Surface Electromyography (sEMG)

Assessment Overview

Assessment Area

ICF Domain: 
Body Function
Subcategory: 
Neuromusculoskeletal & Movement-related Functions and Structures

Summary

Surface Electromyography (sEMG) is a non-invasive technique used to measure muscle activity (both voluntary and involuntary) in individuals with neuromuscular conditions using surface electrodes. sEMG provides quantifiable and objective measures of muscle activity, and is less invasive than needle EMG. In general, EMGs are associated with high costs of administration and interpretation.

You Will Need

Equipment:
• Surface electrodes
• Monitoring equipment.
Training:
Special training is mandatory to conduct and interpret the results.
Administration:
Surface electrodes are placed on the skin overlying the muscles of interest.

Availability


Assessment Interpretability

Minimal Clinically Important Difference

Not established in SCI

Statistical Error

Not established in SCI

Typical Values

Normative Data (mV (SD)):
Frontalis: 1.93 (1.41)
Anterior temporals: 2.22 (1.46)
Masseter: 1.73 (1.52)
Sternocleidomastoid: 1.32 (0.82)
Sternomastoid: 1.99 (1.83)
Occipitalis: 3.13 (2.78)
Splenius capitus: 5.01 (4.14)
Spenius cervicus: 3.59 (3.69)
Semispinalis capitus: 4.83 (3.87)
Semispinalis cervicus: 4.81 (7.68)
Trapezius: 3.54 (3.42)
Latissimus dorsi: 1.30 (1.16)
Paraspinalis: 1.07 (0.73)
Gastrocnemius: 0.91 (0.70)
Soleus: 1.33 (1.10)
Anterior tibialis: 3.53 (6.52)

(Matheson et al., 1988; N=103 college students; measurements taken while seated)
## Measurement Properties

### Validity – Moderate to High

**Moderate** to **High** correlation with Manual Muscle Testing (MMT):
- Biceps: 0.56/0.40
- Triceps: 0.77/0.70
- Extensor carpi radialis: 0.64/0.64
- Abductor digiti minimi: 0.49/0.67
- Psoas: 0.47/0.77
- Quadriceps: 0.54/0.61
- Tibialis anterior: 0.57/0.78
- Soleus: 0.28/0.59

(Calancie et al., 2001; N=45, 34 cervical, acute SCI, < 1 week post-injury)

**Number of studies reporting validity data:** 4

### Reliability – High

**High** Test-retest Reliability:
- Voluntary response index magnitude: ICC = 0.93
- Voluntary response similarity index: ICC = 0.83

(One week interval; Lim & Sherwood, 2005; N=69, 65 male, incomplete SCI, mean (SD) time since injury = 54.8 (3.6) months)

**Number of studies reporting reliability data:** 1

### Responsiveness

**Floor/Ceiling Effect:**
- Not established in SCI

**Effect Size:**
- Not established in SCI

**Number of studies reporting responsiveness data:** 0