May 15th, 10:00 AM - 2:00 PM

The Effect of a Five-Week Exercise Intervention Using EMG Biofeedback on Scapular Stabilizer Muscle Activation and Scapular Kinematics.

Samantha Gunderson
Western Washington University

Follow this and additional works at: https://cedar.wwu.edu/scholwk

Part of the Higher Education Commons


This Event is brought to you for free and open access by the Conferences and Events at Western CEDAR. It has been accepted for inclusion in Scholars Week by an authorized administrator of Western CEDAR. For more information, please contact westerncedar@wwu.edu.
THE EFFECTS OF A FIVE-WEEK EXERCISE INTERVENTION USING EMG BIOFEEDBACK ON SCAPULAR STABILIZER MUSCLE ACTIVATION AND SCAPULAR KINEMATICS

Samantha R. Gunderson1, Jun G. San Juan1, David N. Suprak1, and Wren L. Cunningham1

1Kinesiology 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 performed1.

• Desired scapular kinematics during scapular plane humeral elevation2
  • 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

• No significance found for scapular external rotation (p = 0.880), posterior tilt (p = 0.212), or upward rotation (p = 0.668) for either group

• No significance 3-way interaction of muscle activation (p = 0.249)

• Increased upward rotation and decreased UT activation - Although not significant

Discussion & Conclusion

• Exercise intervention not long enough
  • 6 weeks in line with current recommendations3

• Healthy population
  • Could have already been within normal ranges for scapular kinematics

• Future studies should investigate a longer program with a pathological population

References