EMG) Feedback

- Processing the signal
  - Raw signal is then rectified (negative reflections are flipped to positive pole)

Electromyographic (EMG) Feedback

- Processing the signal
  - Rectified signal is then smoothed by eliminating all of the peaks and valleys
  - Smoothed signal is then integrated by measuring the area under the curve

Electromyographic (EMG) Feedback

- Records the electrical activity of the muscle and then transforms it into meaningful feedback data

Electromyographic (EMG) Feedback

- Instrumentation
  - Three electrodes placed over the muscle in line with the direction of muscle fibers
  - Two active electrodes
  - One reference or ground electrode (usually placed between the two active electrodes)
  - Electrodes should be placed close together to eliminate “noise”

Electromyographic (EMG) Feedback

- Set-up
  - Clean electrode site with alcohol prep pad
  - Apply conductive gel to electrodes
  - Place electrodes in belly of muscle in line with the direction of muscle fibers
  - Plug the lead wires into the biofeedback unit
  - Turn the biofeedback unit ON
Electromyographic (EMG) Feedback

Set-up
- Set the OUTPUT to the desired mode of feedback
  - Visual
  - Auditory
  - Both

Visual strip of colored lights
Auditory beeps, clicks

Electromyographic (EMG) Feedback

Set-up
- Set the SENSITIVITY threshold to the desired level of feedback
  - Increased sensitivity requires less work from the patient
  - Decreased sensitivity requires more work from the patient

Scale reading
- x1 - 0.5-10µV (highest sensitivity)
- x10 - 5-100µV
- x100 - 50-1000µV (lowest sensitivity)

Electromyographic (EMG) Feedback

Set-up
- Set the SENSITIVITY threshold to the desired level of feedback
- high sensitivity to promote relaxation
- low sensitivity to promote reeducation

Electromyographic (EMG) Feedback

Set-up
- Instruct the patient on what they are supposed to do
  - Contract muscle to produce a certain peak level
  - Hold for 6-10 seconds
  - Relax muscle to eliminate feedback
- Treatment time
  - 5-10 minutes

Electromyographic (EMG) Feedback

Indications
- To facilitate muscle contraction
- To regain neuromuscular control
- To decrease muscle spasm
- To promote systemic relaxation
Electromyographic (EMG) Feedback

Cautions
- Do not exceed prescribe ROM
- Avoid undue muscle tension that may affect grafts or other tissue restrictions

Contraindications
- Conditions in which muscular contractions would insult the healing tissues

Biofeedback with Mirror

What questions do you have?