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Samantha Gunderson
Western Washington University

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THE EFFECTS OF A FIVE-WEEK EXERCISE INTERVENTION USING EMG BIOFEEDBACK ON SCAPULAR STABILIZER MUSCLE ACTIVATION AND SCAPULAR KINEMATICS

Samantha R. Gunderson\textsuperscript{1}, Jun G. San Juan\textsuperscript{1}, David N. Suprak\textsuperscript{1}, and Wren L. Cunningham\textsuperscript{1}

\textsuperscript{1}Kinesiology and Physical Education Program, Dept. of Physical Education, Health and Recreation, Western Washington University, Bellingham, WA, USA.

**Introduction**

- Electromyography (EMG) biofeedback has not been investigated as a preventative tool for those at risk for developing shoulder pathologies.
- Observing muscle activation on the screen allows the subjects to obtain the correct movement for the exercises performed\textsuperscript{1}.
- Desired scapular kinematics during scapular plane humeral elevation\textsuperscript{2}
  - Upward rotation
  - External rotation
  - Posterior tilt
- This study investigated changes in scapular kinematics, and muscle activation patterns as a result of EMG biofeedback.
- Hypotheses:
  - The scapula will increase in upward rotation, posterior tilting and external rotation.
  - There will be a decrease in upper trapezius activity, with an increase in serratus anterior and lower trapezius activity.

**Methods - Instrumentation**

- Healthy subjects (9 Males, 11 Females)
  - age = 22.3 ± 1.9 y/o
  - height = 1.71 ± 0.1 m
  - weight = 67.3 ± 10.3 kg
- Exclusion criteria:
  - Current pain
  - SIS diagnosis
  - Shoulder surgery
- Ag/AgCl self-adhesive electrodes placed bilaterally (Figure 1A):
  - Upper Trapezius
  - Lower Trapezius
  - Serratus Anterior
  - Lumbar Paraspinals
- 3D kinematic receivers (Figure 1B):
  - Custom Scapular tracker
  - Humeral Cuff
  - Thorax

**Methods - Protocol**

- Subjects divided into 2 groups
  - Exercise w/ biofeedback
  - Exercise only
- Humeral elevation in scapular plane
  - Baseline, week 6 & 8
- Subjects performed a warm up of pendulum swings
- Scapular stabilization exercises performed
  - I, W, T, Y (Figure 2 A, B, C, & D)
  - 1 x 10
- Exercises performed for five weeks
  - 3 x week
- Biofeedback group:
  - 1 x week EMG biofeedback
  - Exercises on screen in % MVIC
- Exercise only group:
  - Exercises at home w/ video instruction

**Results – Graphical Representation**

- Upward/ Downward Rotation: Exercise with Biofeedback
- Upward/ Downward Rotation: Exercise Only
- Upper Trapezius Muscle Activation: Exercise Only

**Discussion & Conclusion**

- Exercise intervention not long enough
- 6 weeks in line with current recommendations\textsuperscript{3}
- Healthy population
  - Could have already been within normal ranges for scapular kinematics
- Future studies should investigate a longer program with a pathological population

**References**